A Study of Supply Chain Integration Practices, Patterns, Attitude and Performance in Indian Automobile Industry

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By

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UNDERTAKING

I declare that the work presented in this thesis entitled "**A Study of Supply Chain Integration Practices, Patterns, Attitude and Performance in Indian Automobile Industry**," submitted to the School of Management Studies, University of Hyderabad, for the partial fulfillment of the **Doctor of Philosophy** degree in **Management**, is my original work. I have neither plagiarized nor submitted the same work for the award of any other degree. In case this undertaking is found incorrect, I accept that my degree may be unconditionally withdrawn.

August 2017 (Shubhansh Verma)

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CERTIFICATE

This is to certify that the thesis entitled **"A Study of Supply Chain Integration Practices, Patterns, Attitude and Performance in Indian Automobile Industry"** submitted by **Mr. Shubhansh Verma**, bearing registration number **12MBPH03** in partial fulfillment of requirement for award of the Doctor of Philosophy in **School of Management Studies** is bonafide work carried out by him under my supervision and guidance.

This thesis is free from plagiarism and has not been submitted previously in part or in full to this or any other University or Institution for award of any degree or diploma. Parts of this thesis have been:

A. Published in the following publications:

1. "Power, Trust, Integration, and Performance in Supply Chains: A Literature Survey," *Management Today: An International Journal of Management Studies* (ISSN Number: 2348-3989), Vol. 7, No.2: April-June 2017.
2. "An investigation about relational antecedents of Power and Trust and its impact on Supply chain integration," *Proceedings of IAC-MEM 2016* in Budapest July 2016 in Prague (ISBN Number: 978-80- 906231-2- 5), 1st edition.
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2. Supply Chain Integration and Performance: A Literature Analysis, *7th ISDSI, and 5th OSCM International Conference*; December 28-30, 2013, held at International Management Institute, New Delhi.

Further, the student passed following courses towards fulfillment of coursework requirement for Ph. D.:

S. No.	Name	Credits	Pass/Fail
1.	Quantitative Techniques	3	Pass
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Abstract

This dissertation is about the Supply chain integration (SCI) which has received increasing attention from academic researchers and practitioners in recent years. However, our knowledge of what influences SCI, and how SCI influences the performance of supply chains and companies within the supply chains, is still very limited. This research is an effort to remedy that deficiency by empirically examining Power, Trust, SCI and their impact on performance based on the data collected from 216 companies in automobile industry in India. This dissertation consists of two studies.

In Study I two types of Power used by suppliers and their impacts on Trust, SCI, and Supply Chain Performance are examined. The results indicate that both types of Power have different impacts on different types of relationship commitment. This study also extends Brown et al.'s (1995) study and found that cooperative behavior and Trust can improve Supply Chain Performance.

In Study 2, we extended the model suggested by Van Donk & Van der Vaart (2008) with the help of taxonomy of SCI. We investigated the interrelationship of different dimensions of supply chain integration and examined several factors influencing SCI performance, such as long term orientation, information sharing, and interaction patterns. Theoretically, this research contributes to transaction cost theory, social exchange theory and power-relationship commitment theory. The managerial implications and guidelines developed from this study will help the companies enhance their global competitiveness by developing and managing relationships with their trading partners to achieve the more effective integration of the internal and external processes within the supply chain.

Keywords: Supply Chain Integration, Performance, Trust, Power

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Chapter 1 - INTRODUCTION

1.1 Research Background

In today's marketplace, no single company has all the resources and capabilities to manage flows of products from the raw material to the finished product stage. Therefore a lot of different companies are involved in the activities associated with transforming raw materials into products and service for end-users. However, this scheme of things underlines the need for better coordination and cooperation among all the business players to run smoothly various processes in the raw materials-to-end product chains. Once the desired coordination and cooperation are there among the players, they can provide superior customer service, generate high revenues and keep costs low and all this would translate into profitable results for the players. Thus the concept of supply chain management has become vital for any firm operating in today's environment. The term supply chain management is commonly known as *SCM*.

The development of modern logistics could be seen as the first breakthrough in the evolution of SCM. 1960s was the era of fragmentation when production planners rarely took finished goods inventory into account. In those days, production planning, purchasing, procurement, inventory management, warehousing, and transportation were independent functions of any business. All these functions are considered as building blocks of Supply Chain Management. These building blocks in the early days functioned like isolated islands, which were built due to lack of consistency among different business functions. It also meant huge disparities within the supply chain, which resulted in situations where at one point of time channel partners were overloaded with huge inventory with no immediate demand and at the other extreme faced a stock out situation. This situation called for systematization of various functions in the supply chain and a more integrated approach. Centralization of information, lead-time reduction, and

strategic partnerships have helped companies to overcome this situation. 1980s witnessed integration of various functions viz. inventory management, demand forecasting, and management of non-operating assets. The decade helped companies shift their focus towards quality, which in turn has given many strategic tools to the corporate world viz. Enterprise Resource Planning, Total Quality Management, Business Process Outsourcing, etc. This situation forced companies to integrate their operations, where companies integrate all fragmented business functions into two key functions – material management and physical distribution. The rat race for providing 'best quality at affordable price' forced companies to integrate material management and physical distribution. The integration of these functions has given birth to logistics management. This development in 1990s heralded the era of total integration. Logistics management, integrated strategic planning, information technology, marketing and sales activities have taken the initiative to develop an effective SCM.

1.2 Purpose and Scope

Integration has always been the central theme of supply chain management. As the paradigm shifts from competitive advantage to collaborative advantage, supply chain integration has become an essential part of any organization. The term supply chain integration is commonly known as *SCI*. Supply chain integration has always been a challenging task, and effective implementation of it remains a mystery for many organizations. With the beginning of new global business era of technological advancements and internet trade, the very nature of supply chains has started shaping itself. With the plethora of information which exists in form of big data, researchers and industry practitioners have increasingly become more interested in supply chain integration. Internet and other communication technologies enable business for fast sharing information, tracking of goods and inventory stock of production, therefore,

provide an opportunity for effective integration. The inception of supply chain integration can be found back in the late 1970 when studies started showing the strong need for integration of distribution of goods (Lambert 1978). But it was the Porter's Value Chain model in 1985 with the notion of linkages, which laid down the theoretical foundation of the SCI. Over the past decade, rapid globalization and technological advancement have put pressure on organizations for both low inventory stocks and faster order fulfillment cycles. To overcome these challenges supply chain integration is needed more than ever before. Research literature has emphasized integrative practices adopted by suppliers and customers for shared benefits and joint-venture arrangements between supplier and manufacturer when going into new markets (Mabert & Venkataramanan, 1998). In supply chain management literature several researchers have presented a strong positive correlation between SCI and performance (Flynn, Huo, & Zhao, 2010; Kim, 2006, 2009; Koçoğlu, İmamoğlu, İnce, & Keskin, 2011; Lai, Wong, & Cheng, 2008; Prajogo & Olhager, 2012). However, some studies have raised questions about the empirical research done to support this hypothesis (Fabbe-Costes & Jahre, 2007; Ho, Au, & Newton, 2002). While there exists many kind of integration from the loosely bound to the tightly connected, their impact on business performance is still not clear (Frohlich and Westbrook 2001).

Previous empirical studies supports the notion that highly integrated supply chains has positive outcome. (Frohlich Westbrook 2001). Therefore, it is imperative that integration is much needed, but how effectively it should be implemented, such that the performance gains are attained, remains unanswered. It is necessary to understand different dimension of SCI and the factors which enable to achieve a high level of integration. Prior work shortfalls for providing a precise conceptualization of supply chain integration, which consequently limits our ability to evaluate how supply chain

integration relates to the firm's performance. Thus an understanding about the supply chain integration dimensions is extremely important, and it is required to do a detailed investigation of SCI and its impact on performance.

1.3 Supply Chain Management in Automotive Industry

Most innovations in supply chain can be attributed to auto companies. The automotive industry is one of the largest industries worldwide with critical mass in Europe, Japan, and the US. The global auto business is a mature, cyclical business. Many of the supply chain management concepts are derived from the much acclaimed Toyota Production System. Once the Japanese companies started conquering the US market in the late 1970s with their cheaper but high-quality vehicles, the auto industry the world over sat up to take note of their strategies. Several supply chain advances have taken place since then. Trying to implement lean production and JIT concepts have meant several changes in company practices. Working with partners to whom a lot of processes have been outsourced leads to radically designed new business processes in areas such as design, procurement, and logistics. Many ERP solutions have had their origin in the automotive industry. However today, carmakers need to improve their innovative ability to get cars to the market faster and reduce errors. For this, they depend on the technology which refers to computer-aided engineering, concurrent engineering, product data management and business process engineering. For communication among partners in the automotive supply chain, many carmakers are using web based platform such as the American Network Exchange (ANX) or European Network Exchange (ENX). These systems have greatly helped improve the communication across the supply chain.

1.3.1 The Indian Automobile Industry

In the last ten years, most global producers have entered the Indian market. The industry registered a turnover in the excess of Rs. 70,000 crore. Currently, however, the industry is going through a rough phase with the downtrend in the Indian economy. The Indian market is yet a mere fraction of the world market. But the supply chain practices in India shows that like elsewhere in the world. The Indian auto companies are also adopting strategies and concepts of both inbound and outbound sides, as well as production methods. Tata engineering was one of the earlier companies along with Hindustan Motors and Premier Padmini to have started shop in India. Early auto centers were the west in Pune- Mumbai and the east in Jamshedpur-Calcutta. Maruti's advent created the Delhi-Gurgaon belt, and now a few MNCs have created the southern belt of Chennai-Hosur-Bangalore. New capacities have come up with vendors being asked to set up units close to the factory. Hyundai has formed a vendor park around SIPCOT Park in Chennai where 14 joint ventures exist between India and Korean companies. More than 60- 65 per cent of the items are sourced from the park with companies being in a radius of 2-4 km of the auto firm.

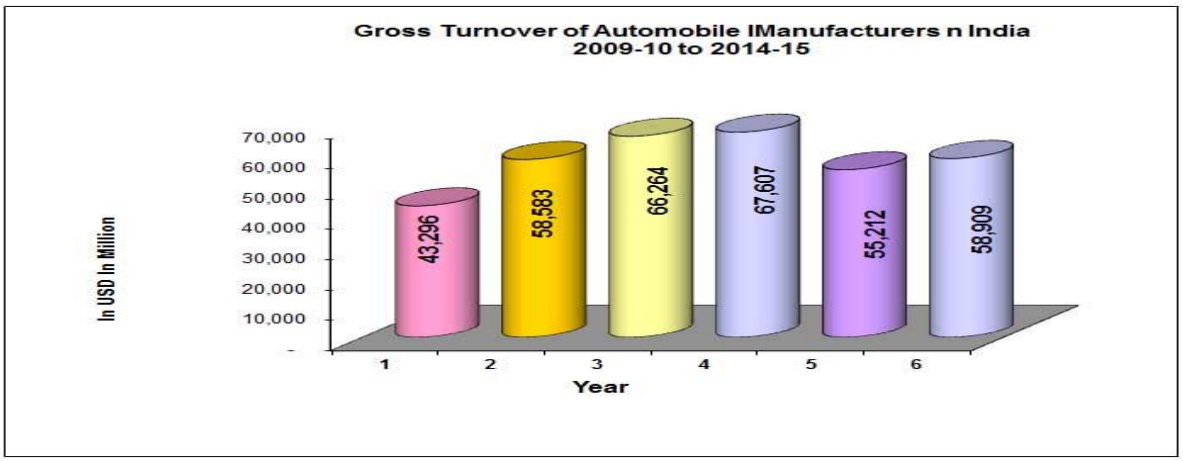

Figure 1.1 Grass Turnover of Automobile Manufacturers in India

1.3.2 Supplier relationship in Indian Automobile Industry

Supply chain management is all about better relationship and collaborating with vendors with a problem-solving attitude and an underlying trust in them is the key to its success. Maruti has a total of 370 suppliers and 12 component suppliers that have joint ventures with the company. It was the first company to start the concept of supplier partnerships in India in 1983-84. For ensuring a steady flow of components, a lot of planning had gone into the selection of the vendor base. Tata Engineering has undergone significant changes from the earlier years. It has initiated a comprehensive supplier rating system based on parameters (Quality, Cost, Delivery, Design capabilities and Management Systems). Over twenty percent of its vendors are QS9000 certified. Mahindra and Mahindra has been following a structured approach to get savings in the short term, medium term and long term. In the short term, through tactical sourcing, the benefits have been via consolidation, in medium term, the benefits have been through driving down acquisition costs. In the long term, the benefits have been through simultaneous working for improved product design, process design, process improvement and technology up gradation.

1.4 Research Questions & Objectives

The research will be attempted to minimize the gap between supply chain integration and its impact on operational performance. Also, this study examines the role of power, trust, information sharing and integrative practices in supply chain management. The aim of this study to show that it is necessary for the manufacturer to understand the different type of power exercised by it to improve the information integration which will improve the performance of the chain. This research also adds to our understanding that in a place like India where power distance and information

asymmetry is very high why gaining trust is much needed for an efficient and integrated supply chain. To investigate the research hypothesis, we used a survey on supply chain managers/logistics managers/the person in-charge for procurement and supply of material residing all over the India. The research unit is the firm which is a supplier in an automobile supply chain. More specifically, the following research questions are addressed:

1. How do relational antecedents such as Power influence Supply Chain Integration?

2. What is the nature of relationship between the attitude, practices, and patterns of Supply Chain Integration?

3. What is the effect of Supply Chain Integration on Buyer-supplier dyad performance?

These research question will be answered in two steps with following objectives. Firstly, we investigate the interrelationship among these three construct, and then we establish the relationship between supply chain integration and operational performance. Research objectives of the study are:

- To find out the effect of two power dimension (Reward and Coercive) on Trust and information sharing practices.
- To investigate the different dimensions of SCI construct and its relationship with supply chain practices and patterns.
- To measure the effect of integrative practices on the operational performance of the supplier.
- To investigate the effect of supply chain integration on of buyers-suppliers dyad performance.

1.5 Organization of the Dissertation

This section describes the organization of this thesis. The thesis consists of seven chapters. The aims, background of the research problem, hypothesis and research methodology are described in these chapters, as so the results of research and its` interpretations and conclusions.

The first chapter (present) is introduction. It presents the research background of the supply chain management in general. The purpose of this study, research questions and objective have been briefly described in this chapter. It also defines the aim and scope of the study.

Chapter 2 provides the theoretical underpinning of the thesis with relevant literature review. The concept and definitions of supply chain integration and performance measurement has been thoroughly discussed in two section which are further divided into several subsections. First of all, it introduces the several definitions of supply chain integration and the different types of integration defined in literature, and then the benefits of supply chain integration has been evaluated within the framework of transaction cost theory. The performance section considers three dimensions of performance: financial, operational and supply-chain performance. The relationship between performance and supply chain integration has been critically evaluated.

Chapter 3 establishes the conceptual model of two studies which are employed in this research. First of all, it presents the research framework adopted from the literature which is the theoretical basis of the research model. In the first section, various concepts like power, information sharing, trust, and performance have been described and then on consideration of gaps in prior research, conceptual model with research hypothesis have been framed. The first model links supply chain integration with the two dimension of power (reward and coercive) and its impact on supply-chain performance. The second

model links supply chain practices and communication pattern with the supply chain attitude dimension (long-term orientation and cooperative behavior) with buyer-supplier relationship.

Chapter 4 presents the research methodology employed in the research. The sections consists in this chapter are research design, questionnaire design and measures, sampling, data collection method, response rates, and reliability. These sections describes detailed process of instrument development and gives the blueprint of research design. It also deals with the various issues related to the reliability of the survey instrument.

Chapter 5 presents the analysis and results of the studies. This chapter provides a detailed process of data analysis. Firstly, in section one the profile of the respondents participated in the survey have been presented. We have used M*plus* software for structural equation modeling. In next section, we give a brief introduction of the software along with the example of input and output files. The next two sections contain the assessment of measurement models and structural models.

In chapter 6 we discuss the findings of the results along with the managerial implications. The chapter is divided into sections which are based on the research questions framed in Chapter three. The aim of the research is to investigate the different dimensions of SCI and its relationship with performance. Also, this study considers the internal factor of supply chain attitudes and trust within the main research framework of supply chain integration. Therefore, this research shows that firms have to deal with these factors in supply chain management to have competitive advantages and that they also need to allocate their resources, based on dynamic capability, effectively to improve performance.

Chapter 7 presents contributions, limitations and future research. The aim of this research is to validate a research framework for supply chain integration and to

empirically investigate how supply chain integration practices and communications patterns influence buyer-supplier relationship from the information sharing perspective. There are some limitations in this study. Though this study includes a wide representation in terms of industry types, it might be interesting to focus on two industries and perform a more in-depth comparison. Validating the findings of this study in another country would also be an interesting extension. Since this research serves to close a gap in the literature of supply chain integration, this research will, hopefully, make a significant contribution to the academic and business world.

Chapter 2 - Literature Review

2.1 Supply chain Integration

As early as the 1970s, researchers have been articulating the need for integration in the physical distribution of products (e.g., Lambert, Robeson, & Stock, 1978). However, it was not until a decade ago that researchers started to call for a systematic approach to SCI. Increasing global competition in the past decade has prompted many organizations to create cooperative and mutually beneficial partnerships with supply chain partners (Wisner & Tan, 2000). The increasing shift toward global sourcing and pressures for both low inventory levels and faster order fulfillment cycles have made supply chains more extended and time sensitive than ever before. To meet these challenges, supply chain collaboration has been employed. Supply chain collaboration has been investigated in various industries over the past decade. In a study of Bleeke and Ernst (1993), "collaborating to compete" is identified as a vital strategy for securing the competitive advantage in a dynamic environment. Research literature has placed an increased emphasis on collaborative relationships developed between suppliers and customers for shared benefits and joint venture arrangements when penetrating new markets (Mabert & Venkataramanan, 1998).Spekman, Kamauff Jr, and Myrh (1998) also suggested that firms in the supply chain should fully collaborate with their partners to maximize the benefits of cost reductions and revenue-enhancing behaviors. Collaboration embodies the integration of the suppliers and customers into the supply chain. Fawcett and Magnan (2002) empirically identified the various forms of integration and validated the importance of collaboration as a critical antecedent to effective SCI. They also stressed the inherent difficulty of collaboration, such as strategic misalignment, poor supply chain visibility, and conflicts of vested interests. They found that most supply chain organizations appreciate the integration with first-tier suppliers and customers because

of a better collaboration with them. With the increase of the importance of SCI and the appearance of various influential studies, several papers about a literature review of SCI were published in recent years. Power (2005) reviewed much literature relating to the integration and implementation of SCM practices from three strategic perspectives. The three perspectives used to review the literature are SCI, strategy, and planning, and implementation issues. The SCI perspective addressed the integration of core processes across organizational boundaries through improved communication, partnerships, alliances, and cooperation. The strategy and planning perspective examined SCM as a strategic matter for trading partners and the factors relating to the planning required. The implementation issues perspective, on the other hand, investigated the factors critical for a successful implementation of SCM and supply-chain initiatives. Three major aspects of SCI were discussed: information flows, physical logistics, and partnerships, alliances, and cooperation. In an earlier paper, Hillebrand and Biemans (2003) reviewed SCI-related literature and investigated the relationship between internal cooperation and external cooperation. They proposed five perspectives on the relationship between internal and external cooperation: (1) the involvement of both internal and external partners, (2) communication patterns, (3) organizational learning, (4) organizational norms and (5) internal cooperation as a coordination mechanism for external cooperation. They argued that the nature of the relationship between internal and external cooperation was quite complex and that further studies from these five perspectives in various areas should be conducted. These review papers reflect the development of the research on SCI. However, SCI studies are still in the infancy stage, for example, there is not a generally agreed definition for SCI.

Table 2.1 Evolution of Supply Chain

Three Distinct Phases of Supply Chain Management	
Time Frame	**Characteristics**
1960-1975	An 'inventory push' era that focused primarily on physical distribution of finished goods.
1975-1990	Companies shifted to a 'customer pull' channel as power moved into the hands of customer.
1980 till date	Companies realized that productivity could be increased significantly by managing customer and supplier relationships and information and material flow across enterprise borders.

2.2 Definition of Supply Chain Integration

Various literature, such as Bowersox and Morash (1989) and Hammer (1990), suggested that SCI means to integrate the relationships, activities, functions, processes, and locations among all channel members in the supply chain. Stevens (1989) proposed that integrating the supply chain is primarily involved in planning, coordinating, and controlling materials, parts, and finished goods from suppliers to customer's at all different strategic, tactical, and operational levels. In addition, Naylor, Naim, and Berry (1999) demonstrated that the goal of integration is to eliminate all the boundaries to facilitate a smooth flow of material, cash, resource, and information. Lee and Whang (2001) suggested that SCI can be defined as a managerial approach that strives for great coordination and collaboration amongst supply chain partners in an attempt to maintain competitiveness. Meanwhile, Vickery, Jayaram, Droge, and Calantone (2003) stated that SCI should be strategically managed as a single system as opposed to individually optimizing fragmented subsystems. One of the limitations of the earlier explanations of SCI is that they may not be systematic enough to differentiate integration from SCM. As will be explained in the following paragraphs, SCI possesses some unique properties and

can be further classified into various types. Based on the various literature reviewed (Bowersox et al., 1999; Frohlich & Westbrook, 2001; Stevens, 1989; Towill & McCullen, 1999; van der Vaart & van Donk, 2004), we found that SCI could be defined as the degree to which the firm can strategically collaborate with their supply chain partners and collaboratively manage the intra- and inter-organizational processes to achieve the effective and efficient flows of products and services, information, money, and decisions with the objective of providing the maximum value to the customer at low cost and high speed. In our explanation, we highlighted the importance of the term "strategically collaborate". Strategic collaboration is a form of mutual ongoing partnership between trading partners to achieve some stated and mutually agreeable strategic goals. It is important for SCI because it engenders better mutual trust, longer duration of contracts, more efficient conflict resolution, and better sharing of information, rewards, and risks (Ellram, 1990; Heide & John, 1990; Poirier & Reiter, 1996). As a high level of collaboration and cooperation, SCI emphasizes the strategic aspects of supply chain collaboration. Moreover, we emphasized the "intra- and inter-organizational processes". Both processes are critical in the stages of SCI. Bowersox and Morash (1989) proposed that the migration path of SCI should extend from the integration of internal logistics processes to external integration with suppliers and customers. However, some previous studies investigating SCI are not comprehensive because they ignored the internal aspect (e.g., Frohlich & Westbrook, 2001). Finally, we stated that the key objective of SCI is to provide the maximum value to the customer at low cost and high speed. Customer orientation is exceptionally important in the current business world. Without the customer-oriented initiatives, we could not reasonably expect a successful implementation of SCI. One successful example of an integrated supply chain is that of Wal-mart and its key suppliers. Their tight coordination can be

capitalized in terms of product availability increases and inventory cost reduction (Simatupang, Wright, & Sridharan, 2002). From the perspective of inter-organizational relationship, SCI is the development of the traditional buyer-seller relationship. Major Differences Between SCI and Traditional Buyer-Seller Relationship Buyer-Seller Relationship SCI Relationship dimension dyadic relationship triadic relationship Cooperation low level cooperation between high level cooperation/collaboration level buyers and sellers between the firms Orientation arm-length oriented, long-term oriented, self-interested customer-focused Target no collaborative objective to benefit all companies, to pursue the collaborative objectives Relationship complexity relatively simple complicated Scope external processes focused both internal and external processes focused Extent working together operationally strategic, tactic and operational cooperation.

2.3 Types of Supply Chain Integration

The main focus of previous research is the development of the SCI definition and instrument. The classification of SCI varies across different studies, in which SCI was investigated from different perspectives. From a perspective of interaction between the competitive environment and the organization, Johnson (1999) investigated the strategic role of inter-firm relationships through the concept of strategic integration. He developed an instrument and empirically validated strategic integration as a center of gravity for building up sustainable integration using data from industrial equipment distributors. From a perspective of relationship governance in supply chains, Whipple, Frankel, and Anselmi (1999) investigated the relationship between supply chain governance structure and performance. They proposed that market exchange, hybrid-integrative, and vertical integration are three stages of supply chain governance structures. They also found that performance could be achieved if inbound supply relationships can be managed better.

From a perspective of integrative practices of the companies, Das, Narasimhan, and Talluri (2006) tried to identify an optimal configuration for supplier integration that included a set of "internal" and "external" practices. Using data collected from 322 US manufacturing companies, they found that there was an optimal set of supplier integration practices that led to the best performance. They also found that indiscriminate and continued investments in integration were not associated with performance improvement. From a perspective of collaborative behaviors that happen within and across supply chain organizations, such as intra/inter-organizational process management and inter-organizational collaboration, Morash and Clinton (1998) investigated and compared three types of SCI for about 2000 global companies. They argued that 1). Intra-organizational process integration integrates cross-functional flows, 2). Inter-organizational strategic alliances integrates behavioral, communicational, and interactive flows in supply chains, and 3). Inter-organizational operational excellence integrates physical, spatial, and temporal flows in supply chains. The decision-making process was also compared for these three types of SCI, from the strategic, tactical, and operational perspectives. They found that the levels of these three types of SCI are different for the companies from the U.S., Japan, Korea, and Australia. The companies in Japan had the greatest inter-organizational operational excellence, while the companies in the U.S. and Australia had higher inter-organizational strategic alliances than those in Japan and Korea. They also found that the companies from Korea and Japan were more likely to use a total cost reduction strategy, but the companies from the U.S. and Australia were more likely to use a differentiation strategy. It was found that strategic alliances were positively related with a differentiation strategy and operational excellence was associated with a total cost reduction strategy. This study actually identified external (customer and supplier) integration and internal (process

reengineering) integration. In a New Zealand study, Campbel and Sankaranl (2005) proposed a framework for enhancing SCI for small and medium enterprises based on the cases reviewed. The framework included internal integration, forward integration, and backward integration. The different types of integration covered several themes, such as organizational structure, information system, relationship management, performance measurement, and technology interfaces. From a similar perspective of inter-organizational collaboration and internal cooperation, Stank, Keller, and Daugherty (2001) investigated internal and external collaboration and found that collaboration with external supply chain entities increased internal collaboration, which in turn improved service performance. Although both dimensions can provide insights for managers and researchers in establishing SCI, it is reasonably believed that a composite of the two may better describe SCI in a highly dynamic environment. In another study, Stank, Keller, and Closs (2001) developed and tested an instrument for measuring SCI competencies as well as evaluating their relative importance to developing logistic distinctiveness. The instrument measures the six areas of logistic competence, which include internal integration, customer integration, material/service supplier integration, technology and planning integration, measurement integration, and relationship integration. Among the six areas of SCI that they identified, customer integration and internal integration are considered the most significant differentiators of overall firm performance. However, contrary to common belief, the regression results related to relationship, measurement, and supplier integration indicated significant negative associations with certain individual performance measures. They made some significant contributions to the literature by proposing an exhaustive list of SCI competencies, yet failed to substantiate the supply chain competencies constructs with literature and test the causal relationships among the competencies. Therefore, it is difficult to assess whether or not their stated

competencies (i.e. customer integration, internal integration, service supplier integration, technology planning integration, measurement integration, relationship integration) as a whole represent the concept of "SCI" effectively. Both supplier integration and customer integration are included in external integration. There are six main types of SCI including internal integration, external integration, strategic integration, relationship integration, information integration, and measurement integration.

2.3.1 Internal Integration

Internal integration refers to the degree to which a firm can structure its organizational strategies, practices, procedures, and behaviors into collaborative, synchronized, and manageable processes to fulfill its customers' requirements (Cespedes, 1996; Chen & Paulraj, 2004b; Kahn & Mentzer, 1996; Kingman-Brundage, George, & Bowen, 1995). This explanation shows notable differences, with the narrow one stated in Chen and Paulraj (2004b), which considered internal integration "the degree to which firms are able to integrate and collaborate across traditional functional boundaries to provide better customer service". Their explanation is too simplistic and cannot direct the efforts of supply chain practitioners to the important integrative areas such as organizational strategies, procedures, practices, and behaviors.

2.3.2 External Integration

The concept of integrating with external parties (i.e., customers and suppliers) has attracted considerable attention. For example, Bowersox and Morash (1989) proposed that the migration path of SCI should extend from the integration of internal logistics processes to external integration with suppliers and customers. Frohlich and Westbrook (2001) relied on external integration to classify their five types of SCI companies. External integration refers to the degree to which a firm can create a partnership with its key supply chain members (customers and suppliers) to structure their inter-

organizational strategies, practices, procedures, and behaviors into collaborative, synchronized, and manageable processes to fulfill their customers' requirements (Stank, Keller, & Daugherty, 2001). External integration can be divided further into customer integration and supplier integration. Customer integration involves the core competency derived from a better coordination of critical customers in a company's supply chain to achieve improved service capabilities at a lower total supply chain cost, whereas supplier integration involves that of critical suppliers (Bowersox et al., 1999).

2.3.3 Strategic Integration

The challenge for SCI is the managerial capacity for combining resources and competencies from various supply chain partners and business units and directing all relevant parties toward an expanded resource base and competitive advantage. Many supply chain companies have relentlessly devised comprehensive integrated strategies to make efficient strategic integration (Burgelman & Doz, 2001; Fuchs, Mifflin, Miller, & Whitney, 2000). Strategic integration refers to the degree to which a firm can structure its strategic goals and objectives, as well as the sharing of resources, rewards, and risks across organizations into a consensus and contractual agreements in order to achieve competitiveness (Burgelman & Doz, 2001; Fuchs et al., 2000; Johnson, 1999). Because of its importance, "strategic integration" can be viewed as a fundamental precondition for the overall SCI.

2.3.4 Relationship Integration

From a strategic perspective, strategic integration between supply chain firms commences when the inter-firm relationships are considered to be strategic assets (Anderson, Hikansson, & Johanson, 1994). Webster (1992) argued that marketers must place a high emphasis on the maintenance of ongoing customer-supplier relationships in order to facilitate the progressive involvement between two partnering firms. Bowersox

et al. (1999) further declared the importance of an effective relationship management in the contemporary SCM and advocated the identification and use of "relationship integration". Unfortunately, the paper could not make a good distinction between "relationship integration" and "strategic integration". Relationship integration refers to the degree to which a firm can structure the formation, commitment, maintenance, and exit of relationships across organizations into a consensus and contractual agreements in order to achieve competitiveness (Bowersox et al., 1999; Stank, Keller, & Daugherty, 2001).

2.3.5 Information Integration

As the marketplace has become more technology-driven and information-based, effective information management and acquisition of intelligence are indispensable goals to be achieved, especially at the operational level. Accomplishing such goals relies on a supply chain approach called "information integration". From the technological perspectives, Roth, Wolfson, Kleewein, and Nelin (2002) defined "information integration" as "a technology approach that combines core elements from data management systems, content management systems, data warehouses, and other enterprise applications into a common platform." However, such an explanation underplays the managerial dimension and diverts the attention from the aspect of "coordination". Leveraging from various literature (Jhingran, Mattos, & Pirahesh, 2002; Kulp, Lee, & Ofek, 2004; Roth et al., 2002), we regard information integration as the degree to which a firm can coordinate the activities of information sharing and combine core elements from heterogeneous data management systems, content management systems, data warehouses, and other enterprise applications into a common platform in order to substantiate the integrative supply chain strategies. Our explanation implies that information integration is both a managerial and technology issue.

2.3.6 Measurement Integration

The last type of SCI is measurement integration, which refers to the degree to which a firm can structure the measurement systems and manage the measurement activities with its key supply chain members in order to substantiate the integrative supply chain strategies (Bowersox et al., 1999). In measuring the supply chain performance, the design and implementation of measurement systems are important issues to be achieved. However, optimism regarding an integrated measurement system must be tempered by a realistic view of the challenges that can be characterized by a set of complex measurement activities. Therefore, our explanation implies that both measurement system and measurement activities play significant roles in the evolution of measurement integration. In examining the literature of SCI, we find that most of it focused on internal and external integration with the major customers and suppliers. The components of the other types of SCI including strategic alliance, information sharing, communication, demand coordination, technology transfer, relationship building, common goals, and so forth, have been largely incorporated into the internal and external integration constructs. Furthermore, a general consensus seems to have emerged regarding how to define internal and external integration. Internal integration and external integration are independent but correlated in the whole SCI context. Internal integration recognizes that different departments and functional areas within a firm should not act as functional silos but instead as part of an integrated process. External integration, similarly, recognizes the importance of establishing close, interactive relationships with customers and suppliers. Because the supply chain is part of an overall product offering, firms across the chain must act in a concerted way to maximize its value. External integration can be looked upon as an extension of internal integration across the firms' boundaries. Moreover, current management beliefs suggest that intra-organizational barriers (lack of

internal integration) are the primary impediments to achieving the full benefits of supply chain external integration (Meachum, 1996). Some stage theories also indicate that internal integration is a prerequisite for external integration (Morash & Clinton, 1998). The argument rests upon the fact that external uncertainties and linkages with customers and suppliers must be internally absorbed into the proper places in a firm. This internal absorption enables firms to engage in external relationships more successfully. In other words, without internal integration, it would be extremely difficult for a firm to achieve external integration. The commonly accepted supply chain concept includes at least three main types of companies: manufacturers, suppliers, and customers. Other companies, such as the suppliers' suppliers and the customers' customers, play the similar roles as these three main types of companies. Many previous studies investigated SCI from a perspective of three-level supply chains including manufacturers, their suppliers, and their customers, such as Armistead and Mapes (1993), Campbel and Sankaranl (2005), Droge, Jayaram, and Vickery (2004), Gimenez and Ventura (2005), Hillebrand and Biemans (2003), Koufteros, Vonderembse, and Jayaram (2005), Morash and Clinton (1998), Narasimhan and Kim (2001, 2002), Rosenzweig, Roth, and Dean (2003), Saeed, Malhotra, and Grover (2005) Stank, Keller, and Closs (2001), Stank, Keller, and Daugherty (2001), Vickery, Jayaram, Droge, and Calantone (2003), and Zailani and Rajagopal (2005). However, many other previous SCI studies only focused on two-level supply chains including two companies, such as Cousins and Menguc (2006), Das, Narasimhan, and Talluri (2006), Homburg and Stock (2004), Petersen, Handheld, and Ragatz (2005), and Ragatz, Handheld, and Petersen, (2002). SCI studies based on three-level supply chains provided a deeper understanding of SCI concept.

2.4 Review Methodology and Paper Selection

A number of articles on Supply chain integration linking to performance have been published in the last decade. This literature analysis is based on a search of the subject in major academic databases, such as *Business Source Premier, Emerald Fulltext, SceinceDirect, and Wiley Online Library*. These research articles are culled out from electronic searches of the academic databases. All identified papers are from 2000 onwards with the word *integration* or *collaboration* in the title or abstract and one or more of the words *supply chain* and *performance* in the article.

A two-step procedure was conducted to select qualified papers for review. First, various keywords, such as "supply chain integration", "supply chain performance", "supply chain integration and performance" and "integration impact on supply chain performance", were queried in the above-mentioned databases to acquire a list of papers. Non-referred articles, such as editorial notes, prefaces, industrial reports, book reviews, and interviews, were excluded from the preliminary search process. To ensure that only relevant paper got included a second step was performed to further filter the preliminary search results by thoroughly reading all articles and summarizing their focus area and contribution to the literature.

The list of papers included in review and their classification with respect to their focus area are given in Table 2.2

2.4.1 Analysis by year of publication

The analysis by date confirms that the selected articles were published quite regularly from 2001 to 2016. The data reveals that there appears an increase in the number of publications since 2001. Figure 1 also highlights an upward trend in the number of publications in 2009, 2010 and 2012 when it peaks respectively articles per year. These

articles published in the last four years show clear signals of the growing interest in the topic.

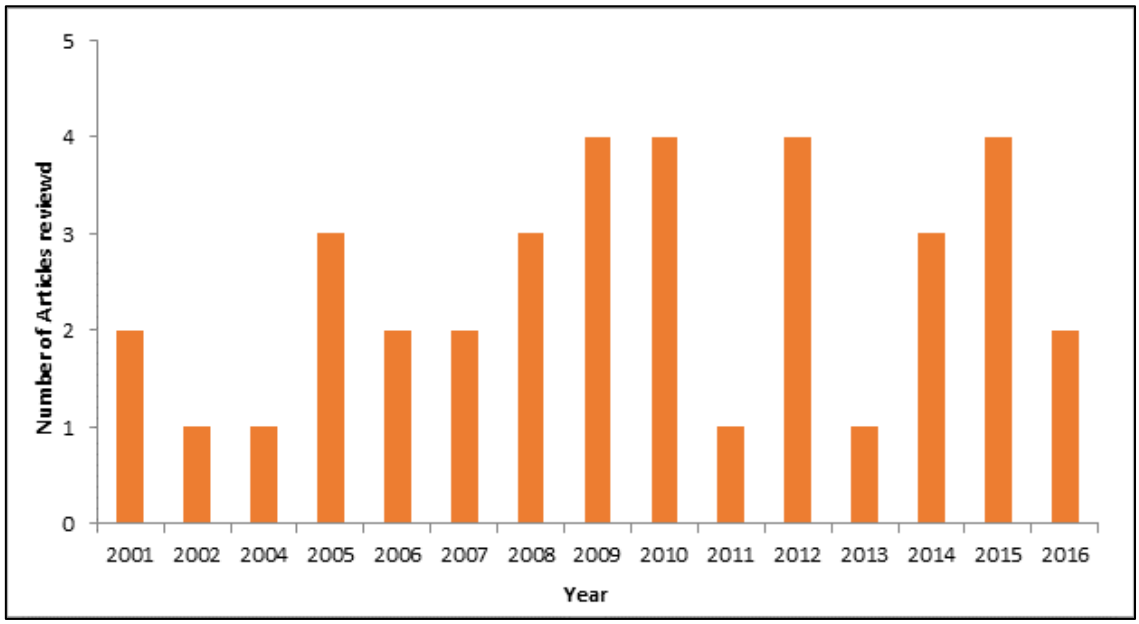

Figure 2.1 Analysis by Year of publication

2.4.2 Analysis by journal

The analysis by journal aims to highlight the journals most involved in the conversation about performance outcomes in supply chain integration. These are journals of high repute in the area of supply chain management. Highest numbers of articles were found in the *International Journal of Production Economics*. Second journal with the most number of articles (5) was *Supply Chain Management: An International Journal*. Figure 2.2 shows all the journals with the number of articles selected.

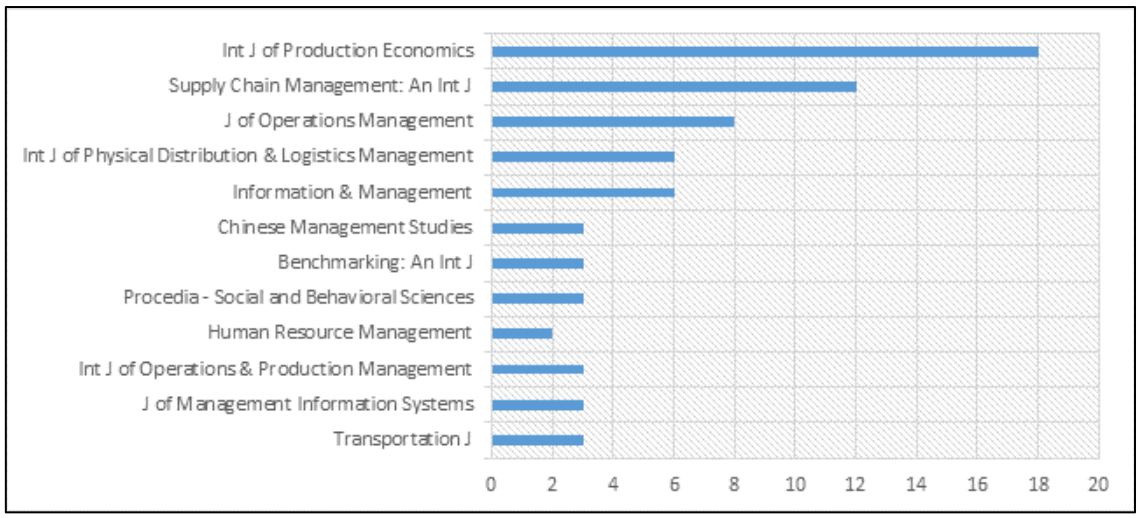

Figure 2.2 Analysis by journal

2.4.3 Analysis by method

The analysis by method shows that the majority of publications (70 percent) used Empirical survey method as the methodological approach. The others articles used different methods such as Literature review (15 percent), Case studies (7 percent) and Conceptual framework (7 percent)

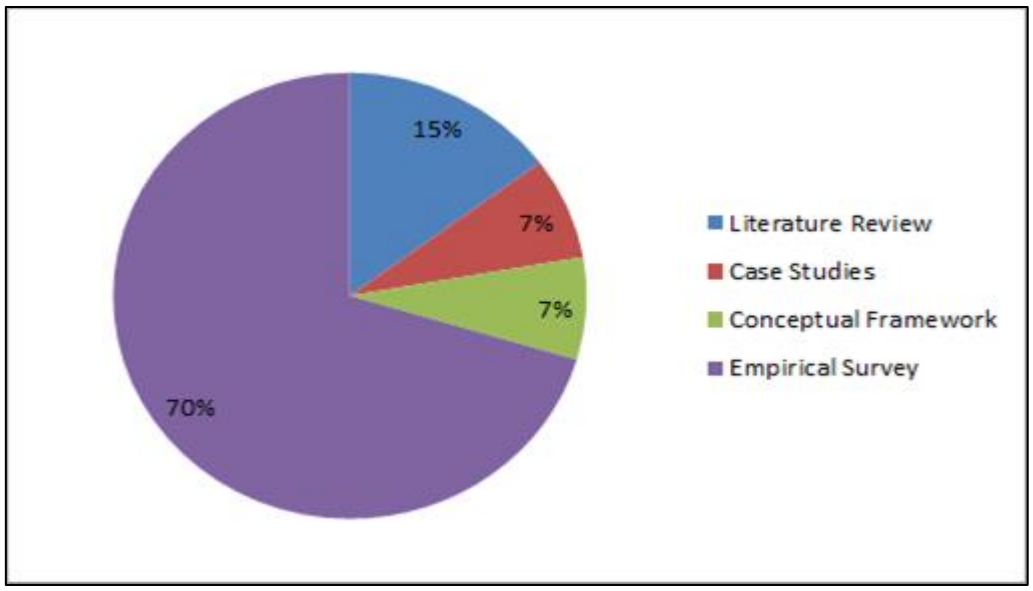

Figure 2.3 Analysis by method

2.5 Multidimensionality of Supply Chain Integration

An important emergent theme from the literature is the importance of taking a holistic view, and the systemic nature of interactions between the participants. The strategic nature of adopting a supply chain wide perspective, on the one hand provides significant potential benefit, and on the other requires trading partners to think and act strategically. In their study (Kim, 2006) tried to understand the interrelationships among three constructs; SCM practice issue, the level of SC integration and competition capability. He also examines how the triangular relationships among the three constructs influence firm performance. He concludes that large firms had already achieved considerable levels of SC integration and based on such high level of SC integration, closer interrelationship between SCM practices might improve performance level. A hypothetical study done by (Forslund & Jonsson, 2009) shows that the control variable of PM integration importance has a significant impact on PM process integration. They found that lack of trust was the most significant obstacle for supply chain integration. (Jr, Chen, Upreti, Fawcett, & Adams, 2009) study offers an empirical analysis of the moderating effect of supply chain integration barriers on the relationship between integration drivers and firm performance. Their main contribution is to examine the moderating effects of integration barriers on these relationships. They confirm that there is a positive relationship between drivers of integration and firm performance. (Droge, Vickery, & Jacobs, 2012) demonstrate that customer integration mediates the linkages from product modularity to delivery performance, as well as the relationship between process modularity and support performance. Their research reveals that there are greater benefits from downstream integration with customers. Their results suggest that without the flexibility or financial resources to invest in supply chain integration it is possible to enhance service performance from investments in modular product architectures. (I. J.

Chen & Paulraj, 2004) identifies and consolidates various supply chain initiatives and factors to develop key SCM constructs conducive to advancing the field. The result of their study presents a set of reliable, valid, and unidimensional measurements that can be subsequently used in different contexts and measurements. Vijayasarathy (2010) explores relational norms in the context of supply integration. They found out that Trust and commitment have major influences on inter-organizational relationships. They also find out that mutual dependence and organizational size has a strong influence on supply integration. (Lin, Wang, & Yu, 2010) findings confirm that value co-creation and the value constellations as the drivers of innovation in channel integration are positively associated with supply chain performance.

Fabbe-Costes & Jahre (2007) in their critical study found that integration is more rhetoric than reality. Their research supports the idea of a multi-dimensional SCI framework. They are very skeptical about the results given by other researches; they argue that results cannot be taken for granted and that more research is needed in SCM integration area.

2.6 Supply Chain Integration and Transaction Cost Theory

The mechanism and importance of SCI can be explained by transaction cost theory. The components of SCI are highly related to specific investments in supply chain transactions. Though there is not a commonly agreed framework for the components of SCI, some aspects have been investigated by most of the previous literature on SCI. For example, strategic partnership and operationally working together are the basic components of SCI, and they were emphasized by most of the previous SCI studies (e.g., Armistead & Mapes, 1993; Frohlich & Westbrook, 2001; Johnson, 1999; Morash & Clinton, 1998; Power, 2005; Stank, Keller, & Closs, 2001; Stank, Keller, & Daugherty, 2001; Zhao, Nie, Huo, & Yeung, 2005). Information system and information sharing are

also deemed crucial to SCI (e.g., Frohlich & Westbrook, 2001; Power, 2005; Narasimhan & Kim, 2001; Stank, Keller, & Closs, 2001; Stank, Keller, & Daugherty, 2001; Zhao et al., 2005). Other aspects implied or indicated in previous SCI studies include dedicated people for managing supply chain relationships and processes, communication, etc. The components of SCI can be further identified and classified into two major groups: specific investments and relationship governance. Specific SCI investments mainly include information systems, dedicated people, and other assets invested for the purposes of SCI. SCI relationship governance includes information sharing, strategic partnership, working together, and other methods that are adopted to manage or control the relationships or processes of SCI. The identification of the two major types of components of SCI can help us understand the mechanism of SCI and relationship governance from the perspective of the transaction cost theory. The transaction cost theory (TCT) is helpful in explaining the mechanism of SCI and its roles in the reduction of transaction costs in supply chains. Williamson (1975, 1996) found that transaction costs are related to three aspects: asset specificity, uncertainty, and contract incompleteness. As one of the major constructs in TCT, asset specificity refers to the transferability of assets that support a given transaction (Grover & Malhotra, 2003). They are investments that are difficult or impossible to redeploy when a relationship has been terminated (Heide, 1994; Joshi & Stump, 1999). For example, the relocation of a manufacturer's facility in order for it to be in physical proximity to a customer is an investment in a transaction-specific asset because it cannot be redeployed to a different customer if the original relationship is terminated. Other examples of transaction-specific assets include customer-specific training of a manufacturer's personnel, modification of internal manufacturing processes to accommodate a specific customer's product, exchange of personnel, and direct capital investments (Carr & Pearson, 1999). In SCI,

the information systems, such as networks used to link with the major customer, the quick ordering systems for the major customer, and the Point of Sales (POS) for the major customer, can be considered as physical specific assets invested by the manufacturers to facilitate transactions with their customers. The dedicated people from the manufacturers who are responsible for maintaining the information systems or managing the process of supply chain transactions are human-specific assets. TCT has a central assumption that the risk of opportunism is inherent in many transactions. Opportunism is "self-interest seeking with guile. This includes but scarcely limited to more blatant forms, such as lying, stealing, and cheating... More generally, opportunism refers to the incomplete or distorted disclosure of information, especially to calculated efforts to mislead, distort, disguise, obfuscate, or otherwise confuse" (Williamson, 1985, p. 47). Opportunism can include lying and cheating, as well as more subtle forms of deceit, such as violating implicit agreements (Rindfleisch & Heide, 1997). Transaction-specific assets are commonly used in SCI. However, due to the characteristics of specific assets, the manufacturer cannot use these assets for other purposes except for the transactions with the partner. Thus, the partner can take advantage of the transaction-specific assets and perform opportunistic behaviors to gain benefits from the transaction relationship. As such, the manufacturer's transaction-specific asset may increase their partner's opportunistic behaviors (Gundlach, Archrol, & Mentzer, 1995; Jap & Ganesan, 2000). Transaction cost increases because a governance mechanism must be established to safeguard the hazards of opportunism (Williamson, 1985). As we know, one of the major purposes of SCI is to reduce transaction costs in the supply chains. However, one of the major components of SCI is specific assets such as information systems and dedicated people that increase the opportunistic behaviors of the partners, which in turn, lead to high transaction costs (Grover & Malhotra, 2003). It is crucial for the manufacturer to

invest in SCI, while, at the same time, reducing transaction costs in the SCI relationship. To meet the challenge of this dilemma, the manufacture must find the methods to control or manage the relationships with their customers to reduce opportunistic behaviors and thereby lead to low transaction costs. Information sharing, strategic partnership, and working together in SCI can be looked upon as relationship governance methods. Information sharing not only helps the partner in the supply chain have a quick and consistent information flow with each other, but also improves the understanding of each other's businesses to reduce the chances of opportunistic behaviors in the transactions. Through strategic partnership with cooperative goals in the supply chain and operationally working together on the improvement of supply chain relationships and processes, the companies in a supply chain are more likely to achieve their organizational goals and the supply chain objectives. These shared vision and cooperative goals in SCI reduce opportunistic behaviors (Wong, Tjosvold, & Yu, 2005). Furthermore, SCI also reduces transaction costs through the reduction of uncertainty. Uncertainty refers to the unanticipated changes in circumstances surrounding a transaction (Grover & Malhotra, 2003). There are two types of uncertainty, including environmental uncertainty and behavioral uncertainty. Environmental uncertainty means that environments surrounding an exchange cannot be specified ex ante for a transaction, while behavioral uncertainty means that performance cannot be easily verified ex post for a transaction (Rindfleisch & Heide, 1997). By investing in the specific assets in SCI such as information systems and dedicated people, environmental uncertainty of the transactions can be reduced. For example, with the assistance of the prediction ability of a quick ordering system, the order placing and fulfilling time can be significantly reduced; as a result, the uncertainty of the ordering time is reduced. The dedicated people also contribute to the reduction of some environmental uncertainties. Behavior uncertainty can be reduced through relationship

governance methods in SCI, For example, with a high degree of information sharing and working together, both partners in the transaction become familiar with the processes of the transactions and will be more likely to evaluate their performance; as a result, behavior uncertainty is reduced. Because specific assets and behavioral uncertainty increase opportunistic behaviors (Anderson, 1988) and specific assets and environmental uncertainty increases transaction costs directly (Grover & Malhotra, 2003; Pilling, Crosby, & Jackson, 1994), SCI will reduce transaction costs through uncertainty and opportunism reduction. From the perspective of relationship governance, SCI plays a crucial role in the supply chain relationship management and controlling. Heide and John (1992) argued that there are two major types of transaction formation with their responding relationship governance methods. The first one is spot market transaction in which one party has no decision control over the other party. The other one is vertical integration in which one party has complete decision control over the other party (Grossman & Hart, 1986). Zaheer and Venkatraman (1995) believed that quasi-integration and joint action are also relationship governance methods. As such, we believe that SCI can be viewed as a relationship governance method with a higher decision control than a spot market transaction, while having a lower decision control than vertical integration. Relationship governance is needed in transactions. Williamson (1991, p. 282) stated that "asset specificity increases the transaction costs of all forms of governance." Ghoshal and Moran (1996) augured that hierarchical governance mechanisms, including fiat, monitoring, and control and prior conditioning such as values, heritability, and stimulus, influence opportunistic behaviors. Comparing the degree of control over the other party and transaction costs in these three types of relationship governance, we can get the extended relationship governance mechanism based on Heide and John's (1992) influential study. Spot market transaction has the

highest transaction costs because no decision control is made to reduce uncertainty and opportunistic behaviors. Vertical integration has the lowest or no transaction costs because transaction may not occur in such a governance mechanism. SCI should have medium transaction costs compared with spot market and vertical integration. In summary, through specific investments and relationship governance, SCI can reduce uncertainties and opportunistic behaviors in the transactions which, in turn, reduce transaction costs.

2.7 Performance

Because the major motivation of SCI for most supply chain partners is to strive for the superior business performance through the synchronization of the customer requirements with the flow of materials and information along the supply chain (Vickery et al., 2003), it is essential to understand "performance" first. A comprehensive review of the literature on business performance, supply chain performance, and organizational performance suggests a wide divergence of opinions regarding the best measure of performance.

2.7.1 Business Performance

Business performance is usually evaluated in several aspects for different contexts, such as financial performance and operational performance for a company, supply chain performance for a supply chain, among others. Financial performance has been widely used as a key measure of firm performance (Bender, 1986; Boyer, 1999; Boyer, Leong, Ward, & Krajewski, 1997) and is evaluated in different dimensions. Chen and Paulraj (2004b) argued that financial performance should be the main measure of business performance because the primary goal of a business organization is to make a profit for the shareholders. However, much literature (e.g. Dixon, Nanni, & Vollmann, 1989; Eccles & Pybum, 1992; Hall, 1983; Johnson & Kaplan, 1987, Skinner, 1971) has

pinpointed the limitations in relying solely on financial performance measures in supply chains. For example, numerical performance measures used as simple qualitative evaluations may not describe the system's performance adequately. Therefore, it is vague and difficult to utilize them in the comprehensive measurement of performance (Beamon, 1999). Because a supply chain is an integrated process through which raw materials are manufactured into final products and delivered to customers, selecting the appropriate performance measures for supply chains is also difficult due to their inherent complexity. Van Hoek (1998) advocated that supply chain firms should devise an innovative measurement system as opposed to the traditional return on investment (ROI)-based system. A broader conceptualization of performance measures includes customer service and other operational indicators. Neely, Gregory, and Platts (1995) suggested the use of cost, time, quality, delivery, and flexibility as measures of supply chain performance. Vickery et al. (2003) used presale customer service, product support, responsiveness to customers, delivery dependability, and delivery speed as dimensions of service performance. Because supply chain performance measurement systems that rely heavily on cost as the primary measure are not adequate and conclusive, Beamon (1999) presented a framework for the selection of performance measurement systems for manufacturing supply chains. In the framework, there are three types of performance measures: resources aiming to measure the level of efficiency, output aiming to measure the level of customer service, and flexibility aiming to measure the ability to respond to a changing environment. He also provided an overview and evaluation of the performance measures used in some supply chain models. However, many SCI studies continued to use either the operational (Scanned, Vickery, & Droge, 2000; Stank, Keller, & Closs, 2001; Stank, Keller, & Daugherty, 2001) or the perceived financial performance (Ross, 2002) alone.

2.7.2 A Balanced Score Card Approach for Performance Measurement

Given the complexity of the performance measurement issue, we generally follow one principle when we choose performance measures, namely, a balanced approach. Such an approach, which uses a combination of qualitative and quantitative measures (if possible) and a broader conceptualization of performance measures, is essential to present a clear picture of organizational performance, as has been advocated by many researchers (Gunasekaran, Patel, & McGaughey, 2003; Kaplan & Norton, 1992). Various literature (e.g. Gunasekaran et al., 2003; Kaplan & Norton, 1992; Maskell, 1991) has suggested that the balanced approach for the performance measurements is essential to present a clear picture of organizational performance. Some recent SCI studies (e.g., Tan, Kannan, & Handheld, 1998; Vickery et al., 2003) have used both operational and financial performance as indicators of the organizational performance. We followed three steps to develop performance constructs and measures for our research. First, we completed an extensive literature review of research in the areas of organizational performance and supply chain performance, with an emphasis on SCI (Frohlich & Westbrook, 2001; Handheld & Bechtel, 2002; Johnson, 1999; Morash & Clinton, 1998; Narasimhan & Kim, 2002; Stank, Keller, & Daugherty, 2001). On the basis of this review, we compiled a battery of performance measures. Second, we carefully examined each measure within the broad context of this study. Guided by the principle of a balanced approach and the purposes of this study, we narrowed our choices to a few well-represented and well-tested performance measures that are relevant to this study. With regard to the instrument, we evaluated existing instruments with their respective validity and reliability. In addition, when possible we adopted measurement items that had been proven reliable and valid in the previous studies. We also added new measurement items and modified some of the existing items on the basis of the results of in-depth interviews

with supply chain executives and observations during our pre-test plant visits. Third, after pre-testing the instrument, we asked several practitioners and academicians to make comments and suggestions on the final pool of performance measures. On the basis of their feedback, we fine-tuned the performance measures. In this study, we use four broad categories of performance measures: customer-oriented performance, supplier-oriented performance, supply chain performance, and financial performance. Customer-oriented performance is defined as the manufacturer's performance in serving its customers, that is, how the manufacturer performs for its key customer in the areas of quality, flexibility, delivery, and so forth. Supplier-oriented performance refers to the manufacturer's perception of its key supplier's performance in serving the manufacturer, such as what the key suppliers' performance level is in the areas of quality, flexibility, delivery, and so forth, as perceived by the manufacturer. Supply chain performance measures the supply chain's cost, inventory level, quality, flexibility, lead time, delivery, process time, speed, and so forth. Financial performance evaluates the firm's profitability and market growth. Customer-oriented performance, supplier-oriented performance, and supply chain performance focus on the operational aspects of the companies and the supply chain, whereas financial performance is a surrogate for an overall performance measure for the firm. The rationale behind these relationships is quite intuitive. All those measures are not mutually exclusive, but they do emphasize different aspects of the supply chain. Customer-oriented performance measures the performance of the link in the downstream of a supply chain and supplier-oriented performance measures the performance of the link in the upstream of a supply chain. On the other hand, the supply chain performance considers the whole supply chain. Naturally, customer-oriented performance and supplier-oriented performance affect the performance of the whole supply chain. The subtle differences between the abovementioned four types of performance can be

categorized into two aspects. The first aspect is the focus, whereas financial performance centers on the manufacturing firm. The other three appear on different links along the supply chain. The second aspect is the issue of operational versus financial measurements. While customer-oriented, supplier-oriented, and supply chain performances are operations-oriented, including performance measures, such as delivery, flexibility, and customer service, Financial performance, in comparison, is financial in nature and includes profitability, sales, market share, ROI, and return on sales. Both theories (e.g., in operations management and strategy) and business cases generally agree that operational excellence leads to the overall financial performance of the firm, as exemplified by Dell and Wal-Mart. Those companies have shown that their excellence in operations and SCM contributes greatly to the firm's financial success. In a recent study, Zhao et al. (2005) tested the relationship between these four types of performance and found that customer- and supplier-oriented performance improved supply chain performance which, in turn, led to financial performance.

2.8 Relationship between SCI and Performance

Transaction cost theory, organizational learning theory, business cases, and empirical studies all provide support for the positive impact of SCI on performance. Above all, the theories have indicated the positive relationship between SCI and performance. For example, from the perspective of the transaction cost theory, external integration enables firms to minimize both production costs and transaction costs. It enhances the firm's ability to obtain resources and provides greater strategic advantages. The close interaction signifies a commitment to and interest in mutual outcomes that will decrease the perceived likelihood of opportunistic behavior (Saxton, 1997). The organizational learning theory also suggests that firms seek to establish competitive

advantage through acquiring both tacit, or non-verbalized, and articulated, or verbalized knowledge (Hedlund, 1994). Integration facilitates the sharing of knowledge between supply chain partners. Therefore, it enables them to cope with environmental uncertainty. These normative assertions highlight the importance of SCI and its contribution to business success. The real world also provides interesting business cases for our reference. For example, the famous Toyota supplier network enables Toyota to be very competitive. Chrysler offers another example. By teaming with a supplier, Chrysler developed a new part that, though more costly than the original part, reduced the total vehicle costs by shortening the assembly time. The same logic applies to issues of quality and response time, for which the goal is to improve the processes together with suppliers, rather than alone (Lewis, 1995). In contrast, the traditional arm's-length supplier relationship often affects firms' performance negatively. In 1992, under its new purchasing chief, GM demanded double-digit price cuts from its suppliers and broke long-term contracts to achieve them. In its quest for low bids, GM also shared proprietary know-how among rival suppliers. As a result, suppliers withheld their newest development from GM and shifted their brightest engineers to projects for other automakers that continued to treat their suppliers like partners (Lewis, 1995). In the academic research area, especially the empirical study area, we found that the relationship between SCI and performance outcomes has been discussed over a vast body of SCM and operations literature (e.g., Armistead & Mapes, 1993; Daugherty, Ellinger, & Gustin, 1996; Tan et al., 1998). Extensive literature has confirmed the great importance of SCI for achieving competitive advantages and better operational performance (Ahmad & Schroeder, 2001; Armistead & Mapes, 1993; Frohlich & Westbrook, 2001; Johnson, 1999; Narasimhan & Jayaram, 1998; Stank, Keller, & Closs, 2001). According to the role of SCI in improving different types of performance, we structured the reviewed

papers into several aspects, in which the relationship between SCI and overall operational performance, customer service, logistics performance, innovation, and financial performance are examined. The lack of the literature addressing the direct relationship between SCI and financial performance also revealed that SCI usually works through operational performance, such as cost, quality, delivery, flexibility, customer service, and innovation, to improve financial performance. Furthermore, we also find that there are few SCI studies that examine the direct relationship between SCI and the performance of the whole supply chain. Moreover, there were even fewer papers that tested the impact of SCI on the operational performance that is linked with the whole supply chain in nature. Some studies investigated the relationship between SCI and overall operational performance. For example, based on a survey conducted of managers from companies that participated in the UK Best Factory Audit conducted by Management Today and the Cranfield School of Management, Armistead and Mapes (1993) confirmed that a greater integration along the supply chain leads to an improved operating performance. They found that the degree of SCI, in terms of information sharing and commitment to manufacturing plans, improved operational performance. They also found that the use of manufacturing techniques and methods contributed to improvements in both customer service and operational performance. Frohlich (2002) investigated the performance of an Internet-based supplier and customer integration (e-integration) in the supply chain. It was found that e-integration improved e-business performance and operational performance. Saeed, Malhotra, and Grover (2005) investigated the influence of inter-organizational systems on process efficiency and sourcing leverage from the perspectives of operations and information systems. They found that external integration, which emphasized the usage of MRPII and advanced planning systems, improved process efficiency. However, internal integration and external integration, which emphasized

simple procurement systems, had no influence on process efficiency. Neither type of external integration had a significant impact on sourcing leverage. They also found that firms making standardized products in highly competitive environments tended to achieve higher process efficiencies and had higher levels of external integration. Cousins and Menguc (2006) investigated the role of supply chain socialization and supplier integration in the improvement of performance in SCM. They found that supplier integration directly enhanced suppliers' communication performance, and supply chain socialization improved suppliers' operational performance and communication performance directly. Suppliers' operational and communication performance led to the buyer's perceived level of suppliers' contractual conformance. However, there was no significant relationship found between supplier integration and suppliers' operational performance. Some studies investigated the relationship between SCI and customer service. For example, Vickery, Jayaram, Droge, and Calantone (2003) investigated the impact of an integrative supply chain strategy on customer service and financial performance. They found that integrated information technologies improved SCI and that SCI enhanced customer service directly. Customer service led to firm performance directly and fully mediated the relationship between SCI and firm performance. Stanley and Wisner (2001) investigated the relationships between cooperative purchasing/supplier relationship, internal suppliers' service quality to purchasing, purchasing service quality to internal customer, and service quality to external customers. They found that cooperative supplier relationship and internal service quality directly improved purchasing service quality which, in turn, enhanced service quality to the external customers. They also found that firm size had no effect on either purchasing service quality or service quality to external customers. Homburg and Stock (2004) examined the relationship between salespeople's job satisfaction and found customer

satisfaction to be particularly strong in the case of high intensity of customer integration into the value-creating process. Some studies investigated the relationship between SCI and logistics performance. For example, by operationalizing Bowersox et al.'s (1999) six supply chain logistics integration competence areas, Stank, Keller, and Closs (2001) developed and tested the instrument for measuring six SCI competencies and determined their relative importance to developing logistics distinctiveness. They found that customer and internal integration are the most significant differentiators of overall firm performance. The managers should focus on identifying the needs of key customers to leverage the supply chain process and develop an effective fulfillment and replenishment process to satisfy the customers' needs. Meanwhile, Stank, Keller, and Daugherty (2001) investigated the impacts of supply chain internal and external collaboration on logistics service performance. They found that internal collaboration and external collaboration were highly related and that internal collaboration could improve logistics services performance directly. However, external collaboration had no significant impact on logistics service performance directly. Using a three-step regression method, they found that external collaboration influenced internal collaboration, which in turn improved logistics service. Gimenez and Ventura (2005) investigated logistics-production, logistics-marketing, external integration, and their impact on a company's logistical performance. They found that internal integration and external integration were highly related. Logistics-marketing integration had no effect on the reduction of costs, stock-outs, and lead times, but logistics-production integration enhanced these performance measures when there was no external integration. External integration improved firm's logistics performance greatly. Some studies investigated the relationship between SCI and innovation. Ragatz, Handfield, and Petersen (2002) investigated the relationship between supplier integration, technology uncertainty, and new product development.

They found that the companies facing a higher level of technology uncertainty were more likely to have a higher level of supplier integration. Supplier integration improved the performance of new product development in terms of cost, quality, and cycle time. They also found that technology uncertainty had a negative impact on cost but no direct impact on quality or cycle time. Some studies investigated the relationship between SCI and operational performance and financial performance together. For example, as one of the most influential SCI studies, Frohlich and Westbrook (2001) established the classification of SCI and investigated the relationship between SCI types and performance based on a global sample of 322 manufacturers. They classified the companies into five types (inward-, periphery-, supplier-, customer-, and outward-facing) according to the "arc" of customer integration and supplier integration. They concluded that those supply chain companies with the widest degree of arcs of supplier and customer integration achieve the highest level of performance improvement with regard to customer service, on-time delivery, delivery lead time, productivity, quality, and cost, as well as market share and profitability. They provided an empirical support in the literature for the linkage between SCI and performance. However, they failed to examine the specific form of integration-performance relationship. As clearly defined in the previous section, SCI does much more than customer and supplier integration. Therefore, the proposed arc of integration may direct the improvement efforts of the executives to the widest arc of integration without examining another important type of SCI, internal integration. In another study, Frohlich and Westbrook (2002) examined the relationship between Internet-enabled SCI strategies and performance in manufacturing and services. They identified four types of Web-based SCI: low integration, supply integration, demand integration, and demand chain integration. They found that manufacturers relying on demand chain integration had the highest performance, and

manufacturers relying on only Web-based demand or supply integration outperformed manufacturers relying on low integration.

2.8.1 IT integration and performance

IT centralizes the information, providing shorter lead time and smaller batch size in the supply chains and can significantly reduce the bullwhip effect, which causes poor supply chain performance (M.-C. Chen, Yang, & Li, 2007). By simulation study they confirmed that shifting the retailer (buyer-driven) collaboration to a manufacturer (supplier-driven) approach was a more viable option. Their study also suggests that IT cannot alone ensure that partners can gain. Mutual trust plays an essential role in achieving effective implementation.

Wang (2006) used Structure equation models to indicate that virtual integration is unlikely to contribute to manufacturers' cost advantage directly. Their hypothesis suggests that the improvement in a manufacturer's flexibility is likely to be observed when it exchanges timely product/process information with suppliers through inter organizational information sharing. Their findings also suggest that IT-enabled integration should be an integral part of manufacturing firms' supply-chain management efforts, especially for supplier development and involvement. Buttermann, Germain, & Iyer(2008) analyzed nine supply chain IT and organizational structure variables such as B2B e-commerce supply chain integration, supply chain analytic capability, ERP applications, and collaborative, planning, forecasting, and replenishment (CPFR) and formed some archetypes. Using the Coordination Theory, (Lai et al., 2008) explored the impact of electronic integration of intra-organizational and inter-organizational business processes on organizational performance in terms of logistics cost and service improvements. They also proposed that e-integration was a multi-dimensional construct comprising a system of electronic linkages to attain logistics cost reduction. Their

findings were consistent with the development of e-integration with a unidimensional electronic linkage which provides a limited coordination mechanism within and between firms for logistics performance.

In contrast to the other studies which support hypothesis that IT implementation increase the performance (Li, Yang, Sun, & Sohal, 2009) results suggest that IT implementation has no direct effect on supply chain performance, but instead that it enhances the communication process. A key finding of their study is that SCI is affected by IT implementation, and SCI mediates the relationship between IT implementation and supply chain performance. (Sezen, 2008) findings show that supply chain design has a higher influence on the supply chain performance measures compared to integration and information sharing. He emphasize that a well-designed supply chain in terms of locations, distances, capacities and planning can provide competitive advantage for the firms in that particular chain. (Zailani & Rajagopal, 2005) article draws on data from electronics manufacturers and related logistic companies. In their view the role of internet and supply chain integration is potentially profound. Their study suggested that there were different supply chain integration strategies that manufacturers followed. They have classified supply chain strategies into at least five category- inward, periphery, supplier, customer and outward-facing.

Zailani and Rajagopal (2005) investigated and compared the indicators of SCI and performance based on the companies from the U.S. and East Asia. They classified SCI into four categories: information sharing, internal integration, external integration with supplier, and external integration with customers. They found that SCI played a significant role in the overall business success. They also found that most of the companies were pursuing an extensive integration with suppliers and customer strategy. Moreover, the companies with the greatest arcs of supplier and customer integration

achieved the highest performance improvement. They also found that, for both East Asian and US companies, long-term partnerships with suppliers and customers are the key to achieving competitive advantages in the long run. Droge, Jayaram, and Vickery (2004) investigated the impacts of internal and external integration practices on time-based performance and overall firm performance in terms of financial and market share. They found that time-based performance led to overall performance directly. On the other hand, both internal integration and external integration influenced time-based performance directly and overall firm performance directly and indirectly. They also found that the interaction of internal and external integration influenced overall firm performance, indicating that the joint use of internal and external integration had a synergistic impact on overall firm performance. Koufteros, Vonderembse, and Jayaram (2005) investigated the relationships between internal integration, external integration, and performance and the moderating effects of uncertainty, equivocality, and platform strategy on these relationships. They found that internal integration enhanced customer integration, supplier product integration, and supplier process integration directly. Supplier product integration was positively associated with supplier process integration. Customer integration improved product innovation; however, supplier product integration had a negative influence on product innovation. Product innovation led to quality, which in turn improved profitability. Nonetheless, there was no directly significant influence between integration and quality. They also found that equivocality moderated the relationships between integration and performance, but neither uncertainty nor platform strategy was the moderator of these relationships. Rosenzweig, Roth, and Dean (2003) investigated the impact of SCI on competitive capabilities and business performance based on a survey of consumer products manufacturers. They found that manufacturing-based competitive capabilities mediated the relationship between SCI and

business performance. The intensity of SCI enhanced a manufacturer's competitive capabilities, in terms of product quality, delivery reliability, process flexibility, cost leadership, and improved return on assets (ROA), and percentage of revenues from new products directly. O'Leary-Kelly and Flores (2002) investigated the impact of the integration of manufacturing and marketing/sales decisions on organizational performance. They found that the impact of the integration of manufacturing and marketing/sales decision on organizational performance was moderated by a firm's business strategy and demand uncertainty. Swink, Narasimhan, and Wang (2007) investigated the relationship between four types of strategic integration, manufacturing competitive capabilities, and performance. They found that different types of strategic integration had different impacts on different competitive capabilities and performance. Corporate strategy integration improved process flexibility, market performance, and customer satisfaction directly. Product-process technology integration enhanced quality and new product flexibility, but decreased market performance directly. Strategic customer integration was positively associated with customer satisfaction, but negatively associated with market performance. Strategic supplier integration positively influenced market performance, but negatively influenced quality. They also found that quality, delivery, and new product flexibility improved market performance. In addition, quality and delivery enhanced customer satisfaction, but process flexibility was negatively related to customer satisfaction. SCI may also play a moderator role in the improvement of performance. For example, Narasimhan and Kim (2002) investigated the moderating effects of SCI on the relationship between product/international market diversification and competitive performance based on the data collected from Japanese and Korean companies. They found that SCI moderated the relationship between diversification and performance and that the coordinated use of SCI and diversification strategies influenced

firm performance significantly. Johnson (1999) investigated the importance of inter-firm relationships from the perspective of strategic integration in industrial distribution channels. It was found that strategic integration improved the distributors' financial performance. Based on the above literature, we believe that the level of SCI will have a significant impact on performance. According to the role of different types of SCI in improving performance, internal integration breaks down functional barriers. In contrast, traditional departmentalization and specialization tend to create functional silos that hinder cooperation among people from different functions within the firm. Although many companies maintain a functional organization structure, customer orders flow through different departments, functions, and activities. When an order is delayed, customers do not care which function or department caused the delay and/or should be responsible. All that they want to know is if the order has been fulfilled. That calls for an integrated customer order fulfillment process in which all the activities, functions, and departments involved in the order are integrated. It has been suggested that "companies pursuing operational excellence are indefatigable in seeking ways to minimize costs, to eliminate intermediate production steps, to reduce transaction and other 'friction' costs, and to optimize business process across functional and organizational boundaries" (Treacy & Wiersema, 1993, p. 85). Concurrent engineering, an application of internal integration in product development, has been demonstrated by many companies to shorten product development time, cut development costs, and increase the speed to market for new products compared with a traditional sequential design. Normative studies have also suggested that internal integration improves process efficiency, demand management, and materials management. In this sense, a high level of operational excellence directly links customer service, supplier service, and the firm's overall financial bottom line. Along the same lines, we can argue that customer and supplier

integration should affect firm performance positively. Close interactions between customers and manufacturers offer opportunities for the partners to develop mutual forbearance and improve information accuracy. More accurate information about customer demand and customer preferences, as well as frequent updating of information, could speed up product design, improve production planning, and reduce inventory obsolescence. Moreover, it can make the manufacturing company more efficient and more responsive to its customer's needs. Bullwhip effects can also be reduced through effective information sharing and cooperation between manufacturers and customers (Lee, Padmanabhan, & Whan, 1997a, 1997b). Customer integration also generates remarkable opportunities to leverage the intelligence embedded in the collaborative process, thus enabling businesses to reduce costs, create more value for customers, and detect critical demand changes quickly enough to design and execute optimal responses. Based on the similar logic, supplier integration also contributes to performance significantly. Furthermore, the idea of supplier integration is not new. Japanese keiretsu, which links manufacturing firms closely with their captive suppliers, has been regarded as a key to Japan's business success. As the driving force of effective SCM, the integration of customer and supplier activities replaces arm's-length bidding, the traditional exchange of specifications from the customer and prices from the supplier. Integration instead allows firms to maximize their combined performance rather than each other's separate performance. In terms of cost, only by identifying all cost sources for both the customers and the suppliers and understanding how they interact can the total cost of the supply chain be trimmed to the lowest level. Thus, organizational theories, business cases, and empirical studies all lead us to believe that SCI will improve performance.

2.8.2 Factors Influencing SCI and Performance

Though various studies examined the role of SCI in improving performance, few studies investigated the drivers of SCI. The challenges or barriers that are being faced by the companies were looked as the drivers for the implementation of SCI in some previous papers. Frohlich (2002) investigated the barriers of an Internet-based supplier and customer integration (e-integration) in the supply chain. It was found that, among the three types of barriers to the implementation of e-integration, internal barriers impeded e-integration more than either upstream supplier barriers or downstream customer barriers. In another study, Frohlich and Westbrook (2002) found that access to new markets, anticipated benefits, and external pressure were the drivers for demand chain integration.

The structure or infrastructure of the companies, such as information systems and organization culture, is deemed as the drivers of SCI in some studies. For example, Marquez, Bianchi, and Gupta (2004) investigated the operational and financial effectiveness of e-collaboration tools using a SCI model. They found that local financial constraints greatly influenced the operational and financial performance of the entire supply chain. They also found that the usage of Internet tools improved the collaboration of the supply chain and that the supply chain full integration had a higher performance than any partial integration of supply chains. Narasimhan and Kim (2001) examined the utilization strategy of an information system (IS) for SCI. Through investigating the relationship between three types of IS and SCM performance, they argued that there might be a recommended sequence in using IS for SCI. They found that IS for infrastructural support leads to IS for value creation management, and IS value creation management leads to IS for logistical operations and SCM performance. They also found that the collaboration between IS utilization and SCM performance were different for the

four stages of SCI. In the independent operation stage, IS for infrastructural support had the highest correlation with SCM performance, but in functional and internal integration, IS for value creation management had the highest correlation. IS for logistics operations in external integration stage had the highest correlation with SCM performance among four SCI stages. Using case studies, Pagell (2004) investigated the factors that enabled and inhibited the internal integration of operations, purchasing, and logistics. It was found that structure and culture at the plant, reward systems, and the amount of formal and informal communication across the functions are the main factors driving supply chain internal integration.

From a different perspective, Johnson (1999) identified that dependence, flexibility, continuity expectations, and relationship age were the key drivers of the distributor's strategic integration with its suppliers. It was also found that uncertainty did not play a moderator role in the relationships between the drivers and strategic integration nor in the relationship between strategic integration and performance. From an inter-organizational relationship perspective, the relationships between the companies or different functions within a company help the companies to integrate their suppliers, customers, or internal functions. In order to facilitate the development of external SCI, the firm must know specifically how to structure and manage the partners' strategic collaboration relationships, in which trust and relationship commitment are two salient features. Some research works in the SCM area have focused on the issues of trust and relationship commitment (Beth et al., 2003;

Handheld & Bechtel, 2002; Kwon & Suh, 2005). Relationship commitment is highly influenced by trust and it is directly related to cooperation (Morgan & Hunt, 1994) Therefore, it is becoming a promising area of research in SCI literature.

Table 2.2 Selected papers on Supply Chain Integration

Sr. No	Author	Year	Title	Journal	Focus
1	M. T. Frohlich and R. Westbrook	2001	Arcs of integration: an international study of supply chain strategies	Journal of Operations Management	Supply Chain Strategy, Supplier and Customer Integration and Operations Performance
2	T. P. Stank, S. B. Keller and D. J. Closs	2001	Performance Benefits of Supply Chain Logistical Integration	Transportation Journal	Supply Chain Logistics Integration competency
3	I. J. Chen and A. Paulraj	2004	Towards a theory of supply chain management: the constructs and measurements	Journal of Operations Management	Supply Chain Management constructs
4	D. Power	2005	Supply chain management integration and implementation: a literature review	Supply Chain Management: An International Journal	E-integration and Strategic implementation
5	D. P. van Donk and T. van der Vaart	2005	A case of shared resources, uncertainty and supply chain integration in the process industry	International Journal of Production Economics	Supply Chain Integration
6	S. Zailani and P. Rajagopal	2005	Supply chain integration and performance: US versus East Asian companies	Supply Chain Management: An International Journal	Integration Strategies in US and East Asian companies.
7	S. W. Kim	2006	Effects of supply chain management practices, integration and competition capability on performance	Supply Chain Management: An International Journal	Level of Supply Chain Integration and Firm Performance
8	E. Wang, J. Tai and H.-L. Wei	2006	A Virtual Integration Theory of Improved Supply-Chain Performance	Journal of Management Information Systems	Virtual integration, Information Technology and Supply-Chain Collaboration.
9	M.-C. Chen, T. Yang and H.-C. Li	2007	Evaluating the supply chain performance of IT-based inter-enterprise collaboration	Information & Management	Information technology and Collaborative Planning
10	N. Fabbe-Costes and M. Jahre	2007	Supply chain integration improves performance: the Emperor's new suit?	International Journal of Physical Distribution & Logistics Management	Supply Chain Management, Integration and Performance levels
11	K.-H. Lai, C. W. Y. Wong and T. C. E. Cheng	2008	A coordination-theoretic investigation of the impact of electronic integration on logistics performance	Information & Management	Electronic Integration

12	B. Sezen	2008	Relative effects of design, integration and information sharing on supply chain performance	Supply Chain Management: An International Journal	Supply Chain Information sharing
13	T. van der Vaart and D. P. van Donk	2008	A critical review of survey-based research in supply chain integration	International Journal of Production Economics	Supply Chain Integration
14	H. Forslund and P. Jonsson	2009	Obstacles to supply chain integration of the performance management process in buyer-supplier dyads: The buyers' perspective	International Journal of Operations & Production Management	Supplier relationship obstacles
15	R. G. R. Jr, H. Chen, R. Upreti, S. E. Fawcett and F. G. Adams	2009	The moderating role of barriers on the relationship between drivers to supply chain integration and firm performance	International Journal of Physical Distribution & Logistics Management	Levels of integration and Supply Chain Integration barriers.
16	S. W. Kim	2009	An investigation on the direct and indirect effect of supply chain integration on firm performance	International Journal of Production Economics	Supply Chain Integration strategy and Competitive strategy
17	G. Li, H. Yang, L. Sun and A. S. Sohal	2009	The impact of IT implementation on supply chain integration and performance	International Journal of Production Economics	Information technology and Supplier Relationship
18	M. J. Braunscheidel, N. C. Suresh and A. D. Boisnier	2010	Investigating the impact of organizational culture on supply chain integration	Human Resource Management	Organizational Culture and Integration, Competing Values Framework (CVF)
19	B. B. Flynn, B. Huo and X. Zhao	2010	The impact of supply chain integration on performance: A contingency and configuration approach	Journal of Operations Management	Customer and Supplier integration
20	Y. Lin, Y. Wang and C. Yu	2010	Investigating the drivers of the innovation in channel integration and supply chain performance: A strategy orientated perspective	International Journal of Production Economics	Channel Integration in Supply Chain Management
21	L. R. Vijayasarathy	2010	Supply integration: An investigation of its multi-dimensionality and relational antecedents	International Journal of Production Economics	Multi-dimensionality of Supply Chain Integration
22	İ. Koçoğlu, S. Z. İmamoğlu, H. İnce and H. Keskin	2011	The effect of supply chain integration on information sharing:Enhancing the supply chain performance	Procedia - Social and Behavioral Sciences	Information sharing in Supply Chain Integration

23	C. Droge, S. K. Vickery and M. A. Jacobs	2012	Does supply chain integration mediate the relationships between product/process strategy and service performance? An empirical study	International Journal of Production Economics	Supply Chain Integration effects on Product and Process on service performance
24	B. Huo	2012	The impact of supply chain integration on company performance: an organizational capability perspective	Supply Chain Management: An International Journal	Mediating effects of Supply Chain Integration on performance
25	D. Näslund	2012	Supply chain management integration: a critical analysis	Benchmarking: An International Journal	Supply Chain Integration
26	D. Prajogo and J. Olhager	2012	Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration	International Journal of Production Economics	Integrations of Information and Material flow and Operational Performance.
27	J. Han	2013	The impact of supply chain integration on firm performance in the pork processing industry in India	Indian Management Studies	Effects of Supply Chain Integration on Firm Performance

Chapter 3 - Research Model and Proposed Hypotheses

The literature presented a number of questions and remarks related to the supply chain integration. In this chapter we present our research model based on the findings of the review. There are three main conclusions that are elaborated below. Recent survey based research can be summarized as: (1) measuring integration in a limited way without distinguishing different dimensions or differences between practices, attitudes and patterns; (2) measuring integration across all links as a variable at the organizational level and not at the level of a specific link or dyad; (3) ignoring business conditions (uncertainty in demand, variety, market structure) and power. Based on the concerns discussed above, van der Vaart and van Donk, (2008) have proposed a framework as depicted in Figure 3.1.

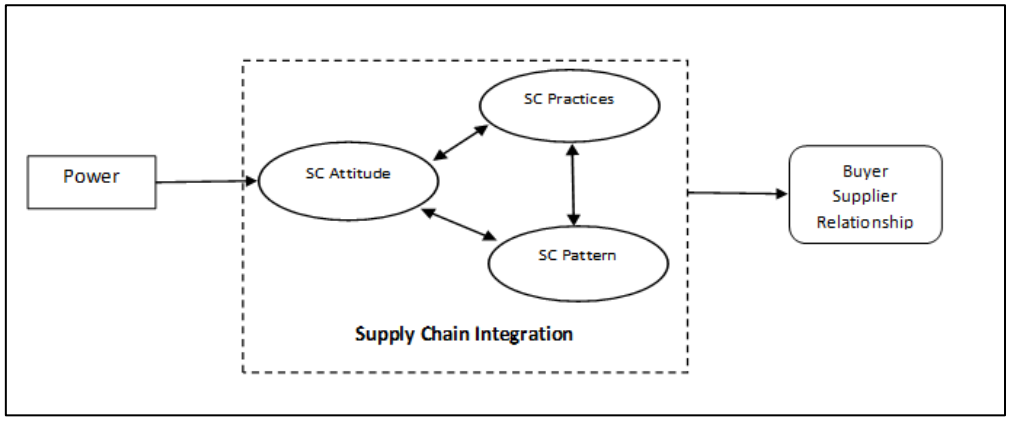

Figure 3.1 Research framework

They recommended that future research should focus more on measuring explicitly attitudes, patterns and practices instead of mixing these three into one factor, as is often done in current research. The framework aim at understanding the possible interactions between attitudes, patterns and practices. On the one hand it seems that (positive) attitudes are a first step in developing a relationship and improving integration. On the other hand, intensive daily contact and the development of SC patterns might influence

attitudes. The framework also stresses the importance of power in the relationship between integration (patterns and practices) and performance. We find this framework comprehensive and follow in our research.

Based on the framework we divided our research in two studies. In the first study we investigated the interaction of two types of power on supply chain integration and its effect on operational performance. This study deals with the first part of framework. The second study concerns with the interrelationship of supply chain attitude, practice, pattern and their impact on operational performance of buyer supplier link.

3.1 Study I - How do relational antecedents such as Power influence Supply Chain Integration?

Integrating the business process among the channel partners is a prominent role of Supply chain management. Recently, Huo et al (2016) have supported the idea that power-imbalance in supply chain can facilitate or hinder the establishment of information systems. They also showed that in such a scenario information sharing behavior of the less powerful player can be predicted. They used different power type (coercive and expert) to investigate its effect on information systems and ultimately related it to firm's financial performance. However, they did not consider the possible effect of trust or other relational aspects. Several studies has suggested that information sharing as part of supply chain integration take place when there is a high demand variability and informal information sharing network remains the way of communication when there is a low demand variability. There is a general belief that frequent information sharing in supply chain improves the performance (Pramshi, Benton 2004). But sharing key information regarding the business increase the risk of more power abuse by the partner firm and it also requires a huge investment in putting up a formal communication network.

Therefore firms make their decision very carefully in this regard and other relational aspects such as trust, goodwill play an important role.

The aim of this study is to show that it is necessary for the manufacture to understand the different type of power exercised by him to improve the information integration which in turn will improve the performance of the chain. This study also adds to our understanding that in a place like India where power distance and information asymmetry is very high why gaining trust is much needed for an efficient and integrated supply chain

3.1.1 Power

Power has been an important concept in social science to understand the relationship between societies and individuals. Power can be defined as the ability of one channel member to influence the decisions of another channel member (Brown, Lusch, & Muehling, 1983; Brown et al., 1995; Goodman & Dion, 2001). "Business success is about the effective management of power. It is not... about working collaboratively, or on a basis of trust" (Cox, 1997, p. 27). It has been an extensively research stream in social science, yet the understanding regarding the different type of power relationship in business remains a less investigated area. Marketing literature to some extent has studies regarding the channel management and effect on performance by the exercise of power source. The power of manufacturer over the supplier also means the dependence of supplier on manufacturer. This statement may be arguable, but it reflects the crucial role of power in the business world.

In the SCM area, Benton and Maloni (2005) investigated supplier satisfaction in power driven buyer-supplier relationships. They examined the influences of supply chain power and buyer-seller relationship on supplier satisfaction. Three primary objectives were achieved in this study: (1) how different “bases of power” affects the satisfaction of

selling firms, (2) how power-driven relationships affect supplier satisfaction, and (3) how the effect of power influences on supplier satisfaction in the automobile industry. The power-affected buyer-supplier relationship was found to have a significant positive effect on both performance and satisfaction. However, Benton and Maloni (2005) failed to find the casual relationship between performance and satisfaction.

3.1.2 Classification of Power

Power is not a unidimensional construct, and in relation to this, French and Raven (1959) classified power into six types according to the power base. These are (1) expert power (2) referent power (3) legitimate power, (4) legal legitimate (5) reward power and (6) coercion power. Typical rewards that manufacturer may be able to give supplier include gross margins, better credit terms etc. Besides these six types of power, information power as the seventh type of power was identified by Johnson et al. (1993). Coercive power is based on the perception of supplier that manufacturer has the ability to mediate the punishments. Coercive power is the expectation of punishment from another party unless there is compliance. Examples are reduction in margins, the withdrawal of rewards previously granted etc. Reward power and coercion power are mediated powers because the reinforcement of these powers over the manufacturer is controlled by the supplier/customer. In this study, we only focus on two types of power. These types of power can be further classified into two broad categories: mediated power and non-mediated power. According to these criteria, in an SCM context, information power, expert power, referent power, and traditional legitimate power are non-mediated powers because the supplier/customer does not mediate the reinforcement of these powers over the manufacturer. Legal legitimate power, reward power, and coercion power are mediated powers because the reinforcement of these powers over the manufacturer is controlled by the supplier/customer. As the source of power, the

supplier/customer decides whether, when, and how these types of power are used to influence the manufacturer's (target's) decision and behavior. Mediated power represents the competitive and negative uses of power traditionally associated with organizational theory (Brown et al., 1995; Maloni & Benton, 2000).

3.2 Information Sharing Practices in Supply Chain Integration

Technological advancement in business has enhanced the ability to track the flow of relevant information in supply chain. Companies have also started recognizing the benefit of forming partnerships which are based on frequent communication, knowledge transfer and honest information sharing. Literature also suggest the strategic competitive advantage being built by the information sharing. Multiple studies suggests the positive effect of information sharing in problem-solving, collaborative planning and building inter-organizational capabilities. Social exchange theory which states that organizations behave like a social entity and have their own value system. These value system cannot be explained by economic benefit

3.3 Trust

Trust is the most essential element in any relationship. Trust in supply chain management has been defined as the willingness to rely on a Supply chain partner. Building long term relationship in business requires both the parties trusting each other. It is one of the most commonly cited element in supply chain literature. It works as prerequisite for the other alignment activities for supply chain integration. It is viewed as the most critical relational factor which facilitates cooperative activities among SC partners. Trust is the fundamental ingredients for maintain co-operation and avoiding conflicts. It creates an environment where partner firms willingly share the common goals. They are ready to go beyond the formal contracts for the success of supply chain. (Ireland and Webb, 2007). Many researchers have argued that trust is a useful lubricant

to deal with social dilemmas and a fundamental ingredient to maintain cooperation and to avoid conflicts (Yeung et al., 2009). Using the transaction cost theory, one can argue that trust among SC partners can reduce unnecessary tension, opportunism and it can help to increase specific asset (Wang et al., 2011). If a manufacturer trusts its suppliers, it has confidence in the partner based on the expectation of cooperation.

3.3.1 Power and Information Sharing

In another study, Maloni and Benton (2000) examined the impact of different types of power on the strength of the relationship between the supplier of automobile parts and the automobile manufacturers, and how the strength of the relationship influences the performance of the supplier, the manufacturer, and the supply chain. Watson (2001) presented that expert and referent power have a significant positive impact on the strength of the relationship between the supplier and the customer, while coercion power and legal legitimate power have a negative impact on the strength of the relationship. They also found that a stronger buyer and supplier relationship could enhance the performance of the supplier, the customer, and the supply chain. The study also validated that SCI is a key element of cooperation strategy, and it is very important to understand the process of SCI. Therefore we propose the following Hypothesis.

H1a: *A supplier's perception about the use of Reward power by its buyer is positively related with the information sharing practice*

H1b: *A supplier's perception about the use of Coercive power by its buyer is negatively related with the information sharing practice*

3.3.2 Power and Trust based relationship

Trust is the fundamental ingredient for any long term relationship. Trust develops over the time by co-operative behavior reliability and goodwill by both the partner firms. It helps in avoiding conflicts and opportunistic behavior and vulnerability of the weaker

partner in supply chain. On the contrary, power can be seen as one of the deterrent to Trust. Use of mediated power to get the desired result by the stronger partner can decrease or increase the trust level depending upon the type of power. Manufacturer's use of reward power to motivate the partner firm for sticking to the contract and avoiding conflict can result in increase of Trust level. It also encourage the partner firm to go beyond the formal contract in case of disruption and emergency. Therefore we propose the following Hypothesis.

H2a: *A suppliers perception about the use of reward power by the manufacturer is positively related to the trust based relationship.*

Use of coercive power is seen as the tactics used to modify the behavior of the partner firm to achieve the desired output. But literature suggests that excessive use of coercive power deter the relationship and decrease the trust level. Coercive power is seen as the exploitive force by the target firm. Hence we proposed the second following hypothesis-

H2b: *A suppliers perception about the use of coercive power by the manufacturer is negatively related to the trust based relationship.*

3.3.3 Trust and Information sharing in supply chain

Trust might have positive effects on information sharing and collaborative planning (Heide and John, 1990; Zaheer et al., 1998). Sharing critical information regarding your business increase the risk of being vulnerable to the opportunistic behaviors of the other firm. However, with trust, the business partners have confidence that each will use the information received in an honest manner. Trust also mitigates the inherent information asymmetry between supply chain partners by allowing more open and honest information sharing (McEvily and Marcus, 2005; Zaheer et al., 1998). Trust fosters information sharing and communication by allowing parties to relinquish some control over decision making. Thus, a relationship is likely to be strengthened through

greater levels of Trust. Therefore, we propose the following hypothesis for the effects of trust on information sharing -

H3: *Trust with the buyer is positively related to the information sharing practices.*

3.3.4 Information sharing practices and performance of buyer-supplier relationship

Information sharing refers to the extent that critical information is conveyed to a supply chain partner. Information exchange is very vital in supply chain management. Information recorded in some form (manual or digital) should be communicated with the partner firms in supply chain. Information sharing enables the supplier to replenish stocks to an optimal level of inventory. It also helps the supplier in reducing its lead time and inventory cost. Information sharing significantly improves the quality of products and helps in customizing products according to the need of Buyer. Van der Vaart suggested that measuring performance at aggregate level is not a valuable approach. Integration and information sharing means investing in a buyer-supplier relationship and it will be useful to measure performance in terms of the aim and efforts with respect to their particular relationship. Thus measuring the operational performance with respect to the key buyer has been adopted and the following hypothesis proposed-

H4: *Information sharing practice with the buyer are positively related to the operational performance.*

Based on the concerns discussed above we propose the research model as depicted in Figure 3.2

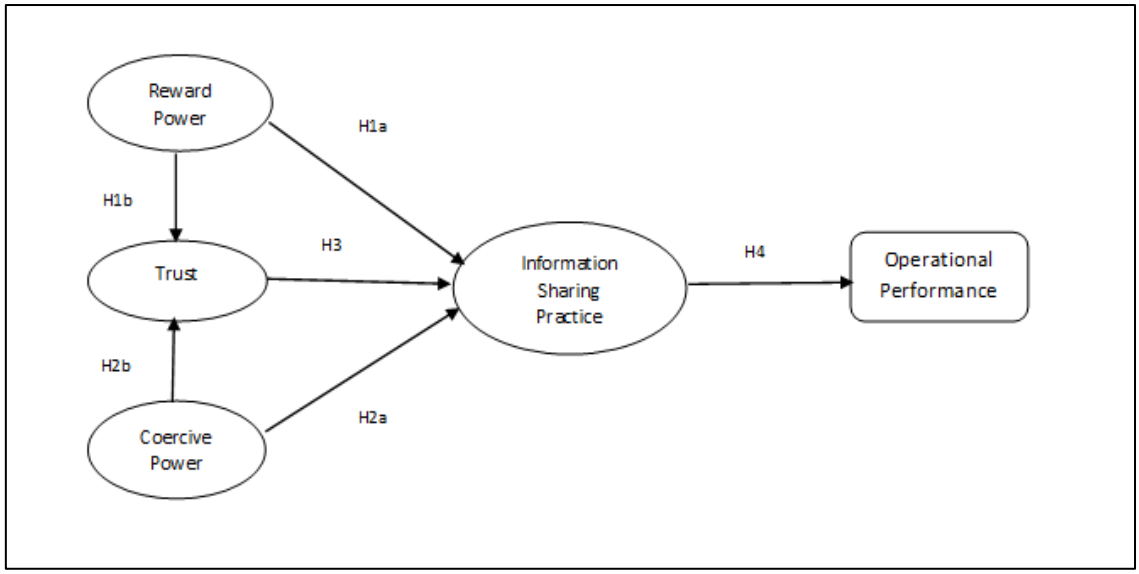

Figure 3.2 Research Model for Study I

3.4 Study II- What is the nature of relationship between the attitude, practices, and patterns of Supply Chain Integration?

An important conclusion based on literature review is that there is little consensus on how to capture the essence of SC integration, or on how to measure the effects of SC integration on performance. In this study, we focus on the interrelationships between the various SCM factors, and on the relationship between SCM factors and performance. We have already argued that there has been too many studies where authors measure closely related SCM factors using different items, and with different levels of aggregation. SC practices are seen as tangible activities or technologies that play an important role in the collaboration of a focal firm with its suppliers and/or customers. Examples are the use of Electronic Data Interchange (EDI), integrated production planning, packaging congruence, Vendor Managed Inventories (VMI). Related to these practices are the SC patterns, or interaction patterns, between the focal firm and its suppliers and/or customers. Example activities are regular visits to the supplier's facility, frequent face-to-face communication, high corporate level communication on important issues with key suppliers and formal, periodic written evaluation of suppliers. The final category

includes those items that measure the attitude of buyers and/or suppliers towards each other or towards SCM in general. Examples of items used in the questionnaires are ‘‘we expect our relationship with key suppliers to last a long time’’, ‘‘we view our suppliers as an extension of our company’’, and ‘‘problems that arise in the course of this relationship are treated as joint rather than individual responsibilities’’

Based on the concerns discussed above we propose the research model as depicted in Figure 3.3. We aim at understanding the possible interactions between attitudes, patterns and practices. On the one hand it seems that (positive) attitudes are a first step in developing a relationship and improving integration. On the other hand, intensive daily contact and the development of SC patterns might influence attitudes. Another interesting subject is the interaction between patterns and practices. Therefore we propose the following Hypothesis:

H5a: *Long Term Orientation with the buyer is positively related to the information sharing practices.*

H5b: *Long Term with the buyer is positively related to the Interaction patterns*

H6a: *Co-operative Behaviour with the buyer is positively related to the information sharing practices.*

H6b: *Co-operative Behaviour with the buyer is positively related to the Interaction patterns*

H7: *Information sharing practice with the buyer are positively related to the Interaction patterns*.

H8: *Interaction patterns with the buyer are positively related to the operational performance of buyer supplier chain*.

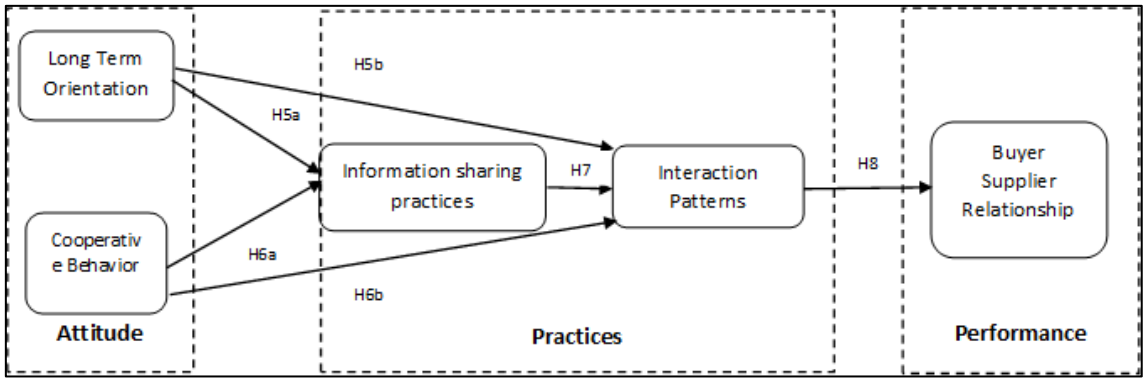

Figure 3.3 Research Model for Study II

Table 3.1 Summary of Hypotheses

H1a	A supplier's perception about the use of Reward power by its buyer is positively related with the information sharing practice
H1b	A supplier's perception about the use of Coercive power by its buyer is negatively related with the information sharing practice
H2a	A suppliers perception about the use of reward power by the manufacturer is positively related to the trust based relationship
H2b	A suppliers perception about the use of coercive power by the manufacturer is negatively related to the trust based relationship.
H3	Trust with the buyer is positively related to the information sharing practices.
H4	Information sharing practice with the buyer are positively related to the operational performance.
H5a	Long Term Orientation with the buyer is positively related to the information sharing practices.
H5b	Long Term Orientation with the buyer is positively related to the Interaction patterns.
H6a	Co-operative Behaviour with the buyer is positively related to the information sharing practices.
H6b	Co-operative Behaviour with the buyer is positively related to the Interaction patterns.
H7	Information sharing practice with the buyer are positively related to the Interaction patterns.
H8	Interaction patterns with the buyer are positively related to the operational performance of buyer supplier chain.

Chapter 4 - Research Methodology

The intent of this section is to describe the methodology used in this research. The research objectives described in previous section are the foundation upon which the research was built. A description of the research design, the sampling method used, instrument development and the data gathering process are justified. The main research method used in this research is survey. Data analysis has been performed using SPSS and M*plus* software. All the standard procedure of statistical measurement have been adopted in the study. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) have been used to assess the reliability and validity of the constructs.

4.1 Research Design

A research design is the general plan or overall scheme of investigation, designed to provide with the answers to research question (Brown et al, 2006).

After defining the research objectives, we had to determine the design of the research which was best suited to the answer these questions. The research design consists of two important elements, the first element is how data was collected and the second element is how it was analyzed. In this chapter we explain the complete step by step procedure of both elements. We start by describing the process of survey instrument development followed by the sampling method and then in the analysis section we discuss the issues of reliability and validity. The design adopted for this study was descriptive with cross sectional survey.

4.2 Questionnaire Design and Measures

The prime data collection instrument used for this study was questionnaire. In order to carry out this study a questionnaire of fifty six questions was constructed and it was

divided into four major sections. Further, some sections were also divided into parts. Survey instrument was designed and structured by closed ended questions. The first section A, is divided into three parts and primarily deals with the buyer–supplier relationship. In the first part, all the twelve questions were asked to identify supplier's attitude towards its buyer. These questions were related to *Trust, Long Term Orientation* and *cooperative behavior*. In the second part questions were designed specifically to know the *Information Sharing Practices* in the supply chain and it consisted five questions. The third part of section A enquires about the *power* relationship between both the partners. It has nine questions related to three kind of power exercised by the buyer namely *Reward, Legal and Coercive.* Section B covers the firm's *Performance* and has six questions mostly dealing with the *Service* and *Cost* performance of the firm. In the third section C, questions were related to competitive environment under which the firm operates and it has five questions in it. The last section D has nine demographic questions. In order to design a reliable and valid survey instrument we have extensively reviewed the existing literature. A rigorous process was adopted to develop and validate the instrument, modelled on previous research studies. The survey instrument that was developed for this study has been adopted from various sources. All the valid measures and scale have been taken from published work.

Supply chain Integration was measured using items of practices, patterns and attitudes. Relational aspects of supply chain integration were measured using nine items. They were largely adopted from the items used by Narasimhan and Kim (2002) and Frohlich and Westbrook (2001). Respondent were asked to indicate their agreement on the Likert scale of 1 to 7 where "1" being "Strongly disagree" and "7" being "Strongly Agree". The measurement items and scale of supply chain patterns is mainly based upon the work of Chen et al. (2004). Supply chain mangers were asked to respond all the activities on the

Likert scale of 1 to 7 where “1” being “Not at all” and “7” being “Extensive”. Ramdas & Speckmen (2000) provided the majority of questions/items for measuring information sharing practices. These were measured with the above mentioned Likert scale along with the pattern item. In the measurement of power, we distinguish between two main types of power: reward power and coercive power. These items and scale has been adopted from the work of Huo (2002).

Supply chain performance has been conceptualized and measured in numerous ways (Van der Vaart and Van Donk, 2008; Zhang et al., 2011): ranging from aggregate financial to single operational performance measures, mixes of both and both at the relationship level and the overall focal company level. In this study, the operational elements of supply chain performance are considered, particularly with respect to cost and service. The cost dimension captures costs incurred during the delivery process related to transportation, delivery, storage etc. Similarly, service dimension relates to how well the delivery process fits with the requirements of the buyer such as delivery accuracy, flexibility, providing information as well as timing. Finally, regarding the performance measurement we have uses items developed by Gimenez & Ventura (2005). Slater and Narver have provided the measures and scale for measuring the competitive environment construct. All indicators for these two dimension were measured on a seven-point Likert scale where “1” being “Strongly disagree” and “7” being “Strongly Agree”. The instrument then given to two professors in the Operations Management area for assessing the validity and language. Few corrections had been made after the feedback given by them. To make sure that there should be no non-sampling errors due to wrong responses or non-response. The questionnaire was designed and checked carefully to make sure that it is not ambiguous for the respondents. All these indicators are listed in Table 4.1 to 4.5.

Table 4.1 Measurements for Supply Chain Integration

Construct	Dimension	Source	Scale items	Scale
Supply Chain Attitude	Long Term Relationship	Chen et al. (2004).	Our firm's long-term strategy depends on maintaining a good, healthy relationship with our key buyer.	1= Strongly disagree, 7 = Strongly Agree
			We work with our key buyer to improve their quality in the long run.	
			The key buyer see our relationship as a long-term alliance.	
	Cooperative Behavior	C. Droge, S. K. Vickery and M. A. Jacobs (2012)	How hard we work for this key buyer is directly linked to how much we are rewarded.	
			When some unexpected situation arises, the parties would rather work out a new deal than to hold each other to the original terms.	
			A strong cooperative relationship must be maintained between our firm and our key buyer for us to remain competitive in our industry.	
	Trust	Narasimhan and Kim (2002)	In our relationship, key buyer cannot be trusted at times.	1= Strongly disagree, 7 = Strongly Agree
			Our key buyer has a high level of integrity.	
			We feel that we can trust our key buyer completely.	
			My key buyer considers how its decisions/actions affect us.	

Table 4.2 Measurements of Power

Construct	Dimension	Source	Scale items	Scale
Power	Reward Power	B. B. Flynn, B. Huo and X. Zhao (2010)	We felt that by going along with the key buyer, we would have been favored on some other occasions	1= Strongly disagree, 7 = Strongly Agree
			Our key buyer often rewarded us to get our company to go along with their wishes.	
			By going along with the key buyer's requests, we avoided some of the problems other suppliers face.	
	Coercive Power	B. B. Flynn, B. Huo and X. Zhao (2010)	The key buyer often hinted that they would take certain actions that would reduce our profits if we did not go along with their requests.	
			The key buyer might have withdrawn certain needed services from us if we did not go along with them	
			If our company did not agree to their suggestions, the key buyer could have made things more difficult for us.	

Table 4.3 Measurements for Operational Performance

Construct	Dimension	Source	Scale items	Scale
Operational Performance	Cost Performance	Gimenez & Ventura (2005)	My company has achieved a reduction in the cost-to-serve this key buyer	1= Strongly disagree, 7 = Strongly Agree
			My company has achieved cost reductions in the transport to this key buyer	
			My company has achieved a reduction in the production cost-to-serve this key buyer	
	Service Performance	Gimenez & Ventura (2005)	My company has achieved a lead time reduction for this key buyer	
			My company serves on the delivery date established	
			My company responds to the special requirements of the key buyer	

Table 4.4 Measurements for Integrative Practices

Construct	Dimension	Source	Scale items	Scale
Integrative Practices		Ramdas & Speckmen (2000) and Frohlich and Westbrook (2001)	Our key buyer shares production plan with us	1= Not at all, 7 = Extensive
			Our key buyer shares demand forecast with us	
			Our key buyer shares cost, quality and delivery information with us	

Table 4.5 Measurements for Interaction Pattern

Construct	Dimension	Source	Scale items	Scale
Interaction Pattern		Huo (2012)	Our key buyer holds a periodic audit of our facilities	1= Strongly disagree, 7 = Strongly Agree
			We have frequent face-to-face planning/communication with our key buyer.	
			Exchange of information takes place frequently, informally and/or in a timely manner.	

4.3 Industry Justification

4.3.1 Indian automotive component sector

With the introduction of the new industrial policy, this sector has shown considerable growth and is becoming one of the leading foreign exchange earners for the nation. Supply chain management is all about better relationship and collaborating with vendors with a problem solving attitude and an underlying trust in them is the key to its success. Maruti has a total of 370 suppliers and 12 component suppliers that have joint ventures with the company. It was the first company to start the concept of supplier partnerships in India in 1983-84. For ensuring a steady flow of components, a lot of planning had gone into the selection of the vendor base. Tata Engineering has undergone significant changes from the earlier years. It has initiated a comprehensive supplier rating system based on parameters (Quality, Cost, Delivery, Design capabilities and Management Systems). Over twenty percent of its vendors are QS9000 certified. Mahindra and Mahindra has been following a structured approach to get savings in the short term, medium term and long term. In the short term, through tactical sourcing, the benefits have been via consolidation, in medium term the benefits have been through driving down acquisition costs. In the long term, the benefits have been through simultaneous working for improved product design, process design, process improvement and technology upgradation. Figure 5.9 provides the profile of auto component industry turnover wise.

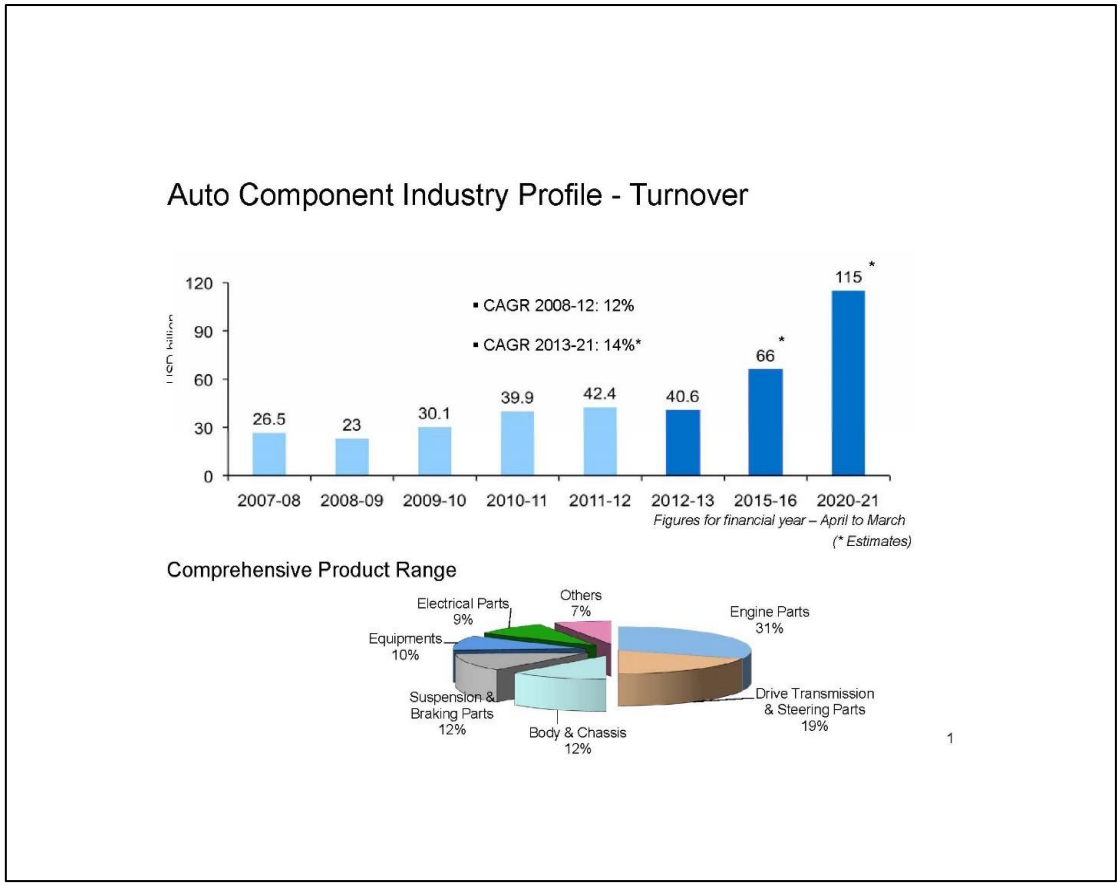

Figure 4.1 Auto component industry turnover

Most innovations in supply chain can be attributed to auto companies. Many of the supply chain management concepts are derived from the much acclaimed Toyota Production System. Once the Japanese companies starting conquering the Indian market in the late 1990s with their cheaper but high quality vehicles, the auto industry in India sat up to take note of their strategies. Several supply chain advances have taken place since then. A lot many companies in India are operating for past few decades, so it must have given time to these companies to implement modern SCM techniques. Thus we decided to conduct our study in automobile sector to test the integration phenomenon.

4.4 Sampling Method

For testing the hypothesis for the study we have collected data from automobile companies from India. Simple random sampling was used for the data collection. To

create a sampling frame for the target population of supply chain managers we used two databases. First data base was taken from Automotive Component Manufacturers Association of India (ACMA) membership directory. According to ACMA website "ACMA is the apex body representing the interest of the Indian Auto Component Industry. Its membership of over 750 manufacturers contributes more than eighty five per cent of the auto component industry's turnover in the organized sector." The directory of association is publically available. Member of the association are spread across the country. The second database used in the study was purchased from an independent market research company. Entries from the database were double checked and all cross entries were removed from the frame. These companies are taken from the variety of economy stage and this was designed to make the sample representative of Indian automobile firms so that the results are more generalizable. Therefore, to capture the different economic conditions and stage it was decided to go for the pan India study. After creating the sampling frame we then randomly selected companies and started contacting them through telephone. A pilot test was conducted with 10 companies. After the minor revision from the findings of pilot test full scale survey was launched.

One of the major challenge for this research was collecting reliable data from the firms about their relationship with the buyer and performance of the supply chain. After discussing with several academicians and industry experts we decided that the best way was to identify one key person from each automotive component manufacturing firm who is aware about the supply chain practices of the firm. This person can be any one with the titles as supply chain manager, logistics manager, president, director or owner of the firm, who is supposed to be knowledgeable about the firm's internal and external processes. He must be involved in the activities such as purchasing, procurement, manufacturing, and distribution and supplier relationship management. The use of a

single respondent is not uncommon in the empirical descriptive research. (Small & Yasin, 1997).

4.5 Data Collection

For the data collection we have employed the same market research firm from whom we purchased the second database of our sampling frame. The firm specializes in data collection and was suggested to the scholar by the dean of the school. It has provided survey research services for the academic purpose in the reputed school such as IIM, ISB and other Business schools. After checking their credentials it was decided to take their services for the data collection. Team leader of the survey team from the market research firm was briefed over the telephone. After the telephone call, we send the survey instrument (questionnaire) with a cover letter. Cover letter highlighted the aims and objectives of the study. The Self-administered Questionnaire survey data collection took place from December 2015 to December 2016 in two phases. In the first phase those companies have been contacted which had email address available and respondent were asked to fill the questionnaire online. In the second phase a personal visit was paid to the companies and pen and paper method was used. We used telephone calls and follow-up mailings to improve the quality of the data. Follow-up mails were sent if there was any discrepancy find out in the filled questionnaire received from the firm. If it was found out that there is large number of information missing the respondents were contacted on phone by the research team to clarify missing data in their responses. Explanation was provided by the survey team when the respondents faced any problem in filling up the questionnaire. Respondents were encouraged to give the true information. They were given an assurance that the information will be used only for the academic purpose and would be kept confidential and not to be revealed to others.

In this empirical study, non-response bias was checked by performing t-test. First and second phase responses on number of competitor, number of employees and number of years in operation were compared. The t-test showed no statistical significant differences which indicated that non-response bias was not present in this study.

Table 4.6 Results of Two-Sample t-Test Assuming Equal Variances

Question	p-value for 1st round e-mail survey	p-value for 2nd round e-mail survey
Q 9	0.71	0.81
Q 16	0.35	0.45
Q 23	0.78	0.62
Q 27	0.16	0.70
Q 33	0.12	0.25

Another matter of concern is common method bias. We have chosen only one respondent from the each company, to answer the self-reported questionnaire in this research. To ensure that there was no common method bias present in the research we conducted Harman's one-factor test of common method bias on the variables of Supply chain integration, power, trust, and performance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff & Organ, 1986). The single factor accounted only 23 percent of total variance. The result showed that several distinct factors were drawn among the Supply chain integration, power, trust, and performance variables. Therefore, we can conclude that common method bias was not present in the present study.

4.6 Response Rates

In the first phase, of the 377 companies were contacted 73 persons responded. The response rate for this phase was recorded at approximately 19 percent, which was lower as per the expectations. The lower response rate could be the reasons of busy schedule of respondent, technical fear (such as virus or spam in email) or over surveying of managers.

In the second phase, a total of 423 companies were contacted and of 148 responses from various firm was collected. The second phase response was higher than the first phase and recorded as 34 percent. The higher response rate in the second phase can be justified because of the personal visit. There was some abnormality found in the five questionnaire. Thus making the total count of useful questionnaire to 216.

As sample size affects the ability to correctly estimate parameter values and determine model fit (Schumacker & Lomax, 1996). While using structure equation modeling requires a large number size there is no agreement between statisticians in terms of the required sample size. Anderson and Gerbing (1988) suggested a minimum sample size of 150. Hair et al (1998) suggested 10 sample per items. Although the correct sample size could not be found in literature, in most of the cases a simple thumb rule of more than 200 response have been observed. (Iacobucci, 2009)

4.7 Reliability

Once the data was coded into SPSS we performed several test of reliability and validity for the measurement items and scale. Reliability is closely related to quality of data and it refers to degree of consistency between the multiple measurements of a variable (Hair, Anderson, Tatham, & Black, 1998). Firstly to ensure the unidimensionality of scale we conducted an exploratory factor analysis. The Kaiser-Meyer Olkin (KMO) and Bartlett's Test measure of sampling adequacy was used to examine the appropriateness of Factor Analysis. The KMO statistic is found out to be 0.872 (greater than 0.50). Hence Factor analysis is considered as an appropriate technique for further analysis of the data. Principal component analysis with Varimax rotation with Kaiser Normalization was used for data reduction and to identify the main constructs. Factor analysis of items measuring SCI extracted three factor, which are mainly attitude,

practice and pattern. Again for the power items these yielded to three factors mainly named, reward, legal and coercive power. EFA showed that all the items strongly load (factor loading of more than 0.65) on the construct which they intended to measure and cross-loadings were very low, suggesting the unidimensionality of the scale. Few items were dropped because of the cross loadings. These factors explained 71.25% of total variance. Once the unidimensionality was established we then conducted reliability test with measures of Cronbach's alpha. Cronbach's alpha was measured using SPSS software for each subscale of items. The traditional threshold value of Cronbach's alpha is 0.7 (Flynn et al.1990) and that all values of Cronbach's alpha were found larger than 0.70. Therefore, reliability is ensured for this study. Table 4.7 presents the composite reliability along with the Cronbach's alpha value.

Table 4.7 Reliability

Constructs	Cronbach's Alpha	Composite Reliability
Long Term Relationship	0.847	0.944
Cooperative Behavior	0.856	0.867
Trust	0.801	0.865
Reward Power	0.924	0.903
Coercive Power	0.836	0.942
Operational Performance	0.798	0.877
Integrative Practices	0.811	0.936
Interaction Pattern	0.879	0.854

Chapter 5 - Analysis and Results

In this chapter the data analysis techniques and the results have been presented. This chapter is organized as follows: Section 5.1 provides the descriptive statistics of the respondents. Sections 5.2 and 5.3 give explanation of the Factor analysis, and M*plus* software used in SEM. A full SEM model comprises both measurement model and a structural model. Section 5.4 and 5.5 present the evaluation of measurement model and structural model, respectively. We conclude the chapter by presenting the result of hypothesis, tested using structural equation modeling.

5.1 Profile of Respondents

Data received from the survey was first entered into excel sheet and then coded into SPSS software. All the entries were double checked to make sure that the encoding is done according to the responses received. As described earlier, Indian automobile firms were selected as sample and their supply chain and logistics managers were respondents. Average experience of the managers has been reported 15 years. It implies that the respondents were familiar with their job duties and also have enough experience in managing supply chain of the firm. So they were competent enough to answer the questions. This the reliability of the data should be high. Average number of year doing business with key buyer has been reported 26 years. A long period must have allowed both the firms to integrate their business process. Therefore, to a certain extent, we can assume that trust and power concepts can be explored in this dyadic relationship. Figures 5.1-5.7 show the descriptive statistics of the 216 respondents in our sample.

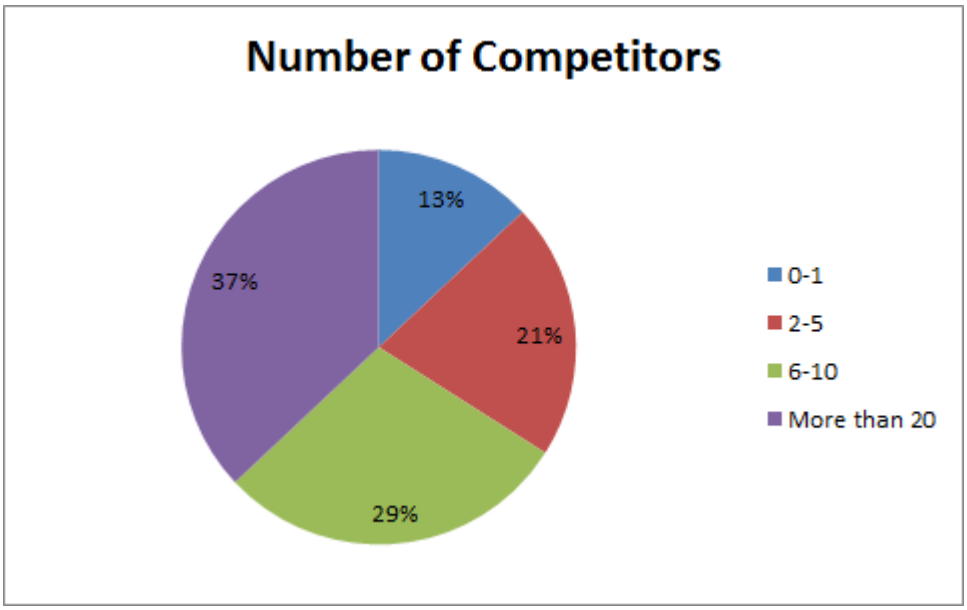

Figure 5.1 Number of Competitors

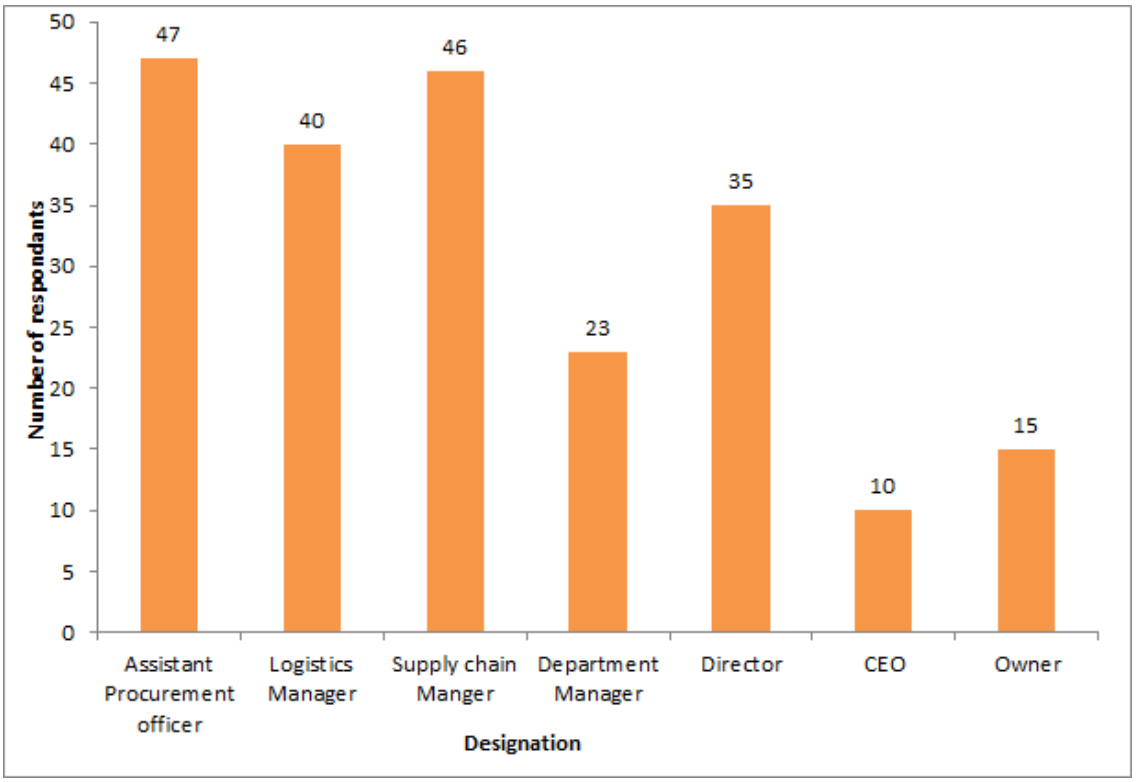

Figure 5.2 Designation of Respondents

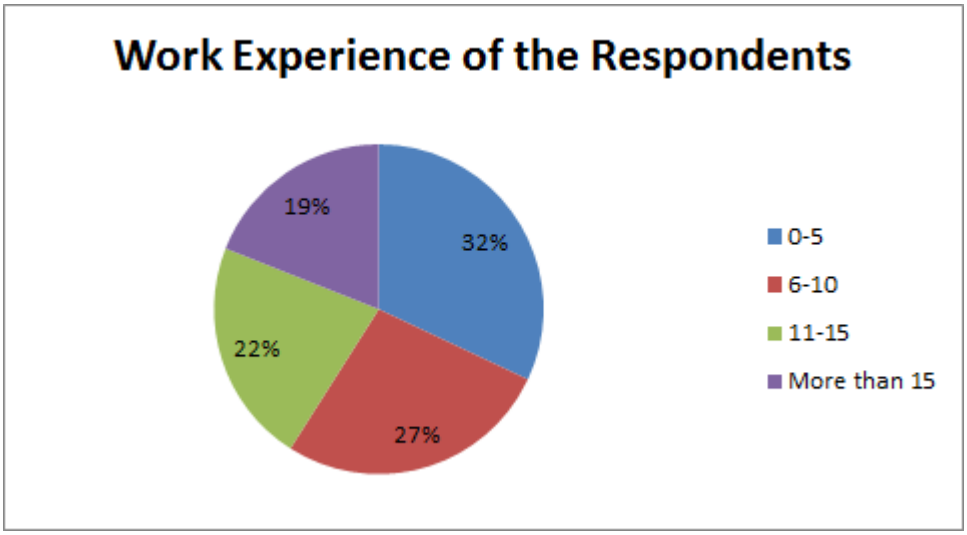

Figure 5.3 Work experience of the Respondents

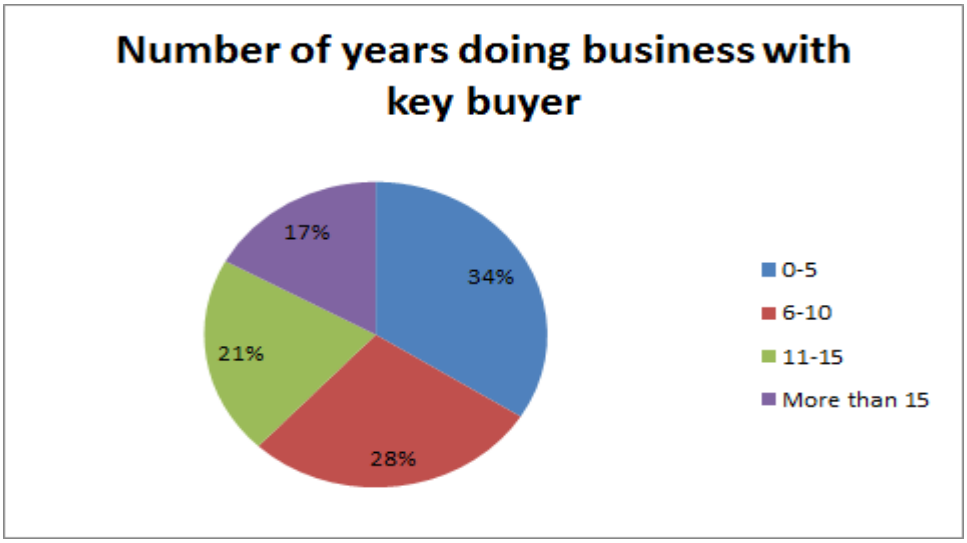

Figure 5.4 Duration of business with key Buyer

Respondents were categorized geographic regions wise. It was found that the north region has the highest response rate followed by South. East had the lowest response rate of just 5 percent. Table 5.1 presents geographical distribution of sample.

Table 5.1 Classification of respondents by geographical distribution

Region	Population (%)	Response Group (%)
East	5	11.8
West	25	29.4
North	40	41.2
South	30	17.6

5.2 Factor Analysis

The Kaiser-Meyer Olkin (KMO) and Bartlett's Test measure of sampling adequacy was used to examine the appropriateness of Factor Analysis. The approximate of Chi-square is 1741.227 with 105 degrees of freedom, which is significant at 0.00 Level of significance. The KMO statistic of 0.872 is also large (greater than 0.50). Hence Factor analysis is considered as an appropriate technique for further analysis of the data.

Table 5.2 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.872
Bartlett's Test of Sphericity	Approx. Chi-Square	1741.227
	df	105
	Sig.	.000

Factor analysis was carried out to reduce the Supply chain integration, Power, Performance and Trust to a smaller number of underlying factors. Principal components analysis with varimax rotation was used. In the interest of convergent and discriminant validity, we only considered items that had high a factor loading and did not have important cross-loads (items with a loading in excess of 0.3 on a second factor were omitted for further analysis). The Power scale yielded two factors, Reward power and Coercive power (see Table 3). These factors explained 71.25% of total variance. Three factors were obtained in the integration scale: Long Term Relationship, Integrative Practices, and Interaction Pattern (see Table 4). The three factors explained 69.9 % of total variance. Trust scale resulted in extracting one factor (see Table 5). Variance explained by this factor was 75.6%. Initially Performance scale resulted in extracting two factors but 3 items had a loading in excess of 0.3 on a second factor and thus these were omitted after removing it resulted in extracting one factor.

Table 5.3 Factor Analysis

	PERFORMANCE	INFORMATION	COERCIVE POWER	TRUST	REWARD POWER
PERFOR 1	**.788**	-.002	.222	.126	.041
PERFOR 2	**.770**	-.072	.064	.088	.067
PERFOR 3	**.761**	-.015	.096	-.011	.004
PERFOR 4	**.751**	.000	.179	.054	.224
PERFOR 5	**.792**	-.038	.079	.044	.025
INFO 1	-.040	**.842**	-.069	.013	-.151
INFO 2	-.021	**.841**	.010	.066	-.078
INFO 3	-.101	**.803**	.064	-.028	-.143
INFO 4	.029	**.761**	-.005	.032	.060
COER 1	.182	-.016	**.932**	-.067	.074
COER 2	.168	-.010	**.911**	-.016	.055
COER 3	.218	.029	**.893**	-.035	.008
TRUST 1	.044	.070	-.048	**.890**	-.024
TRUST 2	.082	-.043	-.067	**.866**	-.028
TRUST 3	.107	.053	.011	**.799**	.009
REWARD 1	.113	-.091	.024	-.004	**.854**
REWARD 2	-.053	-.088	.004	-.010	**.832**
REWARD 3	.244	-.095	.106	-.031	**.804**

5.3 Univariate Statistics

The means and standard deviations of constructs are presented in Table 5.4. The average for coercive power is low compared to reward power. The averages for long term orientation and interaction pattern are particularly high. In other words, firms have not completely integrated these processes yet. The lack of integration could be a resource issue rather than conceptual disagreement. However, as proposed in this study, the very resources that are required for integration of processes must be developed. We can now proceed to hypotheses and model testing.

Table 5.4 Means and Standard Deviations of Constructs

Factor	Scale items	Mean	Standard deviation
Reward Power	We felt that by going along with the key buyer, we would have been favored on some other occasions	4.757	1.024
	Our key buyer often rewarded us to get our company to go along with their wishes.	4.651	1.367
	By going along with the key buyer's requests, we avoided some of the problems other suppliers face.	5.683	1.006
Coercive Power	The key buyer often hinted that they would take certain actions that would reduce our profits if we did not go along with their requests.	3.705	1.257
	The key buyer might have withdrawn certain needed services from us if we did not go along with them	3.646	1.119
	If our company did not agree to their suggestions, the key buyer could have made things more difficult for us.	3.843	1.932
Long Term Relationship	Our firm's long-term strategy depends on maintaining a good, healthy relationship with our key buyer.	5.783	1.162
	We work with our key buyer to improve their quality in the long run.	5.764	1.206
	The key buyer see our relationship as a long-term alliance.	5.607	1.019
Integrative Practices	Our key buyer shares production plan with us	4.801	1.024
	Our key buyer shares demand forecast with us	4.916	1.367
	Our key buyer shares cost, quality and delivery information with us	4.806	1.006
Interaction Pattern	Our key buyer holds a periodic audit of our facilities	5.870	1.162
	We have frequent face-to-face planning/communication with our key buyer.	5.724	1.206
	Exchange of information takes place frequently, informally and/or in a timely manner.	5.796	1.019
Trust	In our relationship, key buyer cannot be trusted at times.	5.614	1.367
	Our key buyer has a high level of integrity.	5.685	1.006
	We feel that we can trust our key buyer completely.	5.778	1.162
	My key buyer considers how its decisions/actions affect us.	4.748	1.781
Performance	My company has achieved a reduction in the cost-to-serve this key buyer	4.867	1.028
	My company has achieved a reduction in the production cost-to-serve this key buyer	5.759	1.231
	My company has achieved a lead time reduction for this key buyer	5.695	1.024
	My company serves on the delivery date established	4.857	1.367

5.4 Structural equation modeling

Structural equation modeling is a statistical methodology that takes a confirmatory approach to the analysis of a structural theory bearing on some phenomenon. Typically, this theory represents causal processes that generate observations on multiple variables. The term structural equation modeling conveys two important aspects of the procedure: (a) that the causal process under study are represented by a series of structural equations such as regression analysis and (b) that these structural relations can be modeled pictorially to enable a clearer conceptualization of the theory under study. The hypothesized model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. Several aspects of SEM set it apart from the older generation of multivariate procedures such as it takes a confirmatory, rather than exploratory approach to the data analysis.

5.4.1 M*plus*

M*plus* is a statistical modelling program and has special features for missing data, complex survey data, and multilevel data. It allows the analysis of both cross-sectional and longitudinal data, single-level and multilevel data and data that come from different populations with either observed or unobserved heterogeneity. Analyses can be carried out for observed variables that are continuous, censored, binary, ordered categorical (ordinal), unordered categorical (nominal), counts, or combinations of these variable types. M*plus* also has special features for missing data, complex survey data, and multilevel data. M*plus* has extensive capabilities for Monte Carlo simulation studies, where data can be generated and analyzed according to any of the models included in the program. Graphic User Interphase (GUI) makes it too easy to lose track of all the changes

made during the modelling process, the simplicity of GUIs breeds sloppiness in record keeping and provides only a limited awareness of how things can and do work. (Little 2013: 28). The building of input files using M*plus* is relatively easy and straight forward, mainly because it has only ten commands statements. An example of input and output file is given in figures 5.5- 5.6.

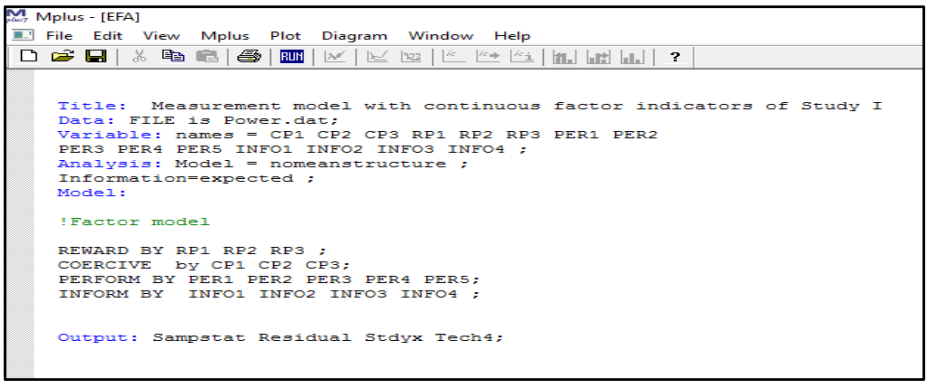

Figure 5.5 Mplus Input File

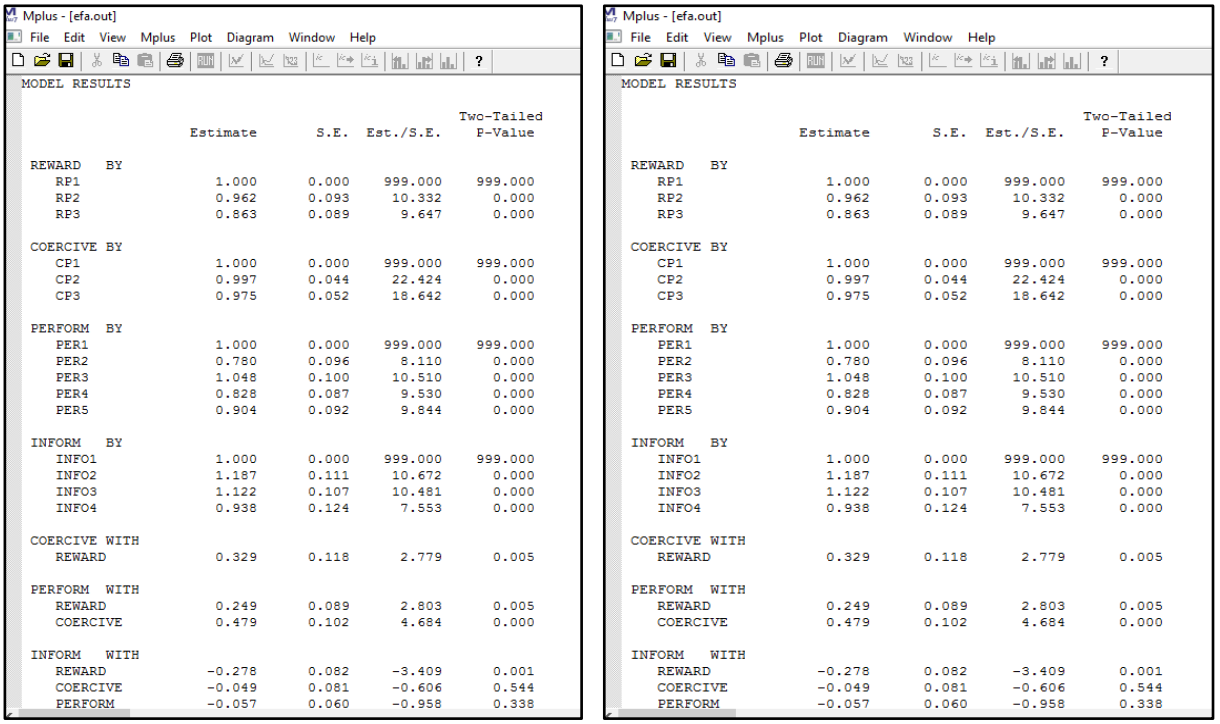

Figure 5.6 Mplus Output File

5.5 Evaluation of Measurement Models

A thorough measurement analysis on instruments is essential for two reasons: (1) it provides confidence that the empirical findings accurately reflect the proposed constructs and (2) empirically validated scales can be used directly in other studies. The latter is possible if the scale is reliable and valid.

5.5.1 Content Validity

Content validity is most directly related to the question of what the instrument is in fact measuring (Churchill 1979). To ensure construct validity, measures should have convergent validity and discriminate validity. Convergent validity examines whether items of a construct are in agreement, and discriminate validity measures the degree to which each construct differs from other constructs. A thorough literature search and critical evaluation has been done for the existing items and scale. Content validity has been established by reviewing the question orders, wording contents, structure and layout. It was send to the some of the students of PGDM program of operations management as a pilot test. Twenty respondents have returned their survey with some comments. It helped in assessing the content, order of questions and layout. Questionnaire was also sent to supervisor for his comments and feedback. According to the responses and feedback some questions were modified.

5.5.2 Convergent validity

Convergent validity refers to the degree to which different measures of the constructs which theoretically should be related are actually related. To assess the convergent validity we conducted a Confirmatory Factor Analysis using M*plus*. This method is more powerful than the traditional method of measuring construct validty through Multitrait Multimethod Matrix. In M*plus* we linked all the items to its

corresponding construct and we estimated the parameter freely. We did not constrain the model or covariance among the construct. The model fit indices are as follows: χ 2 = 933.29 with the degree of freedom of 278, Non-Normed Fit Index (NNFI) = 0.95, Comparative Fit Index (CFI) = 0.95, Root Mean Square Error of Approximation (RMSEA = 0.077), and Standardized Root Mean Residual (SRMR) = 0.071.

To further inspect the convergent validity we checked the factor loadings of each indicator. A loading of .05 and a t value greater than 2 are considered as a proof of convergent validity. In our model all indicators found to be significant above these threshold value. Another way of assessing the convergent validity is to look the value of indicator's coefficient, if the item coefficient is greater than the twice of its standard error we can conclude it has high convergent validity. We have also looked the value of average variance extracted (AVE) and it was found that it is higher than .50 or .30 for each indicator. Thus convergent validity was achieved.

5.5.3 Discriminant validity

To assess the convergent validity we built a constrained model with every possible pair of construct and their covariance was set equals to 1. We then compared this constrained model with the previous unconstrained model where the parameter were estimated freely. A significant difference in chi square indicates the high discriminant validity (Chen & Paulraj, 2004). We have also analysed the correlation matrix of constructs and it is given in Table 5.5. To crate the correlation matrix raw scores of each items were averaged to its corresponding constructs and thus composite score was calculated for each constructs. A high correlation value between the different dimensional construct of latent variable and relatively low correlation value between the unrelated constructs indicates good discriminant validity. Both confirmatory factor analysis and correlational analysis

supports the discriminant validity. Figure 5.7 and 5.8 presents the graphically evaluated measurement model in M*plus*.

Table 5.5 Discriminant Validity

Variables	LTO	COEB	TRUST	REWARD	COER	PERFOR	INFO	INTEG
LTO	**(.857)**							
COEB	.067	**(.866)**						
TRUST	.004	.074	**(.935)**					
REWARD	.224	.055	.126	**(.799)**				
COER	.025	.008	.088	.013	**(.914)**			
PERFOR	.044	-.024	-.011	.066	.024	**(.876)**		
INFO	.082	-.028	.054	-.028	.004	-.091	**(.791)**	
INTEG	.107	.009	.044	.032	.106	-.088	.008	**(.877)**

LTO = Long Term Relationship, COEB = Cooperative Behavior, TRUST= Trust, REWARD = Reward Power, COER = Coercive Power, PERFOR = Operational Performance, INFO = Integrative Practices, INTEG = Interaction Pattern

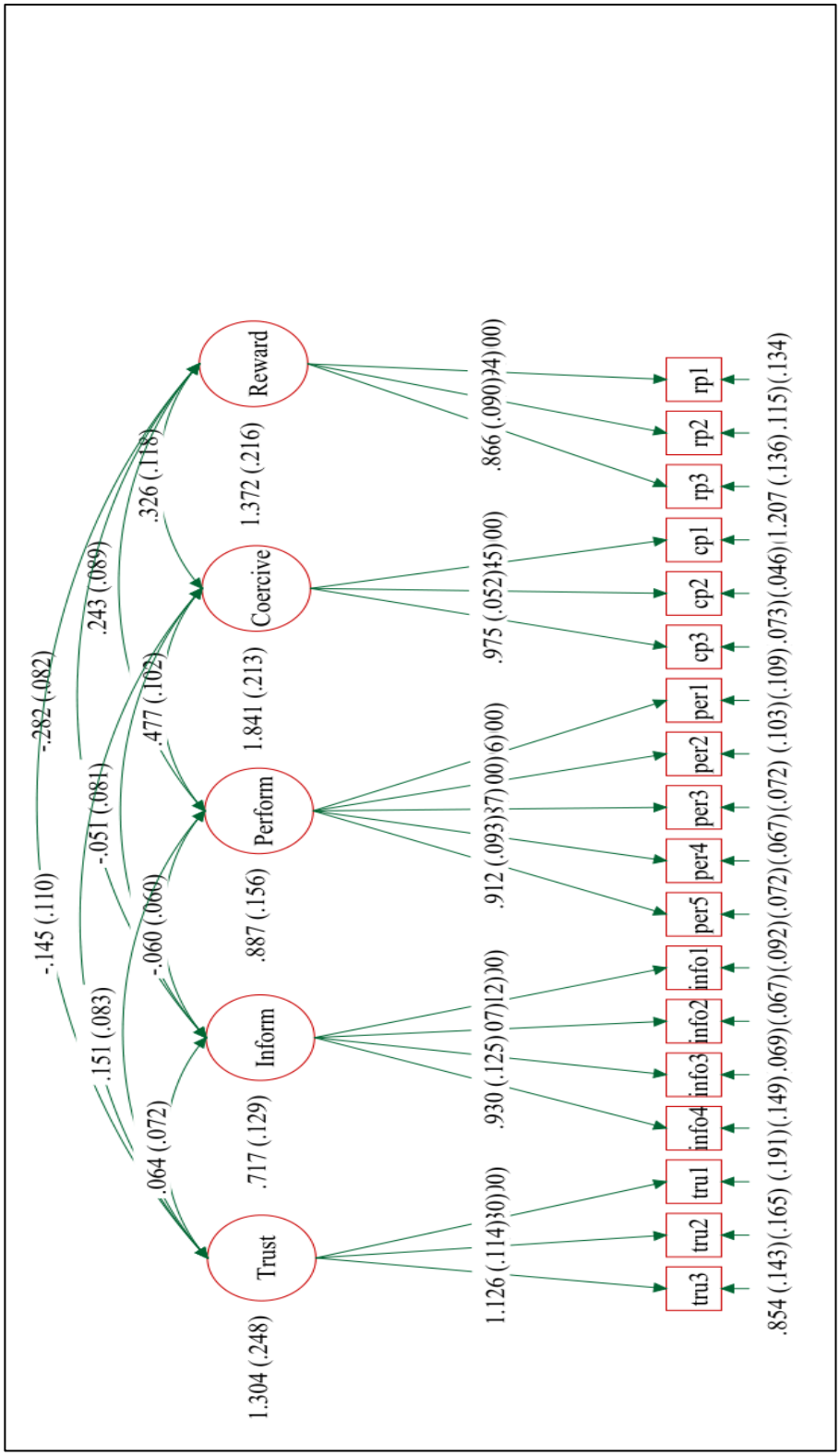

Figure 5.7 Measurement Model

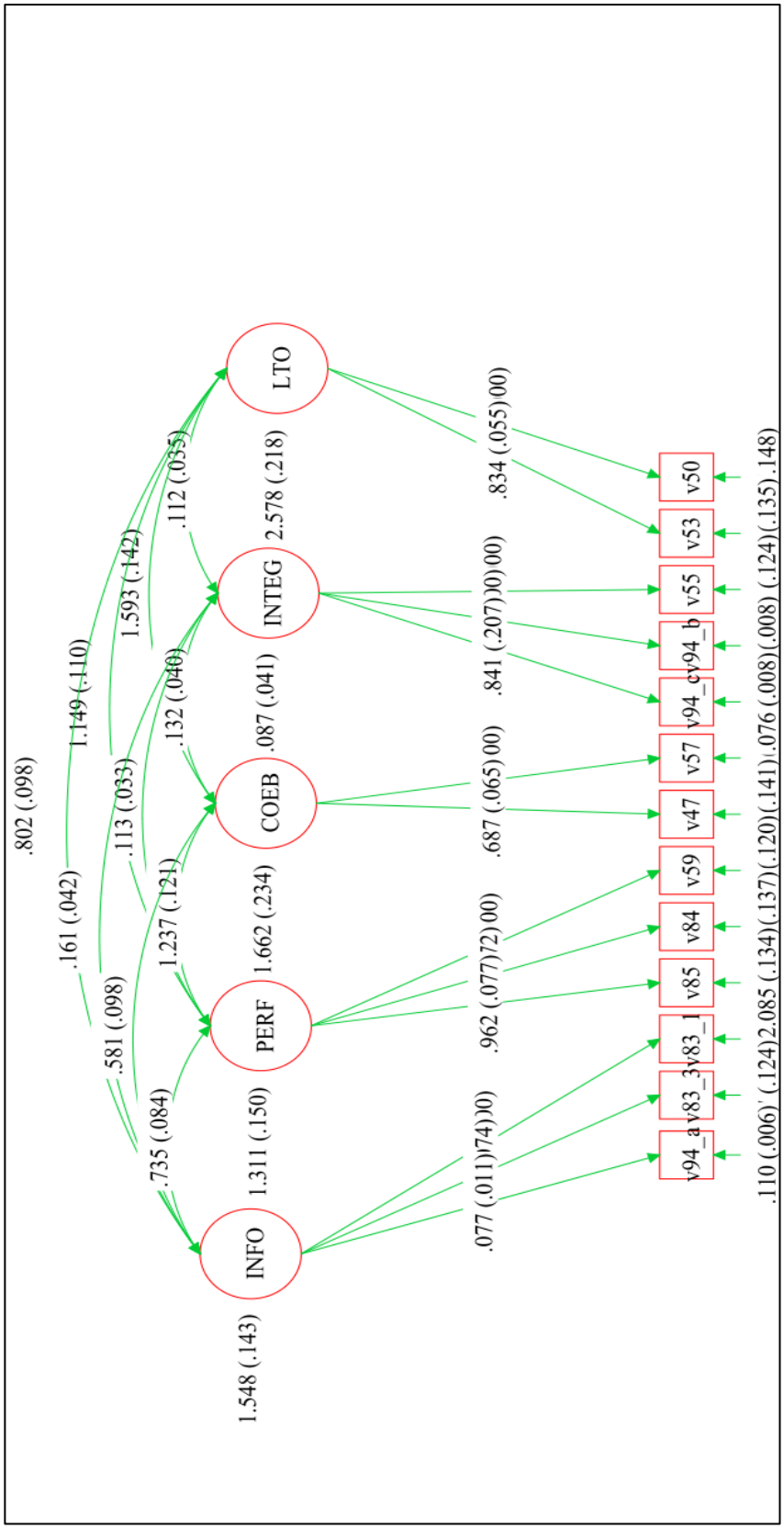

Figure 5.8 Measurement Model for Study II

5.6 Structural Equation Modelling and Test of Hypotheses

We used structural equation modeling to find out the causal relationships among different latent variable with M*plus* program. We collected a sample of 216 firms from automobile industry. For the evaluation of structural equations, we used two step model building approach suggested by the Anderson and Gerbing in their seminal paper of 1988. For the parameter estimation, maximum likelihood estimation method has been used. It has the desirable properties such as asymptotic distribution, minimum variance, and unbiasedness. It is also scale free estimation method and assumes multivariate normality of the manifest variables. According to the recent research (Raykov & Marcoulides, 2000), it can be used for estimation in case of minor deviation from normality. We also performed normality check test for the distribution of the data. The data appeared approximately normally distributed. Thus, in this study, the requirement of normality of the data is met. Marusata and Klomer (2001) contended that Mplus examines the relationships of the items as a unit rather than a collected group in a regression analysis. The assumption of normality and linearity are perfectly reliable measures in regression approach, and Mplus can easily handle it. The research model was built by adopting the standard procedure of statistical modeling. It was measurement models were again modified several times by using the maximum likelihood estimation method.

5.6.1 Model Fit

In structural equation modeling, there is no single test of significance that can absolutely identify a correct model given the sample data (Schumacker & Lomax, 1996). Many goodness-of-fit criteria have been established to assess the model. Several authors recommended some indices to assess model fit (Bentler, 1992; Cheung & Rensvold,

2001; Garver & Mentzer, 1999). We present and discusses the results of this study on a number of such fit indices. $\chi 2 = 1243.47$ with the degree of freedom of 370, Non-Normed Fit Index (NNFI) = 0.95, Goodness of Fit Index (GFI) = 0.932, Root Mean Square Error of Approximation (RMSEA) = 0.043), and Standardized Root Mean Residual (SRMR) = 0.091. The values obtained in these indices are above the threshold values suggested by Satora and Bentler (1999). Other authors such as Cheung and Rensvold (2001) had suggested that more complex models must be evaluated using lower threshold values, on the other hand, simpler models should be evaluated using higher cut-off values. Thus we can conclude that under these argument our model should be accepted. The values for model fit indices with their threshold value for study I are given in the Table 5.6.

Table 5.6 Model fit result for Study I

Measure	**Threshold**	**Model Results**
$\chi 2$ /df (CMIN/DF)	**< 5**	**3.354**
Comparative Fit Index (CFI)	**> 0.9**	**0.932**
Goodness of Fit Index (GFI)	**> 0.95**	**0.914**
Root Mean Square Residual (RMR)	**< 0.09**	**0.091**
Root Mean Square of Approximation (RMSEA)	**< 0.05**	**0.043**

For study II we have used the same process of model building and it the structural equation model with estimated parameter and standardized coefficient is presented in Figure 5.9. The model fit indices for confirmatory factor analysis are as follows: ($\chi 2 = 630.56$ with the degree of freedom = 260, Root Mean Square Error of Approximation (RMSEA = 0.41, Goodness of Fit Index (GFI) = 0.966, Comparative Fit Index (CFI) = 0.972, Standardized Root Mean Residual (SRMR) = 0.092. The values obtained in these indices are above the threshold values suggested by Satora and Bentler (1999).

Table 5.7 Model fit result for Study II

Measure	Threshold	Model Results
χ 2 /df (CMIN/DF)	**< 5**	**2.421**
Comparative Fit Index (CFI)	**> 0.9**	**0.972**
Goodness of Fit Index (GFI)	**> 0.95**	**0.966**
Root Mean Square Residual (RMR)	**< 0.09**	**0.092**
Root Mean Square of Approximation (RMSEA)	**< 0.05**	**0.041**

5.6.2 Path Analysis

The parameter estimates in the modified SEM model shown in Figure 5.9 and 5.10 are the standardized solutions. Estimated path coefficients and significance levels for each path that is ** for p <= 0.01 and * for p<= 0.05 are given. Squared multiple correlations (R2) (i.e. % variance explained) are also given for endogenous variables. A path is considered significant when t-value exceeds 1.96 at a 0.05 significance level (Byrne, 1998). The significant and positive relationships between supply chain integration and operational performances provide support for the supply chain integration concept and its relevance to with estimated parameter and standardized coefficient. All the parameter estimated are at 0.05 significant level. It can be infer from the figure that the use of reward power leads to more information sharing and it also increase the trust between both the partner firms. It has a significant, positive impact on operational performance. Therefore, hypothesis H1a and H1b are supported.

Coercive power has a significant negative impact on trust level between the partner firms, and it is quite opposite to the reward power. It deters the cooperation among the partners. Interestingly coercive power has not a negative impact on information sharing behavior, though the regression coefficient is very low (.09) yet it is not negative. Thus the hypothesis H2a is accepted, but H2b is rejected. We have found a positive relationship

between the trust and information sharing practices in our data. The results show that the regression coefficient for this path has a high value (.35) so the hypothesis H3 is supported.

In our study, we have measured the operational performance by using the items of service and cost related issues, and it has been found the information sharing practice have a significant positive effect on operational performance. The regression coefficient for this path is being found out (.40). All the hypothesis of study I are summarized with their status and along with the regression coefficient and value of t-test in Table 5.8.

Table 5.8 Hypothesis result for study I

Path in the structural model	**Path coefficient (t-value)**	**Outcome**
H1a: Reward Power → Information sharing	0.31 (6.16)	Supported
H1b: Reward Power → Trust	0.27 (6.20)	Supported
H2a: Coercive Power → Information sharing	0.09 (2.44)	**Not Supported**
H2b: Coercive Power → Trust	0.11 (-2.34)	Supported
H3: Trust → Information sharing	0.35 (8.49)	Supported
H4: Information sharing → Operational performance	0.40 (7.35)	Supported

For the relationships between long term orientations to information sharing, the results are similar to those that have been discussed in Study I. This means that normative relationship commitment significantly improves SCI, but long term orientations has no significant impact on the interaction pattern. Therefore, hypothesis H5 was supported, but, H5b was not supported. Moreover, cooperative behavior improves supply chain information sharing positively and also it has a positive impact on interaction pattern. Thus the Hypothesis 6a and 6b were supported. Information integration or information sharing practices improves supply chain performance positively. However, the relationship between interaction pattern and operational performance was not significant.

Thus, Hypothesis 7 was supported, while Hypothesis 8 was not. The hypotheses tests results are shown in Table 4.8.

Table 5.9 Hypothesis result for study II

Path in the structural model	**Path coefficient (t-value)**	**Outcome**
H5a: Long Term Orientation → Information sharing	0.29 (4.21)	Supported
H5b: Long Term Orientation → Interaction patterns	0.04 (1.06)	**Not Supported**
H6a: Co-operative Behavior → Information sharing	0.11 (4.32)	Supported
H6b: Co-operative Behavior → Interaction patterns	0.29 (2.94)	Supported
H7: Information sharing → Interaction patterns	0.28 (5.99)	Supported
H8: Interaction patterns → Operational performance	0.06 (1.31)	**Not Supported**

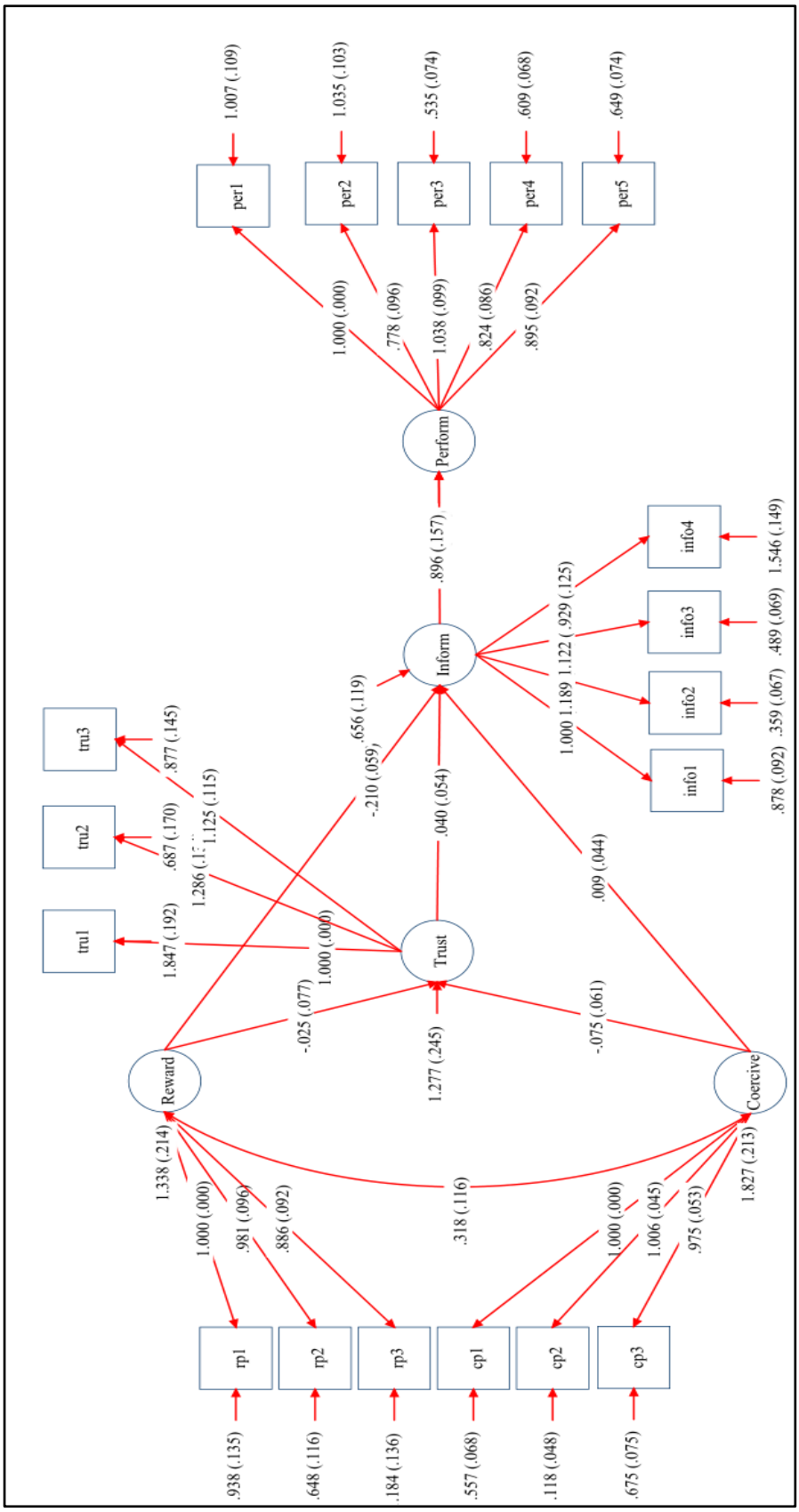

Figure 5.9 Structural Equation Model for Study I

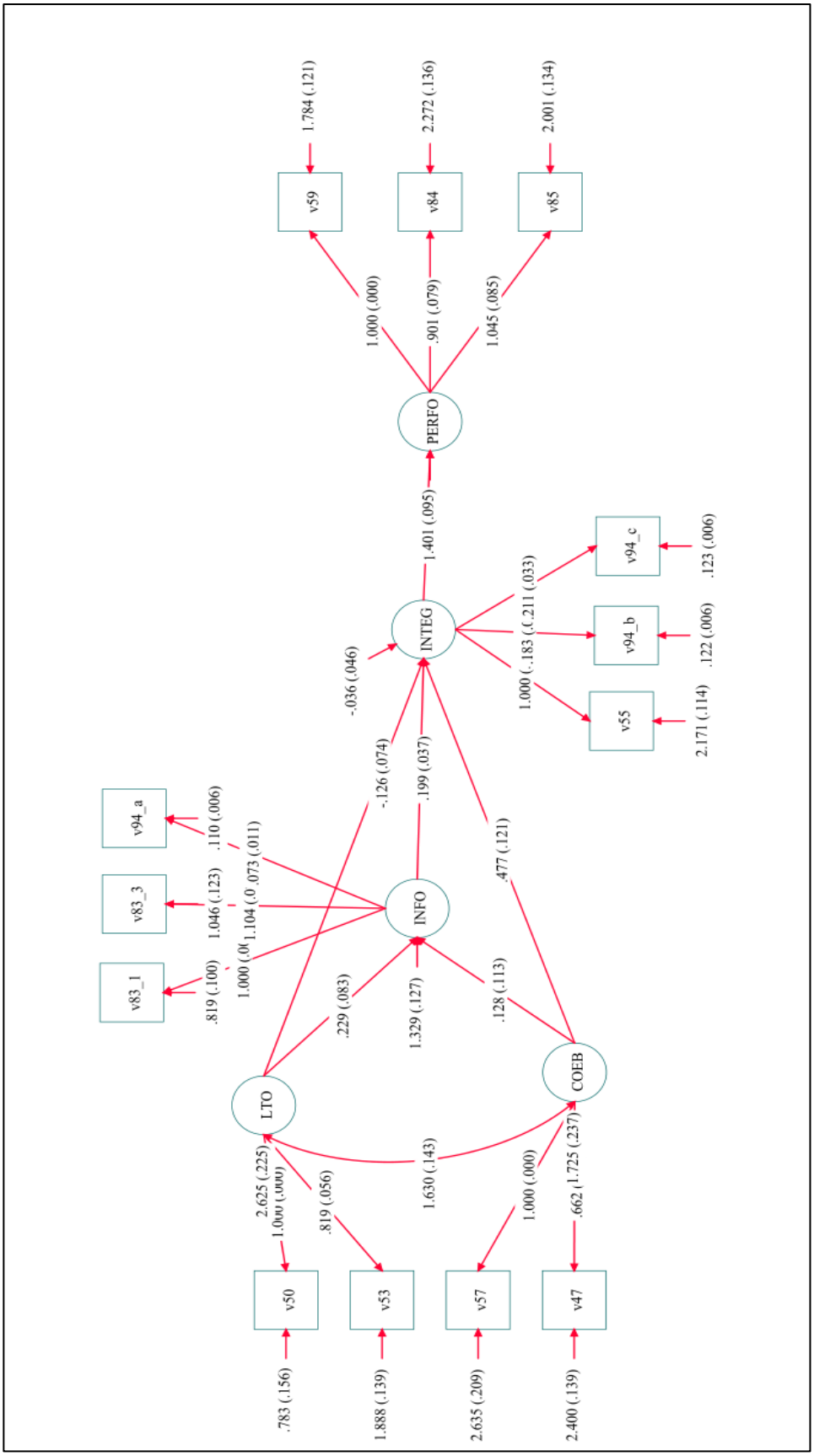

Figure 5.10 Structural Equation Model for Study II

Chapter 6 - Discussion and Managerial Implications

This study investigates the relationships among power, trust and their impact on SCI and performance, based on data collected from automobile companies in India. A holistic model was built that allowed for the simultaneous testing of these relationships by using SEM analysis. India's manufacturing industries are now growing rapidly, and our findings provide significant managerial implications for supply chain practitioners and researchers. In this section, we discuss the major findings and their managerial implications.

6.1 How do relational antecedents such as Power influence Supply Chain Integration?

We found significant main and interaction effects of power and trust on supply chain integration. Based on literature review, we proposed to measure the power construct in two dimensions. Our factor analysis clearly identified these two dimension. Correlational analysis has found that there is a positive correlation between the reward power and long term orientation. It can be easily understood that a supplier seeks a Long term relation when he gets awarded for the efforts he put in raising the performance of the chain. The correlation between the trust and coercive power has been found quite negative. When the focal firm exerts its power through the coercive means, it destroys the trust relationship with its partner. Coercive measures can increase the performance measures in the short term but it has a negative effect on the long term relationship with the firm. Generally, trust may bring potential risks for the firm because it could be exploited by its supplier firms if only few suppliers have key resources. Hence, when a manufacturer depends on its SC partners to pursue its company goals and deems the relationships as strategic assets, it may be more likely to trust the partners. It will be useful to measure

the interactive effect of coercive power and information sharing in the presence of trust. As said above, trust plays a crucial role in relational aspects of the firm. The more trust worthy partner the stronger is relationship which results into the improve performance in the supply chain integration metrics in long term. The findings from the results of the model reveal the mechanism of power-relationship commitment theory in India from an SCM perspective. Our model shows that the use of power by suppliers will significantly influence relationship commitment to the suppliers.

However, suppliers' use of coercive power can only contribute to supplier integration. This finding shows that if companies want to improve supplier integration, they can use either trust or power. Suppliers have limited influence on internal integration because their resources are not scarce and valuable to the internal processes. As such, a moderately higher level of trust suffices to motivate buyers to commit to the relationship. However, supplier integration is different. It needs not only operational information sharing with suppliers, but also process coordination, such as involving suppliers in production and design stages. Those investments are inherently highly relational and cannot be shared by other supply chain partners. As such, trust is very important in motivating buyers to join such a partnership. On the other hand, supplier integration cannot succeed without suppliers' contribution of capability and knowledge. From this perspective, suppliers' resources are vital to the effectiveness and efficiency of supplier integration. These arguments may explain as to why the supplier's use of power, which is based on its resources, is an important factor in supplier integration. In terms of supplier integration, suppliers' use of coercive power is always helpful to enhance buyers' supplier integration, even when buyers do not establish trust with suppliers. This finding provides a significant new insight for companies conducting business in India. Contradictory to western literature suggesting that the use of coercive power will lead to

worse cooperation, our study recommends suppliers to use coercive power to enhance buyers' supplier integration. This contradictory finding might be caused by the cultural differences between India and the United States (Hofstede, 1983, 1984) particularly in terms of power distance, which is much higher in India than in the U.S. In the Indian high power distance culture, on one hand, as in the West, reward power facilitates the instrumental relationship commitment of the partners. On the other hand, it also improves normative relationship commitment because rewards are likely to enforce the power targets' identification of the sources' values.

6.2 Relationship between the attitude, practices and patterns of supply chain integration and buyer supplier relationship

In our research model we distinguish between different types of attitudes. Factor analysis finds two aspects that can be easily labelled and understood. We now discuss the relationships between the different attitudes, patterns and practices. Interestingly, the attitudes Long-term relationship and Cooperative behavior are correlated, but only the second one is related to patterns and practices. The correlation can be understood as a mutual reinforcement process in which striving for a long-term relationship can lead to a positive attitude for cooperative behavior, while it is also well understandable that a more positive attitude in cooperative behavior will positively influence the attitude towards the long-term relationship. Cooperative behavior is directly related to the development of integrative practices and patterns. Integration as practices and Communication Patterns. The three practices are close to the four areas or dimension as distinguished in Van Donk & Van der Vaart (2004): Physical Integration, Planning & Control, Information, and Organisation/Relation.

Cooperative behavior is the integration construct that is positively related to most performance measures when supply complexity is high. To some extent, the dominant role of this construct is surprising. Cooperative behavior is associated with attitudes, the intentional and relational aspects of supply chain integration. However, this finding shows that the wish to make the buyer-suppler relationship work is important, confirming earlier work that emphasizes trust in supply chain integration (Johnston et al., 2004). The interrelationships of the constructs might also point to another possible relationship: once some aspects (represented by our constructs) of supply chain integration are in place and have become beneficial, a positive effect on cooperative behavior might be the result, thus reinforcing the overall relationship performance. Our analysis also shows that structured communication leads to an increase in four cost performance variables: cost-to-serve, production costs, stock levels and stock-outs. One possible explanation for this is related to the characteristics of the high supply complexity environment.

6.3 Effect of Supply Chain Integration on of buyers-suppliers dyad performance

With respect to the performance measurement it is not surprising to suggest that integrative practice and interactive pattern have an effect on delivery time and inventory stock. The results further show that the use of information systems increases the amount of information shared between the supplier and the buyer, and the information shared positively affects the supplier's performance in serving the buyer, which are consistent with previous studies (e.g. Carr and Kaynak 2007; Krause, Handfield, and Tyler 2007; Huo, Zhao, and Zhou 2014). With information systems, the information content is usually shared in real time automatically. When information is automatically shared through established information systems, it is difficult to withhold information and/or deceive the other party, which will enhance transparency and facilitate delivery

processes. The timely sharing of detailed information content also makes the transactions more flexible and responsive to changes in customer requirements and market dynamics.

6.4 Managerial Implication

These findings also provide important managerial implications. Especially, the findings enrich our understanding with regards to how organizations may seek to protect themselves against a potentially aggressive/threatening buyer. Analysis of the interaction effects of trust and power suggest that companies should pay attention to internal integration if they want to achieve a high level of supplier integration, and use power and trust in combination to improve both internal and supplier integration concurrently. Through comparison of marginal means of four power–trust combinations, we found that when the trust level is high, use of power will result in a higher level of internal integration. But, suppliers' use of coercive power cannot improve buyers' internal integration without buyers' trust with suppliers because power cannot influence internal integration directly. Conversely, when buyers do not establish trust with suppliers, suppliers' use of power actually damages internal integration. This finding reveals that, although power has no direct effect on internal integration, it might manifest itself through the interaction with trust. As such, supply chains should build a climate of trust before relying on power. If there is no trust, suppliers should be careful to use power to influence buyers' internal integration. Furthermore, if buyers establish trust with suppliers, they will not see suppliers' requests in a negative light because they believe that such suggested actions will benefit the supply chain as a whole, and will commit to internal integration. Yet, when buyers do not establish trust with suppliers, use of power by suppliers will be viewed as an unfriendly behavior, and so, buyers will not make an effort to integrate their internal functions and processes. The findings suggest that using power and trust to manage relationships can improve supply chain integration. The roles

of power and trust are not independent, and managers should combine these two methods to achieve better integration. Companies adopting trust as a relationship management mechanism can achieve higher internal and supplier integration. From the perspective of the power target, it is noteworthy that although the manufacturer could behave protectively by not establishing inter-firm information systems for the buyer when the buyer is perceived as being exploitative rather than accommodative, our results suggest that these protective behaviours come at a cost and company performance may suffer. Specifically, information systems contribute to the flexibility performance and delivery performance of the manufacturer by increasing information content. As such, eventually the financial performance of the manufacturer will also be harmed by its protective information sharing behaviours in the relationship with the customer. Another side of the coin is that the customer will also be negatively influenced by its abuse of coercive power, as both cost performance and delivery performance (of the manufacturer) actually pertain to the needs and requirements of the buyer.

Chapter 7 - Conclusion

7.1 Thesis Summary

This dissertation extends supply chain research by examining the effect of antecedents of integration such as power, trust and their impact on supply chain performance. For SCM research, most of the previous studies only focused on one aspect of integration and the holistic relationships in them. For example, in SCI area, many studies only investigated internal integration, many other studies only tested external integration, even only one type of external integration. Few studies examined supplier integration and customer integration together and the triadic relationships in the supply chains. In relationship marketing area, most of the previous studies only focused on the customer and seller dyadic relationships, few studies investigated a backward relationship with supplier. Through Study I of this dissertation, we can find that the supplier's use of power has different roles in influencing relationship and trust of the manufacturer. This research also extends Van der Vaart, (2008) study by identifying the different dimension of supply chain integration and their effect on performance through supplier integration. It finds that supplier integration cannot improve supply chain performance directly, but it enhances the buyer supplier relationship and by doing so increase the operational performance of the specific link of that chain which ultimately will improves the financial performance.

This study also provides a comprehensive understanding of the relationships among power, trust, SCI, and performance. The study applies the power and trust research in a different culture to test its generalization property. This study also adds to our understanding that in a place like India where power distance and information asymmetry is very high why gaining trust is much needed for an efficient and integrated supply chain. Firms make their decision very carefully in this regard and trust is the prerequisite

for all these practices. The findings in this study can provide guidelines for the companies in a supply chain to excise power, commit to the relationship, integrate with partners, and achieve high supply chain performance.

7.2 Research Contribution

The current research makes significant contributions to both theories and practices about SCI and relationship management. Theoretically, as an interdisciplinary research, this dissertation combines the knowledge in different areas and puts forward new insights from them. For example, the main concepts adopted in this research are from different areas: SCI, supply chain performance, and company performance are from operations management area, while the uses of power and trust are from the relationship marketing and inter-organizational relationship management areas. This dissertation establishes first a taxonomy of SCI using the empirical methods. Such taxonomy is helpful in the development of the theories in the SCI area. This study also extends Brown et al. s (1995) study by identifying the indirect impact of relationship commitment on performance through supplier integration. This dissertation also examines the relationship-oriented supply chain through confirmation that relationships are important for SCI and SCI measures in India are relationship focused. Practically, this dissertation provides guidelines in the practices of SCI and relationship management for companies in a supply chain. For the manufacturers, this study presents a comprehensive understanding of relationships, integration/cooperation, and performance. This study also provides guidelines for the use of different types of power to influence others and to integrate partners' activities based on relationship commitment.

Furthermore, this study explores a managerial approach to control the transaction costs among the companies in the supply chain, that is, by relationships management from the

perspective of the transaction cost theory. The transaction costs can be reduced by decreasing the opportunistic behaviors of the partners through relationship management and SCI. Suppliers can enhance manufacturers' trust and reduce any non-cooperative behavior by using more reward power and less coercive power. The manufacturers' normative relationship commitment decreases the opportunistic behaviors and facilitates the maintenance and development of the supply chain partnerships. In addition, the high long term commitment improves the level of the integration between manufacturers and suppliers and decreases the opportunistic behaviors to a lower level. Thus, transaction costs can be reduced by using the proper types of power and by enhancing the normative relationship commitment between the firms in the supply chain.

7.3 Limitations and Future Research

Few of the limitation of the study must be mentioned. Firstly, this study has been conducted on automobile industry, though it represents a wide variety of firms, it might be interesting to conduct the study on other industry as well and perform a more in depth comparison. Validating the findings of this study in another country would also be an interesting extension. Therefore, further in depth studies or cross-cultural research can be conducted. Although the proposed framework is holistic, it ignores the other dimensions of supply chains. Examples include sustainability, supply chain risk and operational slack. This study is restricted to only one members' perspective and is not based on viewpoints of the end consumer or any other player. This study uses cross-sectional survey, the mechanism of the evolution of SCI for the companies from a low stage to a higher stage is not revealed in this type of methodology. As such, the future studies can investigate the paths of a company follows to improve its SCI in a longitudinal way. Some of more limitations of this study includes that we have only investigated power, trust, and supply chain performance from the perspective of the

supplier in a supply chain. It will be interesting and important to examine and compare these issues from the perspectives of customers, and manufacturers in a supply chain. Future studies should then identify more drivers for SCI and examine their impacts on SCI. Furthermore, in different industries or areas, the role of relationship commitment may be different and the relative importance of SCI and operational performance in improving financial performance may also be different. Future research can examine the impact of industry and region on the relationships between relationship commitment, SCI, and company performance. We only used the data from India to develop and test the model, employing a combination of established and new scales. Future studies should further develop this construct to provide a deeper understanding of it in India.

Appendices

Questionnaire

हैदराबाद विश्वविद्यालय
University of Hyderabad

Dear Sir/Madam

For the increasing networking in supply chains, the efficient integration is a crucial factor for the success of the company. But which areas of a company should be integrated? How can integration be improved through proven performance? These are the central questions with a study on the ground. We ask you to participate with your expertise in the survey. By completing the questionnaire you will contribute to the networking of business and science.

Points to note:

All questions in this questionnaire refer to a business unit and with respect to its key buyer. A business unit may be an entire company, a division, or a plant, depending on the organization of your company. The respondent to this questionnaire should have overall understanding of supply chain management. The best persons to answer these questions are Logistics Manager and/ or Supply Chain Manager. If you feel that you are not the best person to answer certain questions, you can ask the person who is the most knowledgeable to answer them. Please respond to all questions. If exact figures are not available, please give your best possible estimates.

This questionnaire forms part of a PhD project at the University of Hyderabad examining the impact of SCI on firm performance. The results will be stored anonymously and may be used to inform academic publications and presentations as part of the ongoing research.

Thank you very much for your help and your valuable information.

For any questions please contact Shubhansh Verma at School of Management Studies, University of Hyderabad.

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SECTION A: BUYER RELATIONSHIP

This part of the questionnaire focuses on you and your key buyer. Questions in this section focus on identifying some of the relevant factors that characterize the relationship between you and your key buyer. Please respond to all statements and questions in reference to your key buyer. *Key buyer is defined as the buyer who buys the highest rupee value of your products.*

1. How many buyers do you have in total? _____

2. About how long have you been doing business with your key buyer? _____

3. The following statements are about you and your key buyer concerning *relationship* and *trust*. Please indicate the degree of agreement that you have with each statement.

	Strongly disagree						Strongly Agree
a. Our firm's long-term strategy depends on maintaining a good, healthy relationship with our key buyer.	1	2	3	4	5	6	7
b. We work with our key buyer to improve their quality in the long run.	1	2	3	4	5	6	7
c. The key buyer see our relationship as a long-term alliance.	1	2	3	4	5	6	7
d. When developing our firm's strategy, we consider our key buyer as a large part of the picture.	1	2	3	4	5	6	7
e. In our relationship, key buyer cannot be trusted at times.	1	2	3	4	5	6	7
f. Our key buyer has a high level of integrity.	1	2	3	4	5	6	7
g. We feel that we can trust our key buyer completely.	1	2	3	4	5	6	7
h. My key buyer considers how its decisions/actions affect us.	1	2	3	4	5	6	7
i. Unless we are rewarded for it in some way, we see no reason to expend extra effort to key buyer.	1	2	3	4	5	6	7
j. How hard we work for this key buyer is directly linked to how much we are rewarded.	1	2	3	4	5	6	7
k. When some unexpected situation arises, the parties would rather work out a new deal than to hold each other to the original terms.	1	2	3	4	5	6	7
l. A strong cooperative relationship must be maintained between our firm and our key buyer for us to remain competitive in our industry.	1	2	3	4	5	6	7

4. Please indicate the extent of integration or *information sharing* between your organization and your key buyer in the following areas.

	Not at all						Extensive
a. The establishment of quick ordering system with our key buyer	1	2	3	4	5	6	7

b. Use of Electronic data interchange (EDI) connections with key buyer	1	2	3	4	5	6	7
c. Use of just-in-time purchasing environment	1	2	3	4	5	6	7
d. Our key buyer shares available inventory with us	1	2	3	4	5	6	7
e. Our key buyer shares production plan with us	1	2	3	4	5	6	7
f. Our key buyer shares demand forecast with us	1	2	3	4	5	6	7
g. Our key buyer shares cost, quality and delivery information with us	1	2	3	4	5	6	7

5. The following statements are about you and your major customer concerning *power*. Please indicate the degree of agreement that you have with each statement.

	Strongly disagree						Strongly Agree
a. It was our duty to do as the key buyer requested.	1	2	3	4	5	6	7
b. We had an obligation to do what the key buyer wanted, even though it wasn't a part of the contract.	1	2	3	4	5	6	7
c. The key buyer had the right to expect us to go along with their request.	1	2	3	4	5	6	7
d. We felt that by going along with the key buyer, we would have been favored on some other occasions	1	2	3	4	5	6	7
e. Our key buyer often rewarded us to get our company to go along with their wishes.	1	2	3	4	5	6	7
f. By going along with the key buyer's requests, we avoided some of the problems other suppliers face.	1	2	3	4	5	6	7
g. The key buyer often hinted that they would take certain actions that would reduce our profits if we did not go along with their requests.	1	2	3	4	5	6	7
h. The key buyer might have withdrawn certain needed services from us if we did not go along with them	1	2	3	4	5	6	7
i. If our company did not agree to their suggestions, the key buyer could have made things more difficult for us.	1	2	3	4	5	6	7

6. Please indicate the extent of *interaction patterns* between your organization and your key buyer in the following areas:

	Strongly disagree						Strongly Agree
a. Our key buyer holds a periodic audit of our facilities	1	2	3	4	5	6	7
b. We have frequent face-to-face planning/communication with our key buyer.	1	2	3	4	5	6	7
c. Exchange of information takes place frequently, informally and/or in a timely manner.	1	2	3	4	5	6	7
d. We exchange performance feedback with our key buyer	1	2	3	4	5	6	7
e. Our key buyer provides training on quality requirements.	1	2	3	4	5	6	7

SECTION B: FIRM PERFORMANCE

This part of the questionnaire focuses on the performance of your company or the supply chain.

7. Please indicate the degree to which you agree to the following statements concerning your firm performance.

	Strongly disagree						Strongly Agree
a. My company has achieved a reduction in the cost-to-serve this key buyer	1	2	3	4	5	6	7
b. My company has achieved cost reductions in the transport to this key buyer	1	2	3	4	5	6	7
c. My company has achieved a reduction in the production cost-to-serve this key buyer	1	2	3	4	5	6	7
d. My company has achieved a lead time reduction for this key buyer	1	2	3	4	5	6	7
e. My company serves on the delivery date established	1	2	3	4	5	6	7
f. My company responds to the special requirements of the key buyer	1	2	3	4	5	6	7

SECTION C: COMPETITIVE ENVIRONMENT

8. Please indicate the degree to which the following are a current concern to your company:

	Strongly disagree						Strongly Agree
a. Competition in our industry is cut-throat.	1	2	3	4	5	6	7
b. Anything that one competitor can offer, others can match readily.	1	2	3	4	5	6	7
c. The technology in our industry is changing rapidly.	1	2	3	4	5	6	7
d. Price competition is a hallmark of our industry.	1	2	3	4	5	6	7
e. Lack of availability of suitable labor.	1	2	3	4	5	6	7

9. How many major competitors do you face for your primary product/services?

( ) 0 to 1 ( ) 2 to 5 ( ) 6 to 10 ( ) 11 to 20

SECTION D: COMPANY PROFILE

10. Name of company_____

11. Address _____

12. Website _____

13. Name of respondent_____

14. Job title/ position: _____ Years in this position _____

15. Telephone/ Mobile: _____

16. Number of years your company has been operating in this business_____

17. What is the legal status of your company- Private/ Public

18. The total number of employees of your company is:

( ) < 50 ( ) 50-99 ( ) 100-199

( ) >200 or more

END OF THE QUESTIONNAIRE

Thank You for Your Co-operation

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