A Dissertation

entitled

Challenges in the Global Supply Chain: Exploitation versus Exploration Strategy

by

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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

The Doctor of Philosophy in Manufacturing Management and Engineering

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May 2010

An abstract of

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Supply chain environments are changing at an accelerating pace throughout the globe, creating significant challenges for firms in maintaining a competitive advantage. To sustain competitiveness, firms should embrace these challenges arising out of globalization and be able to manage the global supply chain effectively. This research postulates that selection of supply chain design plays an important role in reducing the intensity of challenges imposed by global challenges such as technology uncertainty, internationalization, intellectual property protection and economic uncertainty. The research also studies how these challenges impact supply chain designs, i.e., Lean and Responsive. This research examines the moderating effects of cultural intelligence and type of product on the relationship between perceived global challenges and the choice of supply chain designs, i.e., lean and responsive. It also studies the relationship between lean supply chain design and operational collaboration as well as responsive supply chain

design and strategic collaboration. This study is supported by: (1) Exploitation and exploration Theory and (2) Theory of Rational search.

The research methodology used to support and validate results of this study included pre-test and Q-sort analysis and a large scale survey that yielded 204 usable responses from supply chain professionals covering a wide variety of industries. A comprehensive research framework was tested using structural equation modeling. Findings from this research confirm that firms embrace global challenges by selecting a specific type of supply chain design and indicate that the relationship between global challenges and supply chain design is mediated by the type of product, and cultural intelligence. The findings also confirm that firms need to prioritize and differentiate possible contributions from different collaboration patterns, and are expected to be a useful resource for researchers and practitioners in the global supply chain arena.

ACKNOWLEDGEMENTS

I am deeply grateful to many people for the support that they gave me throughout this dissertation process. I am also very grateful for the contributions that they made.

First, I would like to thank Dr. Ragu-Nathan and Dr. Tarafdar, co-chairs of my dissertation, for the advice that they gave me throughout my dissertation process. Their timely feedback and valuable inputs greatly enhanced the quality of this research. I also deeply thank the committee members, Dr. Thoung Le and Dr. Sujata Shetty. I am fortunate to have them in my dissertation committee.

I am grateful to be in a graduate school that has faculty members that care about their students. I would like to express my special appreciation to Dr. Subba Rao and Dr. Arthur Smith for their unstinted encouragement and the personal advice they gave me throughout this dissertation journey. In addition, I would like to thank the Director and Assistant Director of the Ph.D program, Dr. Mark Vonderembse and Dr. Hassan HassabElnalby for the support that they gave me. I also want to extend my gratitude to Dr. Pope (and Sally), Dr. Hong, Dr. Lim, Dr. Doll, Dr. Koh and Dr. Udayan,

I would like to express my special appreciation to my good friends, Dr. Bharathi Rao and Seetha Devi. It means a lot to have such wonderful friends who supported me in this process. Their encouragement meant more than words can say. I would also like to

thank the new PhD friends that I have made in the program, Sufian Qrunfleh, Melvin Williams, Erica Marsillac, Oahn Tran, and David Dobrzykowski.

I also want to thank my sister‘s family, Shiela and Azeem, and my beloved parents. Finally, I wish to thank my two sons, Farris and Fahmi for always being very understanding of my busy schedule. Farris never stopped believing in me, and Fahmi always made me feel good by telling me that I am a wonderful mom. Their genuine love and continuous support not only inspired me in many ways but also made me feel that this journey was truly rewarding

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CHAPTER 1

INTRODUCTION

Manufacturing industry has realized that the act of engaging in global competition is a great opportunity to grow in global markets (Bianchi & Ostale, 2006). Organizations realize that global opportunities, global competition and global challenges are interrelated and that they enforce an increasingly symbiotic world. With this enhanced competition come the associated challenges, and therefore the imperatives to manage these in order to ensure the firm‘s survival. Failure to manage global challenges and global competition effectively could lead to negative consequences in the firm‘s performance (Gunasekaran, Lai & Cheng, 2008).

Competition has not just shifted from a small national market to a large global market but also from inter-firms to inter-supply chains (Vonderembse, Uppal, Huang & Dismukes, 2006). While the challenges arising out of globalization could be daunting within an inter-firm context, they could be even more so amongst a competing inter-supply chain. This competition refers to the number and diversity of competing global supply chains with which the firms must interact in its competitive efforts (Mentzer, Myers & Stank, 2007). Furthermore, it is mirrored by the trends in the global market and

is characterized by expanding product variety, short product life-cycle, increasing customer demand and continuous advancement in technology (Lee, 2002). Firms that are in this environment have to act fast in developing strategies to overcome global supply chain competition and challenges.

As the world becomes increasingly ‗flat', and the inter –connectedness of economies heightens along with opening of economic borders of several hitherto closed economies, global supply chains of the 21st century are characterized by unexpected hurdles, uncertain returns and unpredictable outcomes. Needless to say, these situations have increased the intensity and complexity of the global competition and have forced firms to re-evaluate their actions and strategies in choosing a certain type of global supply chain design over the other. The key to the success of organizations depends on the actions taken, or the strategies developed by them. These actions and strategies are typically expected to deal with two aspects.

First, these strategies should enable the organization to embrace global challenges, and simultaneously manage the global supply chain effectively. While at a broad level, firms tend to manage the competition arising out of the global supply chain by means of reduced cost, increased quality, increased customer responsiveness, increased flexibility, and increased agility, it is seen that the firms' responses to these challenges depend on two critical factors: 1) the cultural consciousness of the firm, 2) the type of product the organization produces.

The cultural consciousness of the firm plays a predominant part in determining the way firms react to competition, and the strategies they develop in order to meet it. ‗Cultural consciousness' forms the underlying ingredient that defines the way business is

performed when firms that operate globally are forced to interact and accept suppliers/customers from different cultural backgrounds. These cultural backgrounds are driven by subjective and objective components (Triandis & Vassiliou, 1972; Leung & Ang, 2008; Ang, Van Dyne, Koh, Ng & Templar, 2007). While the subjective component includes the values and beliefs of the members from different societies, the objective component of a culture is represented by legal, economic, political, religious, and educational systems in any particular location. Firms that have substantial background knowledge of these two components should be able to manage global challenges better (Ang et al., 2007) They will be more able to work with both supply chain partners and other entities within the market (Griffith and Myers, 2005)

The second factor that determines the way in which a firm builds strategies to handle global competition is the "type of product" that it produces. The need to operate in an international context dictates that the firms produce certain types of products that are conducive to being shipped across wide geographies and across national boundaries. In producing these products, the firms are also aiming to reduce costs, increase efficiency, increase flexibility, and to be more responsive to customers (Gunasekaran & Kobu, 2007; Ang et al., 2007). The type of product produced (standard or innovative) should be matched with the design of the global supply chain (lean or responsive). Firms that are able to match these factors (product type and supply chain design) perfectly are believed to be able to overcome the global supply chain challenges, and the competition, promptly and effectively.

Increasingly, firms are exploring new ways to improve their performance and to achieve their goals by changing their supply chain design strategy (Gunasekaran, Patel &

McGaughey, 2004). As the competition intensifies, and new players are added on a continuous basis, the continuum of supply chain designs & strategies can impact firms' performance differently. For example, firms that are looking for higher performance in the global market through cost efficiency should produce standardized products, operate at the location that offers the lowest cost and use a global supply chain design that aims at efficiency; while on the contrary, firms that seek to be innovative should use the responsive supply chain design. The type of the global supply chain design that targets for cost efficiency is the lean supply chain design (Gunasekaran, Lai and Cheng 2008).

A firm that decides to use the lean supply chain design is built on the concept of _Exploitation'. The lean supply chain design and the exploitation concept have the same characteristics of efficiency, low product variances, predictable returns, incremental improvement, and short-term pay-off (Tokman Richey, Marina, & Weaver, 2007). The operational activities pays attention to efficiency and product improvement, and lean supply chain also pays attention to the same issue. Hence, Exploitation and lean activities require operational collaboration and result in operational performance of the global supply chain. Thus, this research suggests that the lean supply chain design utilizes an exploitation concept.

On the other hand, the responsive supply chain design tends to result in high product variances, unpredictable returns, radical innovations, and long-term pay off (Tokman et al., 2007). These characteristics reflect strategic activities of the global supply chain design that favor active exploration of process and product development. Exploration concept and the responsive supply chain are utilizing the same concept.

Exploration strategy also requires strategic collaboration and results in strategic performance of the global supply chain. Therefore, the responsive supply chain design and its strategic activities have the same characteristics as exploration strategy. Thus, this research suggests that the responsive supply chain design fits under the exploration strategy.

To date, most of the research regarding the design of the global supply chain provides a general perspective and is not specific to the lean or the responsive supply chain design. This general perspective fails to provide any specific details regarding how firms should react to global challenges in terms of the selection of the specific supply chain design. Furthermore, it does not provide enough evidence on the relationship between products, designs, and types of collaboration involved. In addition, it is also important to know what types of collaboration are associated with specific designs, and how it impacts the organization‘s performance.

This situation leads to several very important imperatives pertaining to the design of the global supply chain:

1) How do firms respond to global challenges such as technology uncertainty, market internationalization, economic and uncertainty, and intellectual property protection in their design of supply chains?

2) How does cultural intelligence influence the relationship between global challenges and the lean supply chain design?

3) How does cultural intelligence influence the relationship between global challenges and the responsive supply chain design?

4) How do product types influence the strength of the relationship between global challenges and the design of the global supply chain?

5) How does the lean supply chain design influence operational collaboration?

6) How does the responsive supply chain design influence strategic collaboration?

7) How does operational collaboration influence the operational supply chain performance?

8) How does strategic collaboration influence the strategic supply chain performance?

9) How does the operational supply chain performance influence the firm‘s operational performance?

10) How does the strategic supply chain performance influence the firm‘s strategic performance?

The purpose of this research is to identify global challenges, and to assess how they impact the selection of the design of the global supply chain. In addition, this research will explore the relationships among the firm‘s: 1) global challenges (technology uncertainty, market internationalization, intellectual property protection, economic uncertainty), 2) cultural intelligence (managerial, structural and competitive cultural intelligence), 3) the type of product (standardized and innovative), 4) lean supply chain design, 5) responsive supply chain design, 6) operational collaboration (current commitment and incremental learning), 7) strategic collaboration (continuous learning and experiential learning), 8) operational supply chain performance, 9) strategic supply chain performance and 10) operational organizational performance, and 11) strategic organizational performance.

The model developed for this research is mainly supported by the exploitation and exploration theories (March, 1991). While exploitation and lean supply chain design operate on a shared premise and have similar characteristics, exploration and the responsive supply chain design share similar characteristics. This research postulates that firms that are utilizing the lean supply chain design are using the exploitation concept, where as firms that are utilizing the responsive supply chain design are essentially utilizing exploration concept. We therefore expect that firms using primarily a lean supply chain design would be associated with exploitation related effects such as incremental learning, cost related efficiencies and operational benefits. Similarly firms using primarily a responsive supply chain design would be associated with exploration related effects such as experimental learning, new product development, innovation and strategic benefits. The model for this research was built based on these supportive concepts. Chapter 2 explains the details of the main and supportive theories for this research.

CHAPTER 2

LITERATURE REVIEW

An extensive literature survey to understand the existing theoretical basis, and the view points of scholars, was conducted as a preparation to this study. The purpose of this chapter is to discuss the existing literature that support the proposed constructs and sub – constructs of this study and will consist of the following:

2.1 Definitions and Benefits of Globalization

2.2 Definition of Global supply chain

2.3 Definitions of Constructs and sub-constructs used in the study

2.1 Definition and Benefits of Globalization

Globalization is defined as the worldwide involvement of technological, economic, political and cultural exchanges (Castells, 2000) and in the context of supply chain is viewed as a network of contemporaneous events which requires a systematic strategy of supply chain management. Globalization increases interconnectedness among global organizations (Capineri, 2004) resulting in multi fold benefits to firms involved. First, firms that are exposed to the global market have more advantages in terms of market share compared to organizations that operate at a national level (Douglas, and

Samuel, 1995; Cavisgil and Zho, 1994; Levitt, 1983; Eric Beinhocker, Ian Davis, and Lenny Mendonca, 2009; Martinez-Gomez, Baviera-Puig, Amparo and Mas-Verdu, 2010). Second, globalization also exposes firms to an abundance of labor competencies, giving advantages for firms to select the most skilled labor force at any location. Third, manufacturing industry in developing countries at the global locations is growing; there by resulting in arbitrages of cost and labor compared to developed countries (Eric Beinhocker et. al, 2009). Fourth, the exposure to globalization increases firms‘ ability to anticipate and react to quick demand changes through market study as firms that operate in a global market are directly exposed to a large market compared to the ones that operate only at national levels (Martinez-Gomez et. al., 2010).

2.2 Global supply chain: Definition and Literature Review

Supply chain is defined as the coordination of resources and the optimization of activities across the value chain to obtain competitive advantage (Gunasekaran et al., 2008) and is a set of value-adding activities that connects a firm‘s suppliers to the firm‘s customers. Near eradication of national trade boundaries and liberalization of trade activities across the globe have created an auspicious venue for the emergence of a supply chain on a global scale. Economies that have successfully made use of operating at global level have emerged as global economic leaders. For example, Japanese firms having long realized the importance of global supply chain are amongst the best and successful market leaders.

The definition of global supply chain is that it is an international network of manufacturers, wholesalers, distributors, and retailers who turn raw material into finished

goods and services and are responsible for the successful delivery of goods/services to end customers. Careful examination of the recent literature related to the global supply chain suggests that a large-scale integrative research regarding challenges in the global supply chain, design of the global supply chain, collaboration in the global supply chain, and performance of the global supply chain is scarce (Manuj & Metnzer, 2008; Rudberg & West, 2008; Ghemawat & Hout, 2008; Landry, 2008). There is even less literature focusing on how firms react to challenges in the global supply chain and how these challenges influence decisions on planning and implementing supply chain design strategies, and how these strategies influence supply chain performance.

In view of scarce or non-existent empirical research on the design of supply chain, it was felt that it is extremely important to empirically investigate how firms manage the design of the global supply chain. Firms that are able to manage global supply chain successfully have the potential to gain financial benefits from globalization (McWilliams, 2001; Miller & De Maria, 2008) and other benefits such as to increase international network (Laanti et al., 2007), to increase market share (Alexander, Flynn and Linkins, 2005), to increase operational efficiency (Whitney and Wilson, 2007), and to extend the firms‘ brand-name (Chow, Tang and Fu, 2007; Lubliner, 1993). All these benefits are added to the firms‘ globalization experience, which leads to the enrichment of the firm‘s tacit knowledge (Amstrong and Anis, 2008); this tacit knowledge could help firms to become more innovative particularly in translating and understanding customers‘ needs (Mascitelli, 2007; Cavusgil, Calantone & Yushan, 2003). Knowledge and experience from globalization are the valuable inputs to firms to perform better in the future (Myers & Mee-Shew, 2008; Gunasekaran & Ngai, 2007; Hult et al., 2002; 2003). However, these

inputs need to be translated into specific strategies that fit with customers‘ needs (Trent & Monczka, 2003).

Understanding customers‘ needs is a prerequisite step in developing effective global supply chain design strategies (Christopher, Peck and Towill, 2006). Firms should be able to translate these needs into specific strategies that not only satisfy short-term needs but also lead to a long term profitable return. This research proposes a framework that helps firms to apply a specific global supply chain design that allows them to enjoy benefits of global supply chain, improved performance and increased ability to tackle challenges imposed by a global supply chain. Figure 3.1 in chapter 3 shows the overall integrative framework of this study, explains the underlying rationale of this research and tracks the inter-relationships amongst various constituent parts of this research such as: challenges in the global supply chain, the design of the global supply chain, the collaboration of the global supply chain, performance of the global supply chain, and performance of the firm. Cultural intelligence is seen as a moderating factor in the relationship between challenges of a global supply chain and the design of the global supply chain.

The first construct in the framework, i.e., challenges in the global supply chain, deals with firms‘ actions and responses to the challenges of global supply chain and how these vary depending on the culture, goal and mission of the concerned firm. While challenges in a global supply chain are myriad and relate to issues or environment of the global supply chain, these will need to be juxtaposed in terms of firms‘ goals and mission as well as type of product being produced or service being delivered. Hence, Firm‘s

choice in choosing a specific supply chain design will be a by-product of triple considerations: challenges of supply chain, type of product/service and firm‘s goals and mission.

The second construct is cultural intelligence and it influences the relationship between the first and third constructs, i.e., challenges and design of the global supply chain. Cultural intelligence is the ability of an organization to understand the cultural nuances that influence the behavioral pattern of individuals that form constituent parts of supply chain. While a wealth of research is available on how culture influences the behavior of individuals, that in turn is instrumental in an organization‘s collective decisions, research on the impact of cultural intelligence on global supply chain performance is scare. This research postulates that: firm‘s with strong understanding of cultural issues will manage global challenges better, and therefore enjoy the benefits of better financial and operational performance. On the other hand, firm‘s inability to understand the underlying cultural aspects within the context of a global supply chain will result in conflict of interest and misinterpretation of valuable information (Vadosek, 2005; Skinner, 1964) leading to a sub-optimal organizational performance.

The third construct is the design of the global supply chain and is followed by the collaboration of the global supply chain; these should to be aligned with the type of the product produced. This research postulates that a better alignment between the type design and collaboration leads to greater performance of the global supply chain and on the other hand, a mis-alignment would place firms on the path of potential losses in investment. For example if a firm‘s mission is to produce a product that is innovative, then it should select a supply chain design that accommodates this mission and the type

of collaboration should fit with the characteristics of the supply chain design so selected. If these two elements (the type of design and collaboration) fit well, complexity in the management of the global supply chain can be reduced and product execution time is expected to be faster, which, in turn will accelerate performance of the overall global supply chain (Vachon and Klassen, 2002). In summary, there should be a match amongst firm‘s goals and mission, global supply chain design and the type of global supply chain collaboration. A mismatch in any of these areas will delay product execution and eventually could reduce a firm‘s performance.

2.3 Literature Review of Construct and sub-constructs

While the previous section dealt with the definition of Global Supply Chain, the remaining sections of this chapter will discuss the definition and literature review of each construct and sub-construct that are proposed as part of this study.

2.3.1 Global Supply Chain Challenges

Firms perceived globalization as a bridge to achieve their short and long term goal and also as a ticket to expand their market share (Burnham, 1994; Badri et al., 1995; Chase and Aquilano, 1995; Dilworth, 1996; Badri, 1996; Russell and Taylor, 1998; Dorneir et al., 1998; Atthirawong and MacCarthy, 2000). Firms are aware that globalization comes with its own challenges, followed by intense competition that characterizes global markets. However, it is seen that most firms in the global market are paying less attention to tackling global challenges, instead focusing more attention on their strategic or operational goals (Mckinsey, 2008). Even though global challenges can add to a firm‘s opportunity, operating in a global market can be very risky, if there is

scant understanding of complexities arising out of global supply chain. Typically these challenges are related to each other in a complex pattern with one risk or opportunity leading to another (Manuj and Mentzer, 2008). Hence it is important for organizations to know the type of global challenges they face and it is equally or more critical to know how to handle them.

McKinsey‘s survey of 2008 identified seven top challenges in the global supply chain as follows: greater complexity of products and services, higher energy prices, increasing financial volatility , increasing global labor markets and rising wage rates, shifting industrial structure forms, adoption on increasingly scientific data-driven techniques, and exposure to different regulatory requirements in different geographic locations.

Each geographic location of supply chain management deals with issues that are related to the differences in the cultural norms, languages, traditional preferences, business infrastructures, currencies, legal environment, business structures and economic conditions (Dornier, 1998). In a Delphi study on management decision in choosing the international locations (MacCarthy and Atthirawong, 2003), authors found that there are five major factors that may influence the selection of international location; cost, infrastructure, labor characteristics, government and political factors, and economic factors. In addition to these five factors, the study also found ten sub-factors; quality of labor force, existence of model of transportation, availability of labor force, quality and reliability modes of transportation, quality and availability of utilities, wage rates, motivation of workers, telecommunication systems, record of government stability, and

industrial relations laws. Other extended sub-factors include protection of patents, availability of management resources, specific skills and systems and integration costs.

Some researchers indicate that global challenges are related to currencies fluctuation, political and cultural uncertainty, product complexity, economy uncertainty, uncertain costs, and uncertain customers demand (Manuj and Mentzer, 2008; MacCarthy and Atthirawong, 2003; Ueltschy, Ueltschy and Fachinelli , 2007; Meixell and Gargeya, 2005; Burnham,1994; Badri et al., 1995; Chase and Aquilano, 1995; Dilworth, 1996; Badri, 1996). While, none of these researchers study the relationship between global challenges and supply chain design, this study defines perceived global challenges as unexpected and demanding situations of the global supply chains including: technology uncertainty, market internationalization, intellectual property security, and economy uncertainty. The next sub-section discusses each sub-construct of perceived global challenges.

Table 2.3.1 Perceived Global Challenges construct and sub-constructs definition and literature support.

Construct		Definition	
Perceived Global challenges		Unexpected and demanding situations of the global supply chain.	Davidson, 1989; Cohen, 1989; Trent & Monczka (2003); Hammami et al., 2008
	Technology Uncertainty	The degree to which the technology change and development is unpredictable in the context of global supply chain.	Chen and Paulraj, 2004; Hoetker, 2005; Oh and Rhee, 2008; Stock and Tatikonda, 2008
	Market Internationalization	The degree to which the markets are composed of international competitors and customers.	Nahm et al., 2006; Calontone et al., 2000; Doll and Vonderembse,1991; Skinner, 1985

	Economic Uncertainty	Unpredictable or a rapid change of economic policy and procedure.	(Garret, 1998).
	Intellectual Property Protection	The rules and regulations that govern the exchange of valuable information with suppliers.	Wang, 2004; Choi et al., 2004; Himma, 2004

2.3.1.1 Technology Uncertainty

Technology uncertainty is defined as the degree to which the technology changes are unpredictable in the context of global supply chain. The development of technology could provide firms abundant opportunities and on the other hand, could expose firms to numerous risks. For example, unforeseen technology changes could cause fluctuation in customers demand and influence relationship among supply chains members (Chen and Paulraj, 2004; Hoetker, 2005; Oh and Rhee, 2008), leading to an increased difficulty in the management in the context of global supply chain.

At the same time, technological developments facilitate firms to produce better product or to achieve better communication. How people interact with technology in their ongoing practices enables the structure of the system which shapes the emergent and situated use of technology (Orlikowski, 1992; 2000). Intense and frequent communication among supply chain members increases information sharing and decreases unpredictability of customer‘s demand. Stock and Tatikonda (2008) indicate higher firm‘s performance could be achieved if the technology applied satisfies inter-organizational needs.

Paulraj and Chen (2007) indicate that technology has positive and significant impacts on both operational and strategic level of supplier-buyer relationship. Ragatz, Handfield and Petersen (2002), found out that technology uncertainty has a negative impact on cost but no direct effects on quality or cycle time. There is less evidence in the early literature on how technology uncertainty affects the global supply chain design strategy. This research is interested to find out how firms react to technology uncertainty in terms of the selection for supply chain design.

2.3.1.2 Market Internalization

Market internationalization refers to the degree to which markets are composed of international competitors and customers (Nahm, 2006; Doll and Vonderembse, 1991; Ghosal, 2002; Skinner. 1985). Market internationalization is known as one of the ways to increase a firm‘s market share through capturing different segments of customers, cutting across geographies and national boundaries. Firms that enter international markets are not only exposed to new customer segments but also to new competitors. Market internationalization intensifies challenges by shifting the level of competition from an inter-firm to inter –supply chain dimensions. At a supply chain level, firms are not only competing with one organization but with a set of firms, which are bound by an over all business network. Stronger ties within the network lead to higher supply chain performance and weak network ties make supply chain vulnerable to entry by rivals (Granovetter, 2005).

Even though internationalization is perceived as a factor that leads to greater firm performance, not all market internationalization efforts are successful. Bianchi and Ostale

(2006), conducted case-studies analysis and found that one of the reasons for the internationalization failures is related to a lack of close relationships between buyers, suppliers and customers. This situation happened particularly when executives ignored the importance of the global supply chain connection and did not embed themselves in a business network (Bianchi and Ostale, 2006).

To date, research on how market internationalization influences the global supply chain, particularly how it affects supply chain design selection has not been empirically tested yet. Specifically earlier research has not addressed the issue of internationalization in regards to a firm‘s selection of operational versus strategic supply chain design This study perceives market internationalization as one of the challenges in the global supply chain, and intends to explore how challenges effect selection of a specific global supply chain design.

2.3.1.3 Intellectual Property Protection

The risk of doing business in the global supply chain is increasingly growing. Due to a growing number of inter linkages amongst firms, protection of firm‘s intellectual property assumes paramount importance (Manuj and Mentzer, 2008). It is interesting to observe how security and protection of intellectual property is different within the context of developed and not so developed countries (Wang, 2004). Wang conducted an intellectual property protection study in China; her result indicates that awareness of the need to protect intellectual properties is sufficient at the organization level, but enforcement for such protection is not fully effective at the national level. Awareness without enforcement is not action, and therefore, without necessary action - the security

of the intellectual property is not fully protected by legal regulations imposed by national governments in developing countries.

There are two categories of intellectual property; industrial property, which includes patent‘s protection, trademarks, industrial designs, and geographic indications of source; and copyright, which includes literary and artistic works (Wang, 2004). From the global supply chain perspective, intellectual property such as patents and trade secrets are the key organizational resources that are the vehicles of creating sustainable competitive advantage (Choi et al., 2004) and hence protection. The idea of intellectual protection in the supply chain depends on the code of ethics (Himma, 2004) of a particular nation. Even though the notion of intellectual property is important there is not much research explaining how organizations perceive this issue. There are many conceptual papers and mathematical models (Crawford and Strasser, 2008; Morgon and Cohn-Sfetcu, 2008; Kiema, 2008) of how firms should protect their intellectual property in the global market. However, there is less empirical research on how firms perceived intellectual property, therefore this study classifies protection of intellectual property based on how confident firms feel about their intellectual property management.

2.3.1.4 Economic Uncertainty

Economic uncertainty can be defined as unpredictable or rapid changes in policies and procedures of governments, for example: restrictions on imports and exports of certain items. It could also result from an increasingly inter-dependent commercial world, for example – failure of U.S Banking system might have a considerable ripper effects on the financial systems of the world and could easily precipitate a global

economic melt down. By its very nature, a global supply chain is extremely susceptible to changes and economic uncertainties. Therefore, a stable economic situation with a stable political system has a favorable impact on global supply chain, on the other hand political turbulence could lead to a change in the off-shore location‘s economic situation, often uncontrollable by firms. Within the context of global supply chain, it is observed that many geographical destinations are more attractive than others due to friendly governments offering incentives to foreign investors. Many governments are vying to provide incentives in terms of tax breaks, large plots of land in industrial hubs etc in exchange for foreign direct investments as these investments are believed to boost economic situation and create jobs for a particular country. Businesses look towards establishing their centers in areas where peaceful conduct of business is possible, educated and motivated workforce is abundantly available and a viable government with laws and regulations exists. On the other hand, countries with least governance and often war ridden do not encourage economic activities. Thus, most off-shore governments are looking forward to expanding their incoming foreign direct investment, by offering investors attractive investment incentives, this is particularly so in the case of corporatist political economies where the potential costs of interventionist government are mitigated by coordination among business, government, and labor (Garret, 1998).

2.3.2 Cultural Intelligence

Culture is a manner of collective thinking, feeling and acting (Hofstede,1991) of a population and refers to cumulative deposits of knowledge, experience, beliefs, values, and attitudes of people over the course of generations (Li & Karakowsky , 2001). The concept of culture also refers to a programmed mindset of an individual (Hofstede, 1991).

Cultural awareness is important in the supply chain context, as global supply chains are typically sewn together with people from multiple cultures co-existing with one another.

Operating business, especially in a global, multi cultural environment means that compromises and business understandings have to be reached amongst constituent parts of global supply chain all the time. Such understanding and compromise is easily facilitated when organizations have higher collective cultural intelligence. Ignoring cultural differences could lead to negative effects on business relations (Daniels, Radebaugh and Sullivan 2002; Johnson, Lenartowicz and Apud 2006). Doing business in the global supply chain typically involves collaboration of two or more firms from different cultural backgrounds; hence it is important to understand the role of culture in decision making. By nature, global supply chain activities combine both national and organizational culture through integration and partnership, dealing with firms that have different cultures is a difficult task; not all managers are comfortable with it (Tushman and O'Reilly, 1996).

In order to understand cultural differences, firms need to take action on educating their managers through cultural trainings which in turn adds to the collective cultural intelligence of the firm. The concept of cultural intelligence as a theory within management and organizational psychology (Ang et al., 2007) is not new. This theory implies that understanding the impact of an individual's cultural background on his behavior is essential for effective business management and identifies three categories of cultural intelligence; managerial, structural and competitive.

Cultural intelligence refers to the ability of the firm to function effectively in the culturally diverse environment imposed by global supply chain (Earley, 2002; Earley &

Ang, 2003; Thomas & Inkson, 2005; Earley &Mosakowski, 2004; Earley & Peterson, 2004). Individuals working in a diverse cultural setting should consider the impact of cultural attributes before taking any major decision (Triandis & Vassiliou, 1972).

Table 2.3.2 Cultural intelligence construct, sub-constructs definitions and literature review.

Construct		Definition	
Cultural Intelligence		The ability of the firm to function effectively in the culturally diverse environment of the global supply chain	Earley, 2002; Earley & Ang, 2003; Thomas & Inkson, 2005; Earley &Mosakowski, 2004; Earley & Peterson, 2004
	Managerial cultural intelligence	The ability of the top management to understand the values and beliefs in the diverse cultural settings.	Thomas & Inkson, 2005; Earley &Mosakowski, 2004; Earley & Peterson, 2004; Earley, Ang & Tan, 2006
	Structural cultural intelligence	The ability of the firm to acknowledge and understand the roles, responsibilities and expectation of business partners in the global supply chain	Earley, Ang & Tan, 2006; Ang et al., 2007; Earley &Mosakowski, 2004
	Competitive cultural intelligence	The ability of the firm to maintain the organization‘s reputation in diverse cultural settings.	Ang et al., 2007; Earley, Ang & Tan, 2006

2.3.2.1 Managerial Cultural Intelligence

Managerial cultural intelligence refers to the ability of the top management to understand the values and beliefs of doing business in diverse cultural settings (Ang et al., 2007;2008; Carpenter, Sanders, & Gregersen, 2001). The quality of the relationship between supplier and buyers depends on the level of understanding between two separate firms and top management support has a strong impact on this relationship‘s

performance, both from short term operational as well as long term strategic perspectives (Kearns, 2006). From the perspective of global supply chain relationship, top managers are not only expected to understand the firms‘ culture but also to understand the external values and beliefs belonging to diverse cultural the backgrounds of all global locations (Ang et al., 2008) with which his/her organization is engaged in.

Better understanding of external values and beliefs shows that firms are interested and committed to fostering long standing business relationships. This kind of a positive relationship between firms is derived from the level of commitment - the higher the level of commitment, the closer the relationship (Levinson, 1988; Petty, Brinol, Tormala, 2007). Most firms are known as being committed to the partner or alliances, but not all firms understand each other cultural background.

Cultural intelligence elements that are important in the context of top management are; meta-cognitive, cognitive, motivational and behavioral (Ang et al., 2007). The meta-cognitive element of top management is defined as knowledge and experience that they have about their own cognitive process and how conscious they are of a particular cultural situation. The higher the meta-cognitive ability of a manager, the better the communication between firms (Ang et al., 2007; Alba & Hutchinson, 2000; Lee, 2004; Schwarz, 2004; Wright, 2002) Cognitive element refers to the process of thought and the application of knowledge (Wright. 1973) and within an a cultural context, cognitive element applies to knowledge of norms, beliefs and practices of a particular group (Ang et al., 2007).

The motivational element deals with how thoughts and actions are put together to accomplish tasks. Individuals that have high motivational element tend to possess higher

self-efficacy (Bandura, 1988) and higher an individual‘s self efficacy, the more confident the individual is; this situation leads to a comfortable working environment (Bandura, 2002). Behavioral cultural intelligence refers to verbal and non-verbal actions when dealing with different cultures. Positive behavior is part of social support that could enhance psychosocial functioning (Bandura, 2002). Every organization has its own culture, but it is important for firms to understand behavioral differences that many exist between cultures.

2.3.2.2 Structural Cultural Intelligence

Structural cultural intelligence refers to the way firms organize and develop routines (Ang et al., 2007) and involves the way in which organizations formulate strategy, implement strategy and in general the overall decision making process (Ang et al., 2007). Structural cultural intelligence is highly dependent on the managers abilities to understand their roles, expectations and responsibilities of their partners particularly during implementation of organization strategy. Structural cultural intelligence has several dimensions (Hofstede, 1991) such as: power distance, uncertainty avoidance, masculinity/ femininity, and individualism/collectivism, and long-term orientation. For example, the decision making in Eastern culture relies more on consensus, while in Western culture the individual is empowered.

2.3.2.3 Competitive Cultural Intelligence

Competitive cultural intelligence refers to the ability of a firm to maintain the organization‘s reputation in diverse cultural settings (Ang et al., 2007) and is related to how firms position themselves among rivals. Competitiveness not only relies on material

or technology, but is also often related to intangible elements (Smaiziene, 2008), such as corporate reputation.

2.3.3 Product Type

Different types of product require different types of supply chain design and this study matches types of product base to the types of supply chain that accommodates the essential nature of these products such as standardized products or innovative products.

Table 2.3.3 Type of product construct, sub-constructs definitions and literature review

Construct		Definition	
Type of product		Characteristics of the product based on its life cycle, demand and design.	Vonderembse et al., 2006; Shah and ward, 2003; Mason-Jones et al., 2000
	Standardized Product	Is defined as products that have stable processes and design characteristics, long life cycle and the demand for the products is stable.	Vonderembse et al., 2006; Shah and ward, 2003; Mason-Jones et al., 2000
	Innovative Product	Is defined as products that require sophisticated design, has a short life cycle and the demand for the products is uncertain.	Vonderembse et al., 2006; Shah and ward, 2003; Mason-Jones et al., 2000

2.3.3.1 Standardized Products

Standardized products are those that have stable demand, and whose productions are highly dependent on forecasting methods (Vonderembse et al., 2006; Mason-Jones et al., 2000) and typically have an extended life-cycle. The process and characteristic of such products do not change frequently, therefore, standardized products favor tactical planning compared to strategic planning (Whitehead, 1932) and are more suitable for a

lean supply chain. This study predicted that firms that produce standardized products use lean supply chain design.

2.3.3.2 Innovative Products

Innovative product is defined as products that require sophisticated design and the demand for which is uncertain (Vonderembse et al., 2006; Mason-Jones et al., 2000) and have a short life cycle. Firms that choose to produce innovative products essentially live in a very unpredictable world, with changing demand and customer patterns. Hence they, by choice, use a more responsive supply chain design that allows them to adapt to changing situations. Such a responsive supply chain design is especially designed to accommodate the characteristics of innovative products. Table 2.5 shows the definition and literature for innovative and standardized products.

2.3.4 Design of the Global Supply Chain

This research studies two types of global supply chain design, the lean supply chain design and the responsive supply chain design within the context of exploration or exploitation strategy.

2.3.4.1 Lean Supply Chain Design: Exploitation Strategy

March (1991), developed the concept of exploitation and included the following elements of exploitation: refinement, production efficiency, selection, implementation and execution, on the other hand firms that engage in exploration activities are likely to find themselves drowning in the cost of experimentation with no promise of benefit or positive outcome (March, 1991). The first element in exploitation strategy is refinement; organizations that operate internationally should already have refined their operational

skill as it is almost impossible to operate at a different location without having existing expertise or substantial operational knowledge of the current products. The second characteristic of exploitation is production efficiency. Since organizations operating internationally are constantly looking for lower costs and better efficiency, they tend to select Lean supply chain design. Lean supply chain embodies the characteristics of selection, implementation and execution as related to firms‘ decision making process in product execution. By nature, global supply chain is extremely competitive and leaves very little room for waste, redundancy or inefficiency, thus, when product execution has to be super fast, Lean supply chain is the best match for these needs.

Lean supply chain is defined as a supply chain activity that focuses on the elimination of waste or non value steps in operations. However, one weakness of lean production is its inability to accommodate variations in demand for finished products which makes the operation less attractive from the global supply chain perspective (Katayama and Bennet, 1996), especially for innovative products with volatile demand base. Thus lean supply chain design is suitable if firms decide to produce products that have standardized attributes.

Cua et al., (2001) investigate the relation of lean manufacturing with quality, just in time and preventive maintenance programs, and examine the impact of these three constructs on operational performance. Shah and Ward (2003) study the impact of manufacturing practice, plant size, plant age, and the extent of unionization on lean manufacturing. The authors also integrate quality, resource management with lean manufacturing at operational levels.

Most of the researchers suggest that lean manufacturing focuses more on operational activities, and it leads to better operational performance (Vonderembse et al., 2006; Shah and ward, 2003; Ahire et al., 1996; Samson and Terziovski, 1999; Cua, McKone and Schroeder 2001; Flynn et al., 1995; McKone and Weiss, 1999; McKone et al., 1999; McLachlin, 1997; Schroeder and Flynn, 2001; Osterman, 1994). However, past researchers do not explore lean practices in the context of exploitation concept as they relate to supply chain. The fact that lean supply chain is similar in theoretical base to exploitation concept is due its characteristics such as cost reduction, efficiency, incremental learning activity and product standardization that are similar to the characteristics of exploitation. In a nutshell, organizations that apply a lean manufacturing system do not invest in expensive product innovation but rather have simple, standardized products that are easy to manufacture, their manufacturing process could be broken into simple, repeatable steps and can be assimilated by low cost labor.

2.3.4.2 Responsive Supply Chain Design: Exploration Strategy

Exploration strategy is characterized by elements of search, risk taking, experimentation, play, flexibility, discovery and innovation (March, 1991). Some firms that operate in the global market are constantly on the lookout for new market share or new products or services. Their task is especially challenging in the extremely volatile, inter related and uncertain global markets. The exploration strategy imposes an extra level of responsiveness to changes in customer demands, technological innovation and political/economic changes. Previous research has typically elaborated on agile supply chain with scant attention to responsive supply chain, however, this research focuses on responsive supply chain that exhibits the characteristics of exploration.

Table 2.3.4 Definition and literature support of lean and responsive supply chain designs:

Construct	Definition	References
Lean Supply chain	Is defined as a global supply chain that focuses on the reduction or elimination of waste, or steps of no value in the operation.	Vonderembse et al., 2006; Shah and ward, 2003; Ahire et al., 1996; Samson and Terziovski, 1999; Davy et al., 1992; ; Flynn et al., 1994, 1995;McLachlin, 1997; Schroeder and Flynn, 2001; Osterman, 1994)
Responsive supply chain	Is defined as a global supply chain that adds value to customer satisfaction through the development of new products or services.	Gunasekaran et al., 2008 Thatte, Shahnawaz and Argawal, 2007

Responsiveness in the context of supply chain design is the ability of the supply chain to respond to changes in demand quickly through operational flexibility and synchronized operations. Hallmarks of a responsive supply chain are: customer satisfaction, improvements in quality, introduction of new product, improvements in service levels, and reduction in lead-times (Thatte, Shahnawaz and Argawal, 2007). Responsive supply chain is defined as the organizational strategic activity in the global supply chain that adds value to customer satisfaction through the development of new products or services. Table 2.3.4 shows the definition of lean and responsive supply chain design.

2.3.5 Collaboration of the Global Supply Chain

The previous literature on collaboration includes contributions from various disciplines and has been studied extensively in the context of supply chain. However, there is scant literature that supports classification of operational and strategic collaboration and in turn, how they influence the performance of a global supply chain.

Collaboration refers to two or more entities working together towards achieving the same goal or objective (McGinnis and Kohn, 1990, 1993; Morris and Calantone, 1991; Fisher, 1997; Dyer and Singh, 1998); in the context of global supply chain, collaboration goes beyond working with just two or more entities. Typically entities collaborating in a global supply chain are from different geographic locations, with political affiliations and economic backgrounds. These differences amongst the suppliers and buyers in a global supply chain make collaboration even more dynamic and challenging.

Simatupang and Sridharan (2008) have clarified the architecture of supply chain collaboration and proposed a design for the supply chain collaboration. The authors developed architecture of supply chain collaboration that includes; collaborative performance systems, decision synchronization, information sharing, incentive alignment, and innovative supply chain processes. The research was conducted based on a case study analysis. The results of the study suggest that reciprocal interaction among the five elements could improve collaboration performance and looks at supply chain collaboration from the perspective of strategic planning. Collaboration in the supply chain should be studied at both strategic and operational level (Freeman and Cavinato,

1990; McGinnis and Kohn, 1990, 1993; Morris and Calantone, 1991; Cammish and Keough; Fisher, 1997; Dyer and singh, 1998; Hammer, 2001).

When suppliers and buyers share information through effective collaborations, mistakes arising out of insufficient information or misunderstanding or mis-interpretations can be minimized. When information is transferred faster, better and more effectively, it is likely that the product and process development are more efficient (Paulraj, Rado and Chen, 2008). Information sharing and error reduction through collaboration contribute to a significant short term or immediate performance improvements. While there is an abundance of research available on firm‘s performance resulting from collaboration; there is limited availability of previous research on whether improvements in performance are a result of operational or strategic collaboration.

Paulraj et al, (2008) stress that communication can be considered as a relational competency that enhances collaboration, they investigate effectiveness of collaboration based on a study involving 200 firms in the United States. The antecedents for inter-organizational communication are network governance, long term orientation and information technology and the authors report that these three antecedents have a direct impact on inter-organizational communication, as effective communication reduces product and performance related errors. The results of this research are general and do indicate whether its impact is short term or long term, or at operational or strategic levels of the global supply chain. The authors acknowledge the limitation of their research and suggest that future research should include other factors such as geographic dispersion, cultural compatibility, the role of trust and commitment, and strategic network.

Simatupand and Sridharan (2008) indicate that collaboration plays a major role to interconnecting supply chain practices. This includes collaborative performance systems, information sharing, decision synchronization, incentive alignment, and integrated supply chain processes. The authors give a broad perspective, and it is not comprehensive enough to cover all the activities involved in the supply chain. The practices do not represent all the activities involved in the supply chain perspective and it is difficult to identify whether the features represent operational or strategic levels of collaboration.

Table 2.3.5: Supply chain collaboration category, definitions and literature review.

Construct	Definition	Reference
Supply chain collaboration	The extent of all activities in supply chain management including operational and strategic supply chain	Freeman and Cavinato, 1990; McGinnis and Kohn, 1990, 1993; Morris and Calantone, 1991; Cammish and Keough; Fisher, 1997; Dyer and singh, 1998; Hammer, 2001
Strategic collaboration	is defined as activities between buyers and suppliers that include communication and information sharing for long term commitment.	Eisenhardt and Schoonhoven, 1996; Narasimhan et al., 2002; Fisher, 1997; Dyer and Singh, 1998; Hammer, 2001
Operational collaboration	is defined as activities between buyers and suppliers that include communication and information sharing regarding daily operational activities.	Stevens, 1935; Das, Narasimhan and Talluri, 2006; Morris and Calantone, 1991; Cammish and Keough (1991); Fisher, 1997; Dyer and singh, 1998; Hammer, 2001

2.3.5.1 Operational Collaboration

The definition of operation derives from psychological philosophy of human action - operation is an activity that includes process and execution, which are in turn represented by the notion of existence and experience (Stevens, 1935). This indicates that

operation involves tackling of an existing or current situation. By not necessarily targeting long term or strategic activities, this concept is ontological in nature. Interactions amongst suppliers and buyers in a global supply chain result in elements of existence/experience and relationships in global supply chains involve typically more than two entities. Thus, in a global supply chain, collaboration is not just the interdependency between suppliers and buyers but also leads to knowledge transfer and forms a key part of organizational learning process (Das, Narasimhan and Talluri, 2006). This study argues that the collaboration at the operational level is not a continuous process; but is formed on a more ad-hoc basis depending on the need of a particular project or for a particular situation. Based on the basic definition of operation this research classifies operational supply chain to three categories, namely: operational collaboration, ontological commitment and incremental learning.

Operational collaboration is defined as daily activities between buyers and suppliers that include communication and information sharing (Das, Narasimhan and Talluri, 2006; Morris and Calantone, 1991; Cammish and Keough; Fisher, 1997; Dyer and singh, 1998; Hammer, 2001). Information that is received through communication is aimed at reducing errors, improve quality, reduce uncertainty, improve development performance and increase efficiency (Dyer, 1996; Daft and Lengel, 1986; Brown and Eisenhardt, 1995; Li et al., 2006; Zirpoli and Caputo, 2002;), all of which lead to better performance.

Oh and Rhee, 2008 indicate that the purpose of collaboration is to have mutual understanding and to solve problems between buyers and suppliers. The authors did their research on buyer and supplier collaboration in the automotive industry in Korea.

However, they did not classify collaboration as operational or strategic, instead considered only one type of collaboration. In general, they found that active collaboration impacts the level of commitment and that even though collaboration leads to higher commitment, it is not a guarantee of continuous commitment; discontinuity could happen for many reasons; for example end of the target project, economic difficulties, and redirection of the operation target.

Each type of collaboration requires some level of commitment on the part of firms, whether long term or short term. Firms that focus on a long-term commitment should pay attention to continuous strategic collaboration, which in turn typically leads to continuous improvements. On the contrary, firms that focus on short term, current collaborations will pay attention to incremental improvement (Dyer and Singh, 1998) arising out of operational collaboration. Thus, this study classifies collaboration into two perspectives, strategic and operational collaboration, operational collaboration being ongoing and current operational issues such as current quality, capacity and information sharing (Oh and Rhee, 2008), whereas strategic collaboration is more on the lines future needs issues such as new product development.

2.3.5.2 Current Commitment

Ontological commitment is defined as the current obligation or agreement between suppliers and buyers. Even though it is undeniable that commitment enhances collaboration, the outcome of commitment depends on the type of commitment involved. Allen and Meyer (1990) developed a set of measurements for individual commitment and indicate that there are three types of current commitment: affective, normative and

continuing. Affective commitment is related to personal feelings about an organization; this commitment is applicable at the individual level, whereas normative commitment concerns obligations and the feeling of responsibility. Continuance commitment is an ongoing commitment for the long term.

Wu et al., (2004) use affective, normative and continuance commitment in the context of supply chain, and measure how commitment influences integration of supply chain. Morgan and Hunt (1994), defined commitment as the desire for a continued relationship for future benefit and suggested that the measurement of commitment in the collaboration should be aligned with the specific type of supply chain design. For example, if the collaboration is at the operational level, organization probably should not look at continuance commitment but normative commitment is more suitable. At the same time, investment made for long term continuance is wasteful if there is no indication of such a commitment.

2.3.5.3 Incremental learning

Incremental learning is defined as ongoing and current learning activities aimed at improving a firm‘s operational processes. In addition, these activities generate immediate returns to the firms. Learning in an organization can be divided into two types: first is behavioral learning and second is strategic learning (Duncan, 1972). Behavioral learning is associated with adaptation, which includes changes to a specific behavioral pattern and strategic learning is a long-term learning process. Even though past research relates learning to organizational behavior, the process of learning in various types of industry, especially learning activities in manufacturing firms have long been neglected.

Huang, Kristal and Schroeder (2008) investigated the role of learning in the development of mass customization capability. The authors divided learning into two aspects; internal and external. External learning leads to problem solving, and internal learning involves training of multifunctional employees. Learning is a multi-routine process (Alder, 2006), and this process helps developing flexibility and efficiency. In summary, most of the learning activity that happens at the operational level is routine; thus, it is an incremental process.

A lean supply chain focuses more on the current operational improvements that includes the improvement of process and product development and fits well with characteristics of exploitation strategy that focuses on operational effectiveness and efficiency (Peterson et al., 2004). An exploitative strategy typically relies on incremental improvement and refinement. (March, 1991) and is related to incremental change for operational level supply chain (March, 1991; Peterson et al., 2004). The exploitation perspective fosters repetitive learning; even though it improves efficiency, it restricts creativity, thus innovation is unlikely to happen (Freire, 1970).

Table 2.3.5.1 Operational collaboration sub-constructs definitions and literature

Construct	Definition	References
Operational collaboration	is defined as activity between buyers and suppliers that includes communication and information sharing regarding daily operational activities.	Stevens, 1963; Das, Narasimhan and Talluri, 2006; Morris and Calantone, 1991; Cammish and Keough,1991; Fisher, 1997; Dyer and singh, 1998; Hammer, 2001
Current Commitment	is defined as current and ongoing commitment between buyers and suppliers based on current production plans.	Allen and Meyer , 1990; Morgan and Hunt ,1994; Wu et al., 2004;

Incremental learning	is defined as ongoing improvement of process and product development at the operational level between buyers and suppliers.	Duncan, 1972; March, 1991; Peterson et al., 2004

2.3.5.4 Strategic Collaboration

A strategy is a plan of action, designed to achieve a particular goal. Almost all actions at all stages in the planning process involve both buyers and suppliers and firms that are in the same supply chain link could have a similar goal, and they could share their planning strategy. Since their goals could be similar, these firms view their partners' planning processes as an extension of their own (Swink, Narasimhan and Wang (2007).

Hult et al., (2007), indicate that there are two important factors for the strategic supply chain; a culture of competitiveness and development of knowledge. According to the authors, culture of competitiveness increases performance, decreases market turbulence and adds new knowledge towards improving performance. Sohdi et al.,(2003), indicate that the strategic supply chain does not have immediate execution but focuses on long term planning.

Strategic collaboration is defined as the activities between buyers and suppliers, which include communication and information sharing. In order to achieve success in strategic supply chain, supply chain partners need alignment of information through collaboration (Gunasekaran & Kobu, 2007;Venkatraman and Camillus, 1984; Venkatraman and Camillus, 1984). Strategic collaboration benefits include reducing turnover, increasing revenue and decreasing unexpected supply chain costs in the long

run (Agrawal and Pak , 2001; Alber and Walker, 1998; Attaran, 2004; Leonard and Cronan, 2002; Mentzer et al., 2000).

2.3.5.5 Continuous Commitment

Continuous commitment is defined as a long-term obligation between buyers and suppliers (Soosay et al., 2008; Ring and Van de Ven, 1992; Gray and Hay, 1986). The strategic supply chain requires a long term planning; the commitment between supplier and buyer is continuous. Firms that share strategic planning with suppliers also share the same goals and objectives and commitments on an ongoing basis gives firms competitive advantage, which in turns leads to better performance in the long run (Swink, 2006; Malthora et al., 2005; Zahra and George, 2002; Van den Bosch, F. A. J., Volberda, H. W., and De 1999; Koza & Lewin, 1998). Previous research only examined a general type of commitment at the organizational level, and has not specifically focused on continuous or current commitment.

2.3.5.6 Experiential Learning

Experiential learning is defined as ongoing activity of knowledge transfer and knowledge dissemination between buyers and suppliers, and is rather strategic than operational. This type of learning has the potential to increase organizational knowledge and capabilities, but also can be very risky as the learning situation faced by firms are uncertain and unpredictable. Hult et al. (2003), researched on the potential role of organizational learning, and indicated that learning is a strategic resource in supply chain management. Hult et al also indicate that in order for learning to be a strategic resource, learning needs to be valuable, rare and inimitable. Thus, firms involved in a frequent and a longer learning process tend to be more innovative than those who are not active.

Table 2.3.5.2 Definitions and literature review of Strategic collaboration sub-constructs

Construct	Definition	References
Strategic collaboration	is defined as activities between buyers and suppliers that includes communication and information sharing for short term and long term commitment.	Eisenhardt and Schoonhoven, 1996; Narasimhan et al., 2002; Fisher, 1997; Dyer and Singh, 1998; Hammer, 2001
Continuous commitment	is defined as ongoing commitment between buyers and suppliers based on future plans, shared goals and objectives.	Soosay et al., 2008; Ring and Van de Ven, 1994; Gray and Hay, 1986
Experiential learning	is defined as ongoing learning (regarding innovation) activities of knowledge transfer and dissemination.	Peterson et al., 2004; Preiss and Murray, 2005

There is scant availability of research that addresses how experiential learning helps collaboration in the supply chain. This research divides learning into two categories; incremental and experiential. Incremental happens at the operational level, and experiential is a continuous learning at the strategic level. Table 2.3.5.2 shows the definition and literature support for strategic collaboration, continuous commitment and experiential learning.

2.3.6 Performance of the Global Supply Chain Design

In this study, design of the global supply chain is divided into two categories and the performance of the global supply chain design depends on its type. For lean supply chain design, the performance indicators are cost efficiency and lead-time and for responsive supply chain design, the performance indicators are innovativeness and time-to-market.

2.3.6.1 Lean Supply Chain Performance

Lean supply chain performance measures the effectiveness of lean supply chain design and is defined as operational supply chain activities that focus on the elimination of waste and of non-value steps. Because the focus of lean supply chain is on elimination of waste and of non-value steps (White et al., 1999; Koufteros et al., 1998; Im and Lee, 1989; Samson and Terziovski, 1999), the sub-constructs for lean supply chain performance are cost efficiency and lead-time.

Shah and Ward (2003) measure lean supply chain performance through scrap work, manufacturing cycle time, unit cost and lead time. In their research, they postulated a bundle for lean which includes interrelated and internal consistent practices of just-in-time, total quality management, total preventive maintenance, and human resource management. They found out that this bundle contributes substantially to operating performance. The concept of bundle used in their research is at the operational level and none of these ―bundles" represents a strategic perspective. For example the use of just-in –time does not directly influence innovativeness of the product but it reduces inventory cost; thus this results in cost efficiency but not necessarily in the creation of a sustainable competitive advantage for the firm.

Mason-Jones et al., (2000), classify lean performance based on the types of market, in a qualifiers-market, the performance depends on quality, lead time and service level; for winners-market, the performance is based on cost. For the qualifiers market, ―service level" indicator should not be one of the characteristics of lean manufacturing (Christopher and Towill, 2003) as qualifiers market needs manufacturers to be more responsive in terms of their response to customers' demand on the types of product. This

study follows most past research in measuring lean supply chain through cost effectiveness.

Lead-time performance refers to the reduction of the period of time starting from the initiation of product development through the process and execution (Wieters, 1979; Perry 1990; Cooper and Kleinschmidt, 1990; Calantone and Di Benedetto, 2000; Cohen, 1996; Carmel, 1996; Zirger and J. L. Hartley, 1996) Managing time in production is a representation of productivity of the firm (Blackburn, 1991). Time and cost are interrelated, the more the time firm reduces, the faster the products move to the next level, the faster production leads to a higher performance.

Winters (1979), indicates that procurement lead times are a significant source of excessive lead times. Improvement in procurement could potentially decrease communication barriers between partners (Ward and Zhou, 2006). Lead time delay results in ripple effect; if one firm has a problem with lead time, other firms will be affected, thus delaying the end product, resulting in excessive build-up of inventory across supply chain. Calantone and Di Benedetto (2000) developed a model that studies the relationship between performance and time to market. In their research, they found that overlapping stages reduce time to the market. They also indicate that the faster time to market cannot be at the cost of end product quality or performance. Products that have low quality performance could damage a firms‘ reputation, even though a firm is pushing the product faster to the market, they also have to think about how customers feel about the product performance, and possible loss of business.

Cost efficiency refers to an effective product development and process without wasting time, effort or expense (Swink et al., 2005; Hayes, 1984). When firms are able to reduce the cost, they demonstrate the ability to execute plant operations with fewer resources (Swink et al., 2005), thus most of the quality improvement practices relate to cost efficiency (Flynn et al., 1999). For example the six-sigma project normally has the objective on certain amount of cost saving. However, saving cost by cutting steps in product process is an operational view and does consider the long term impact on strategic development.

Operational efforts that focus on elimination of waste fit well with lean supply chain practices (Shah and Ward, 2003; Ahire et al., 1996; Samson and Terziovski, 1999; Davy et al., 1992; Cua, 2000).

2.3.6.2 Responsive Supply Chain Performance

Performance of the responsive supply chain is defined as the ability of the firm to fulfill customer requirements quickly and effectively (Gunasekaran et al., 2008) and depends on the uniqueness of the products (Argawal et al., 2001). Gunasekaran et al., (2008) clarify the differences between responsive and lean supply chain; responsive supply chain is related to innovativeness and timely responses to customers‘ requests. This research has identified responsive supply chain performance sub-constructs as: innovativeness, time to market and customer responsiveness.

The term ***innovative*** refers to the ability of the firms to produce new products (Vera and Crossan, 2004; Tushman et al. 1996) and in a responsive supply chain, firms that are able to produce unique products frequently are considered innovative. Innovation

is divided into two categories, which are incremental or radical and firms have to choose to adopt either or both of them. In a responsive supply chain, products‘ modification depends on the input the firms receive from the customers or suppliers and can result in a) modifications to existing functionality b) obsolescence of an existing product and entry of a new product c) a new customer need altogether

In this research***, time-to-market*** refers to the extent to which firms are able to introduce their products to the market faster than major competitors (Montoya-Weiss and Calantone, 1994; Koufteros et al., 1998). A number of studies show that speed in product development has a positive and direct effect to firm‘s performance (Crawford 1992; Song and Perry, 1997; Ali, 2000; Griffin, 2002; Boulding and Christen, 2003). This study measures the time to market in a subjective manner, following past researcher recommendation (Droge, Jayaram, and Vickery, 2000), however the items asked of respondents are aimed at differentiating between time to market of product execution of a particular firm and product execution of major competitors.

Table 2.3.6 Supply chain and organizational performance definitions and literature support

Construct	Definition	References
Supply chain performance	Supply chain performance refers to the ability of the supply chain members to fulfill its financial goals in supply chain.	Droge, Jayaram, and Vickery, 2000; Argawal et al., 2007
Organizational performance	Organizational performance refers to the ability of the supply chain members to fulfill its financial goals	Snow et al. (1980); Crawford 1992; Song and Perry, 1997

2.3.7 Organization Performance (strategic and operational)

Organizational performance refers to the ability of the firm to fulfill its financial, social and ethical goals. This study focuses on organizational performance from a financial perspective and metrics used in this construct are from subjective financial performance. Operational performance is measured by reduction of price, cost and quality (Koufteros et al., 1998), where as strategic performance is measured by innovativeness and reliability.

Snow et al. (1980) indicate that every industry has a distinctive competence; for example industries using standard product and process development are looking for having the high performance in the elements of price and efficiency. Firms that are more innovative and utilize responsive supply chain cannot not use cost as the measurement for performance. Thus, measures of organizational performance should move in tandem with the supply chain design adopted by the concerned organization.

CHAPTER 3

THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

This chapter discusses the theoretical background as well as the development of hypotheses that support the models proposed in the study. A framework of the overall model is shown in figure 3.1. Each hypothesis is supported by the conceptual relationship that exists between the proposed constructs, and the chapter comprises of the following sections:

I. Theoretical Background

II. Exploitation and Exploration theory from a global supply chain perspective

III. Development of the Hypotheses

3.1 Theoretical Background

Firms that operate in a globalized world have to constantly explore new markets, create new opportunities and focus on customer needs by leveraging either existing or new resources (Rudberg and Martin, 2008). Markets extending beyond national boundaries have brought the hitherto absent customer base into the fore, and created a vast demand base necessitating ever increasing production of goods and services. Several major technological breakthroughs and the dawn of the internet era have changed the rules of the game so far as the global markets are concerned (King and Tucci, 2002;

Gilbert, 2003). Consequently, firms are paying ever more attention to designing their global supply chains to fit their business imperatives. Companies like Dell have successfully demonstrated that ‗Innovation in the Supply Chain' is as important as ‗Innovation in Products or Services', as well as the fact that the design of the Supply Chain can be a powerful competitive differentiator that can have a significant impact on a firm's top or bottom line growth. Hence firms play closer attention to tailoring their supply chain design to fit their business imperatives.

Just as firms have realized the possibility of utilizing supply chains to gain significant competitive advantage (Lee and Whang, 2001; Fisher, 1997), the supply chain has also attracted considerable research interest and has seen a proliferation of several theories. Extensive research exists on various concepts of a supply chain such as the Lean (Vonderembse at al., 2006) and Responsive (Gunasekaran et al., 2004) concepts. Apart from a study of the supply chain concept, this research also draws comparisons from areas such as the learning based Exploitation and Exploration Theory (March, 1991) and other supporting theories such as the Theory of Rational Search (Radner & Rothschild, 1975).

This study co-relates the exploitation and exploration theory (EET) and the rational search theory (RST) to the more traditional SCM concepts of Lean and Responsive, and derives the conclusions that firms select a particular supply chain design, whether ‗Lean' or ‗responsive' based on several factors. The following paragraphs detail the existing theoretical basis that provides a framework for these comparisons.

March (1991) developed the theory of exploitation and exploration in the context of learning gained by the organization. March postulated that the ‗learning gained' could be derived from various sources such as local search, experiential refinement, selection and re-use of existing resources and the ‗exploitation' itself would be characterized by refinement, efficiency, choice, production, selection, implementation, and execution (Gupta et al., 2006: Holmqvist, 2004; Benner and Tushman, 2003; March 1991;). What it simply meant was that the firms, after having identified a particular product to be manufactured or a service to be provided, would focus on refining the ‗same idea' over and over again through several processes aimed at deriving efficiencies. What this also meant was that industries, in which a manufacturing process could be broken up into several discrete, ‗easily learnt steps', were more amenable to standardization and were better candidates for an exploitative supply chain strategy. When an Exploitative strategy was applied in the context of a Supply Chain, it gave rise to industrial destinations that provided vast pools of low cost labor, leading to significant ‗labor arbitrage' gained through a ‗factory set-up' to handle repetitive, standardized processes leveraging less skilled workers at low labor costs. Coupled with the advances in information technology, modern supply chains are rooted in developing countries such as China, Malaysia, and India, which can offer mass workforce at low cost & provide world class infrastructure for transportation (Kuruvilla, 1996).

March also states that the exploitation activity alone, without exploration, leads to a suboptimal stable equilibrium (March, 1991). Two reasons can be attributed to this:

First: Any firm that focuses on repeating an idea, albeit with better and better processes, essentially creates a _lower competitive barrier' for itself. As more competitors enter the markets, and _learn' process improvements, the firm loses any _super normal profits' arising out of standardization & process improvements. The firm will continue to look inwards, focusing on further reducing manufacturing costs by bringing in efficiencies, leading to a sub-optimal equilibrium in a stable state.

Second: firms adopting an exploitative strategy with a focus on improving a repetitive manufacturing process, move away from creating brand new products, services and customer needs, and lose _sustainable competitive advantage' that can arise only from these _core innovation activities'. Hence, exploitation mainly focuses on the current production activities, and may not have a positive relationship with innovation activities (Yalcinkaya et al, 2007).

On the other hand the explorative strategies are characterized by risk, search, product variation, experimentation, play, flexibility, discovery, and innovation (March, 1991). The definition of exploration is –learning gained from experimentation" (Gupta et al.,, 2006; March, 1991). Exploration encompasses behavior that increases variance in the organizational activities (Chen and Katila, 2008). Thus, the main focus in the exploration strategy is innovation (March, 1991; Tushman et al., 1996).

Industries in which innovation is the main element, in which manufacturing or services cannot be easily broken up into standardized, repetitive process steps, tend to adopt explorative strategies (Katila and Chen, 2009; Azedegan et al., 2008). These industries also enjoy a _sustainable competitive advantage' by creating new products or

services and often creating new customer needs and experiences (King and Tucci, 2002). The labor force utilized by such industries is typically _high paid' and _highly skilled' (Leiponen, 2005), and goods or services cannot be easily copied by competitors. This strategy also imposes a significant investment in R& D activities, often with long gestation periods (Chen and Katila, 2008; King and Tucci, 2002). For example, companies in the pharmaceutical industry invest very heavily in creating new drugs and patents to cure illnesses from various diseases. Companies that invest in such activities are rewarded by patents or copy rights or royalties and are thus protected from competitive pressures. Hence the profit margins in such industries would be high, the competitive differentiation sustainable and more likely to create optimal equilibrium in the stable state. While Explorative and Exploitative theories look at a firm's business strategy from the kaleidoscope of _learning', several other designs such as _Lean' and _Responsive' arrive at remarkably similar conclusions, albeit set in the context of a supply chain.

Similar to the exploitative strategy, a lean supply chain (LSC) employs _continuous improvement' in efforts that focus on eliminating waste or non-value steps along the chain. It pays attention to the efficiency of product and process development; hence it could reduce the duration of product execution. Even though a lean chain has advantage in term of time, it does not have flexibility in product design and planning (Vonderembse et al., 2006); hence its restrict firms in being more responsive to customers.

On the other hand, the responsive supply chain (RSC) design examines the symbiotic existence of companies, customers, and markets. A successful adaptation of the RSC Supply chain would be determined by the willingness of the firms to ‗respond' quickly to the various stimuli arising from the market place on a continuous basis. The supply chain needs to adapt to the ever changing, dynamic needs of a growth-oriented, typically ‗buyer-driven' market. Innovation in products often with very little shelf life would necessitate lesser lead times and faster, shorter supply chains. In this constantly changing competitive atmosphere, firms adopting an RSC tend to leverage technology for taking snap decisions, managing risks and shortening the supply chain. The RSC encourages firms in deploying new technologies, methods, tools, and techniques to solve unexpected problems.

While research on Lean and Responsive supply chain designs focus on the business needs of firms to choose either of these strategies, the rational choice theory throws light on the process by which a decision is taken to make this choice (Radner & Rothschild, 1975). Rational Choice Theory postulates that the decision to choose an appropriate type of global supply chain is essentially a ‗rational process' in which firms make a choice based on the ‗objective' needs of business, the capability and the willingness to invest in the global supply chains. Ultimately, the decision to choose between lean or responsive depends on the firms' goals and resources.

The choice of the supply chain design depends on the type of resources firms possess at their disposal, and how these resources are allocated amongst often competing needs. The optimal growth of the firm involves a balance between exploitation of existing resources and exploration of new opportunities (Wernerfelt, 1977; 1984). Exploration and

exploitation compete for scarce resources; if more resources are allocated for exploitation, it means that fewer resources are available for exploration. Firms that take a rational decision to balance exploitation and exploration needs are seen to perform better than their peers in the same industry.

3.2 Concepts of Exploitation and Exploration from a Global Supply Chain Perspective

While an abundance of research exists in the context of exploitation and exploration theory and their applicability to business strategies of firms, the same has not been extensively studied in the context of a global supply chain. Most of the previous research studies focusing on the exploitation and exploration concept relate to other areas in the service industry and not necessarily to global supply chains. They are related to areas for innovation activities (Schulze et al., 2008; Ying et al., 2008; Greve, 2007; Nemanich et al., 2007; Sindhu et al., 2007;), for value creation (Liang and Tsai, 2008), for knowledge and continuous innovation (Soosay and Hyland, 2008), for product development resource and environmental threats (Voss et al., 2008), for network and information (lazer and Friedman, 2007), and for organizational learning (Miller et al., 2006; Holmqvist, 2004; Özsomer & Genctürk, 2003).

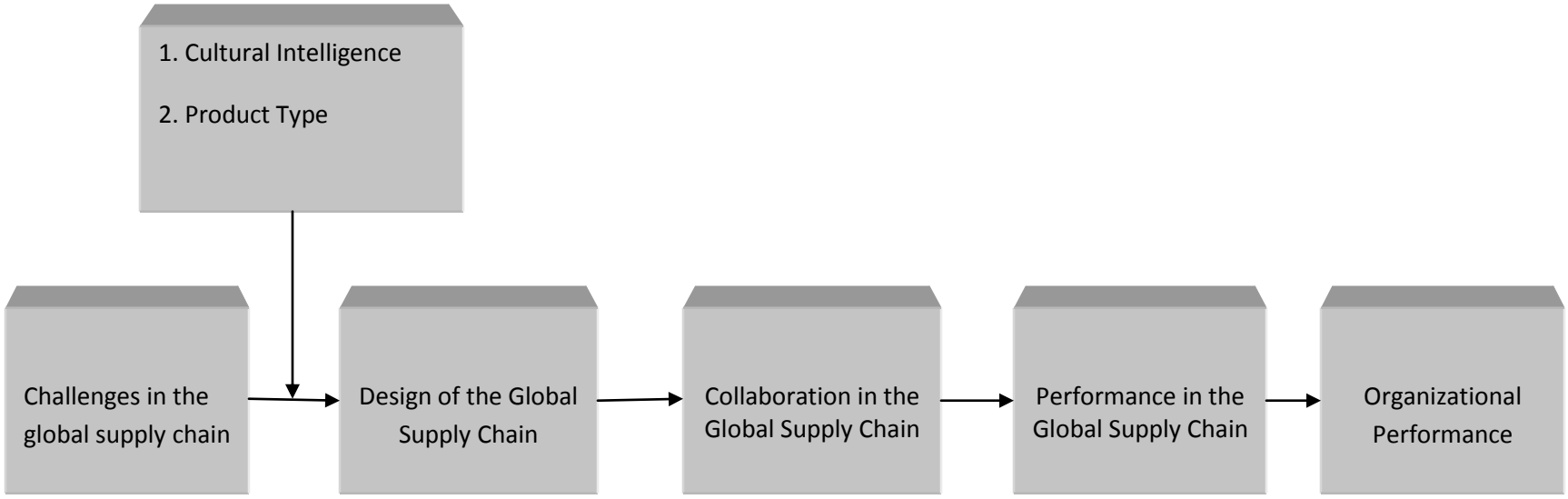


Figure 3.1: Summary of the overall research framework

The only research on the exploitation and exploration theory in the context of customer relationships has been conducted by Tokman et al. (2007). The research suggests that a firm‘s goals and strategies are the antecedents of the customer relationship portfolio, which can in turn lead to the choice of strategy to be adopted, i.e., explorative or exploitative. While the current research follows those broad recommendations, it examines the recommendations in the context of a global supply chain design, and includes cultural intelligence as an additional element.

The choice between exploitation and exploration is based on a firm‘s goals towards globalization; this research discusses how the decision on supply chain design plays a vital role in operationalizing this goal. It is important to match the design of the global supply chain (i.e., lean or responsive or hybrid) with the goals that the firm strives to achieve. For example if the goal of a firm is to be efficient, a lean supply chain built on the principles of exploitation strategy is more suitable since lean and exploitation characteristics focus on elimination of waste, and exploitation strategy focuses on refinement, selection and production (March, 1991)

The decision on the type of global supply chain design to be adopted should be followed by a determination of the specific types of collaborations required for the supply chain design so chosen. Collaboration in the context of a supply chain is denoted by the activities between buyers and suppliers that include coordination, communication, and information sharing of daily operational activities (Hammer, 2001). While collaboration activities are required regardless of the type of supply chain chosen, their flavors differ based on whether the firm has chosen a lean or a responsive strategy. In the context of the

lean supply chain, collaboration is characterized by its operational nature that results in refinement of a product being manufactured or a service being provided. On the other hand in a responsive supply chain, collaboration is evidenced by the innovation activities (Holmqvist, 2004) that convert a firm‘s experience into the creation of a long-term knowledge asset and a sustainable competitive advantage. Hence, this research postulates that collaboration in the context of the lean supply chain is operational in nature, and relates to day-to-day activities of bringing in more efficiency, while collaboration that occurs in the context of the responsive supply chain is strategic in nature.

Thus, the performance of a supply chain, and therefore the performance of the firm, depends upon the type of supply chain design applied. For a supply design that aims to be efficient and measures organizational performance by way of metrics relating to cost reduction and elimination of waste, a lean and an exploitative supply chain design is considered appropriate. Whereas, if the goal of the supply chain is to create sustainable competitive advantage based on innovation, then the measurement of the organizational performance should be based on innovation activities built on the premise of a responsive supply chain design.

To better understand global supply chain design, and its impact on an organization‘s performance, this research proposes a detailed framework to identify & describe the causal relationship that exists amongst various elements influencing the selection of a particular supply chain strategy such as: global challenges, cultural intelligence, design of the global supply chain, collaboration in the global supply chain, performance of the global supply chain, and the performance of the organization. The

detailed framework, which is an extension of the overall framework, is represented in figure 3.2.

Thus, the fundamental objectives of this research are:

1) To identify the challenges of a supply chain that drive organizations to select a particular type of supply chain design (lean or responsive).

2) To explore the influence of the relationship between cultural intelligence and the supply chain strategy adopted (lean or responsive).

3) To explore the impact of the relationship between product type and the supply chain design adopted (lean or responsive)

4) To explore the relationship between different types of collaboration patterns (operational or strategic) and supply chain design adopted (lean or responsive)

5) To explore the relationship between the collaboration patterns (operational or strategic) and the performance of the supply chain design (operational or strategic).

6) To explore the relationship between the performance of the supply chain (operational or strategic) and the performance of the firm (operational or strategic).

There are twelve constructs that include: 1) challenges in the global supply chain; 2) cultural intelligence; 3) standardized product 4) innovative product 5) lean supply chain design 6) responsive supply chain design 7) operational collaboration 8) strategic collaboration 9) operational supply chain performance 10) strategic supply chain performance 11) a firm‘s operational performance, and 12) a firm‘s strategic

performance. Table 3.0 shows the constructs‘ definition and the literature supporting these constructs. Figure 3.1 shows the detailed framework of the research.

Table 3.0 constructs‘ definition and the literature supporting these constructs.

Constructs	Definitions	References
Global supply chain challenges	Unexpected and demanding situations in the global supply chain.	Davidson, 1989; Cohen, 1997; Voss 1996; Trent & Monczka (2003); Hammami et al., 2008
Cultural intelligence	The ability of the firm to function effectively in the culturally diverse environment of the global supply chain.	Earley, 2004; Earley & Ang, 2003; Thomas & Inkson, 2003; Earley &Mosakowski, 2004; Earley & Peterson,
Standardized Product	Is defined as products that have stable processes and design characteristics, long life cycle and the demand for which is stable.	Vonderembse et al., 2006; Shah and ward, 2003; Mason-Jones et al., 2000
Innovative Product	Is defined as products that require sophisticated design, have a short life cycle and the demand for which is uncertain.	Vonderembse et al., 2006; Shah and ward, 2003; Mason-Jones et al., 2000
Lean Supply chain	Is defined as a global supply chain that focuses on the reduction or elimination of waste, or steps of no value in the operation.	Vonderembse et al., 2006; Ahah and ward, 2003; Ahire et al., 1996; Samson and Terziovski, 1999; Davy et al., 1992; Cua, 2000; Flynn et al., 1994, 1995;McLachlin, 1997; Schroeder and Flynn, 2001; Osterman, 1994)
Responsive supply chain	Is defined as a global supply chain that adds value to customer satisfaction through the development of new products or services.	Gunasekaran et al., 2008 Argawal et al., 2007
Strategic collaboration	is defined as activities between buyers and suppliers that include communication and information sharing for long term commitment.	Clark and Fujimoto, 1991; Eisenhardt and Tabrizi, 1994; Narasimhan et al., 2006

Operational collaboration	Is defined as activities between buyers and suppliers that include communication and information sharing regarding daily operational activities.	Stevens, 1935; Das, Narasimhan and Talluri, 2006; Morris and Calantone, 1991; Cammish and Keough; Fisher, 1997; Dyer and singh, 1998; Hammer, 2001
Operational Supply chain performance	This supply chain performance refers to the ability of the supply chain members to fulfill their short term financial goals in the supply chain.	Droge, Jayaram, and Vickery, 2000; Argawal et al., 2007
Strategic Supply chain performance	This supply chain performance refers to the ability of the supply chain members to fulfill their long term financial goals in the supply chain.	Droge, Jayaram, and Vickery, 2000; Argawal et al., 2007
Operational Organization performance	The extent to which a firm is able to achieve its short term financial goals.	Skinner,1985; Roth and Miller, 1990; Koufteros et al., 1997;
Strategic Organization performance	The extent to which a firm is able to achieve its long term financial goals.	Skinner,1985; Roth and Miller, 1990; Koufteros et al., 1997;

3.3 Development of Hypotheses

To better understand how a firm selects a specific supply chain design to respond to a set of perceived global challenges, and to describe the causal relationship among the identified variables, a framework was established containing the following constructs: challenges specific to a global supply chain, type of product, cultural intelligence, design of the supply chain, role of collaboration in the supply chain performance, and organizational performance. Table 3.0 shows these constructs and their definitions, whereas Figure 3.1 depicts causal relationship among eleven constructs discussed in

chapter 2. A total number of twelve hypotheses were developed to empirically test these relationships. Figure 3.1 summarizes a theoretical model to analyze the relationships below:

1. Relationship between perceived global challenges & a lean supply chain design.
2. Relationship between perceived global challenges & a responsive supply chain design.
3. Impact of cultural intelligence on the relationship between perceived global challenges and a lean supply chain design.
4. Impact of cultural intelligence on the relationship between perceived global challenges and the responsive supply chain design.
5. Impact of a standardized product on the relationship between perceived global challenges and the lean supply chain design.
6. Impact of an innovative product on the relationship between perceived global challenges and the responsive supply chain design.
7. Relationship between a lean supply chain design and operational collaboration.
8. Relationship between a responsive supply chain design and strategic collaboration.
9. Relationship between operational collaboration and operational supply chain design.
10. Relationship between operational supply chain design and a firm‘s operational performance.
11. Relationship between strategic collaboration and supply chain performance.
12. Relationship between supply chain performance and the firm‘s strategic performance.

The definition of each construct and the supportive literature is explained in chapter 2. The following section in this chapter discusses the development of the hypothesis for each of the relationships cited above.

3.3.1 Research Hypothesis 1: Perceived Global Challenges will lead to a Lean Supply Chain

This hypothesis postulates that a lean supply chain is influence by global challenges such as: technology uncertainty, internationalization of markets, need to protect Intellectual Property (IP) and uncertainties related to politics and economies imposed on a global supply chain.

It has already been discussed how a lean supply chain design focuses on cost efficiency through reduction and elimination of waste. The sources of waste could be in terms of time, access inventory and process redundancy (Vitasek, Mandrot and Abbott, 2005). Higher waste increases the firm‘s expenses and reduces its potential profits. Competitions that are solely based on cost efficiency leave less room for product innovation, and therefore increase the protection of intellectual property.

The Lean supply chain design focuses typically on products that are easy to assemble, processes that have lower redundancy and materials that require less storage. Lower redundancy in processes not only reduces the product processing time but also reduces the need for different job training. With less time spent in producing the product, the final product could reach the market faster.

Thus, firms that adopt the lean supply chain tend to manufacture products that are simple to produce, and therefore have lesser need for technological sophistication but easier to be copied by competitors. These products are typically used in day to day life and hence enjoy a relatively stable demand base, and in that sense have lesser price

elasticity‘. All this makes firms find out easy ways of producing a low cost, standard product, typically not protected by IP with minimal investment in technical infrastructure.

In a Lean Supply chain, technology is typically leveraged in the area of _how to improve a supply chain and make it –leaner, meaner and faster‘ rather than innovating a new product or creating a new customer need. Several popular process improvement techniques aimed at optimum utilization of inventory such as _Just in Time‘ or Japanese techniques of _Kaizen‘ (Continuous Improvements) are all hall marks of lean supply chains.

This study indicates that if firms decided to use lean design, they are using the strategy that has the characteristics of reduced waste, low cost and high efficiency. Producing products based on the economy of scale leads to cost efficiency, and by its very nature an LSC is most amenable to those industries using exploitation techniques such as refinement, efficiency, production, implementation, and execution (March, 1991). These characteristics fit well with an exploitation strategy. These characteristic are at operational level. Firms that applied lean supply chain are paying attention in enhancing operational processes and procedural efficiency (Tokman et al., 2007). In summary, firms looking for production efficiency through cost savings and an elimination of waste should apply lean supply chain design. Thus;

H1: Perceived Global Challenges will lead to a Lean Supply Chain

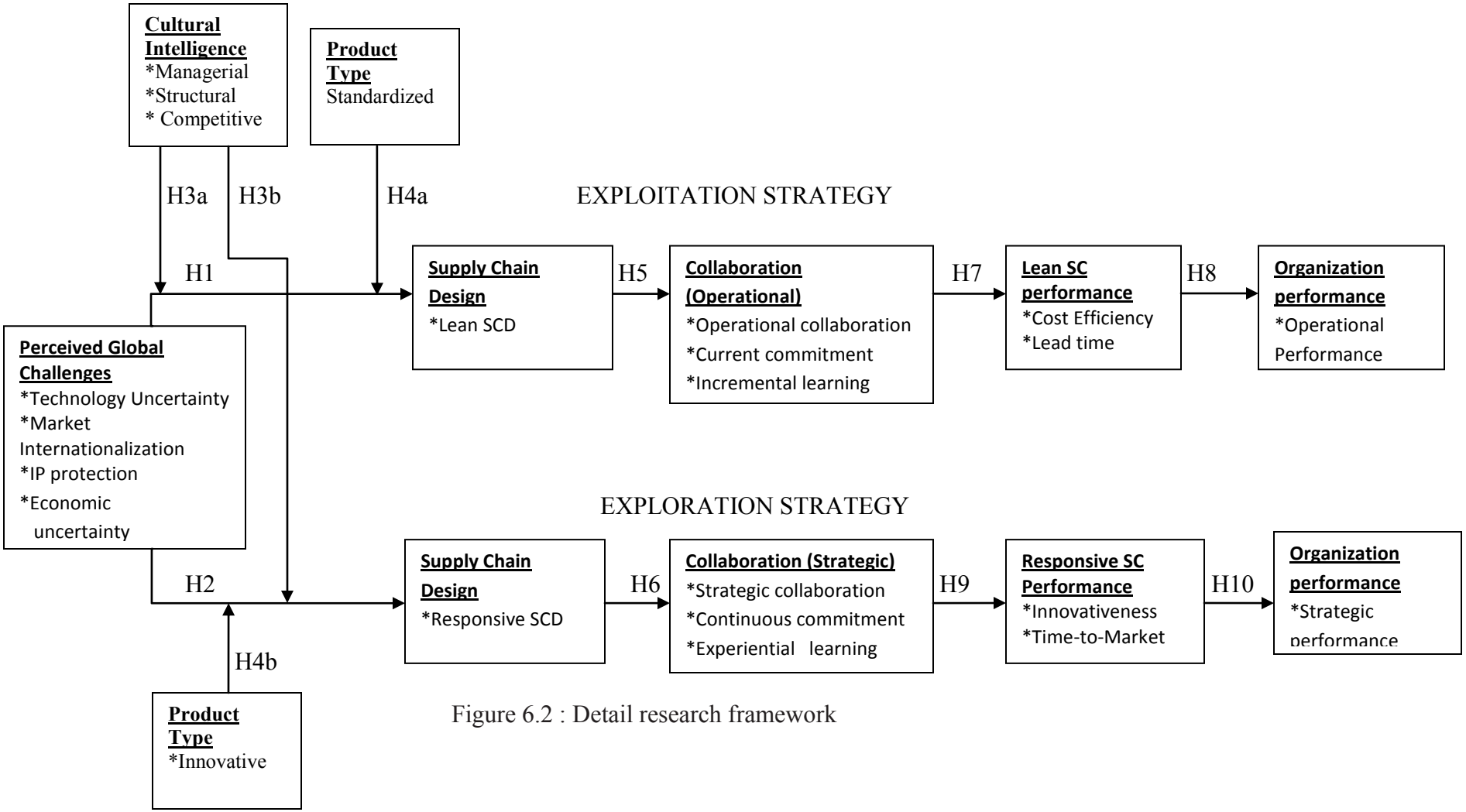


Figure 6.2 : Detail research framework

3.3.2 Research Hypothesis 2: Perceived Global Challenges will lead to a Responsive Supply Chain

Research Hypothesis 2 postulates that a responsive supply chain is impacted by global challenges such as: technology uncertainty, internationalization of markets, need to protect Intellectual Property and uncertainties related to politics and economies imposed on a global supply chain.

A responsive supply chain design focuses on organizational activities that add value to customer satisfaction through the development of new products or services and thus, the responsive supply chain operates in an intensely competitive environment. In this situation, firms must be able to offer customers new products that have all-in-one characteristics; the products must be valuable, different, new, and of high quality (Birou and Fawcett, 1993). The strategy chosen to embrace these challenges must also have the characteristics that can defeat the competition. Contrary to a lean supply chain design, a responsive supply chain design includes variation, risk taking, experimentation, flexibility, discovery and innovation (March, 1991). Responsive supply chain design is amenable especially in markets where customers are not looking for standardized products, are typically very demanding, and their requests are unpredictable. Firms need to act fast to fulfill customers requests before a rival‘s products reach the market Hence, in such markets, it is extremely important for supply chains to be responsive, and enable firms to anticipate and overcome these challenges. Being the first in the market is like an experiment, if the experiment fails the consequences are high. However, if the products are successful, the firm could gain a fruitful opportunity and is considered very

responsive to customers‘ demands. In contrast, if the product fails, the circumstance that firm has to face is unpredictable; this situation is risky.

The supply chain design that fits the characteristics of exploration strategy is the responsive supply chain. Two main characteristics of the responsive supply chain are the time taken for the products‘ execution, and the innovativeness (Gunasekaran et al., 2008). In a responsive supply chain, firms are willing to produce products faster than competitors and they are exposing themselves to a risky situation. Where demand is volatile and customer interests fragile at best, markets are characterized by rapid innovations, and products become obsolete very quickly. Goods and services are typically not standardized, and organizations are continuously re-inventing themselves to stay ahead of the competition. Being first in the market is critical, and the rewards for risk taking are very high. Firms are not only looking at creating new products and identifying new customer needs, but also ways and means of taking these products to the markets swiftly. Given this type of market, the supply chains have to be continuously responsive to changing needs. A small change in technology can lead to a firm‘s product becoming obsolete, copying of the firms‘ intellectual property by competitors a constant worry and any economic changes may have catastrophic impact on the supply chain.

Exploration strategy enhances a firm‘s ability to identify and to leverage new opportunities, resources and products (Tokman et al., 2007). Global challenges give firms new ideas, new opportunities to grow and new markets. Thus the hypothesis is:

H2: Perceived Global Challenges will lead to a Responsive Supply Chain

3.3.3 Research Hypotheses 3: Cultural intelligence positively influences the relationship between perceived global challenges and Supply Chain design

Differences in cultural background could cause conflicts leading to organizational or human relations issues (Skinner, 1964). Decades ago, cultural difference was perceived as an unfavorable factor, but now this perspective is no longer appropriate. In a globalized business world, where people from different cultures work shoulder to shoulder, cultural difference is viewed as an opportunity for widening the window of diversity.

Culture is a way of life that includes the values and beliefs of a particular group (Hofstede, 2003), whereas cultural intelligence is the ability of an individual to understand and grasp concepts in business settings that involve different cultural backgrounds (Earley and Ang, 2003). The higher the level of understanding of cultural differences, the more the synergy that exists in the relationship between buyers and suppliers. Cultural openness, such as open communication regarding differences, is positively linked to a firm‘s effectiveness (Denison and Mishra, 1995). It is important to have managers who can take decisions, or who are comfortable in negotiating through different cultural environments. Understanding different cultural backgrounds is considered as one of the organizational resources and capabilities (Earney and Ang, 2007). This study predicts that higher the top manager‘s cultural intelligence; higher will be the organization‘s chances of being successful in a global supply chain (lean or responsive). For a responsive supply chain design, inputs based on cultural intelligence could create customizations of products based on cultural needs. For example McDonald

created a special ‗chicken and vegetarian burger' to cater to Indian markets, where beef eating is culturally prohibited for most consumers. For a lean supply chain, cultural intelligence could lead to better handling of conflicts at the factory floors. It means that cultural intelligence eases the tension and positively helps the situation. It plays a role as a moderator.

One of the problems in the global supply chain is lack of understanding of cultural differences (Skinner, 1964). By having managers who understand the importance of cultural intelligence in a global market, the risk of doing business internationally could be reduced (Crown, 2008). The better the understanding of the culture, the better and smoother the business interactions (Alon and Higgins, 2005). Thus, this research postulates that an organization with a higher collective cultural intelligence is more likely to be successful in a global setting. Regardless of the type of supply chain chosen or the type of product produced by the organization, cultural intelligence plays an important role if the organization is operating in markets that cross national boundaries. Hence,

H3a: Cultural intelligence positively influences the relationship between perceived global challenges and Lean Supply Chain design.

H3b: Cultural intelligence positively influences the relationship between perceived global challenges and Responsive Supply Chain design.

3.3.4 Research Hypotheses 4: The type of products positively (as a moderator) influences the relationship between perceived global challenges and a supply chain design.

The type of product moderates the firm‘s decision whether to select a lean supply chain design or a responsive supply chain design. Products that are standardized & do not need specific modifications fit in well with the lean supply chain design. On the contrary, complex products which are not easy to ‗learn‘ fit well with a responsive supply chain design. Organizations that produce standardized products may achieve better performance using the exploitation strategy. In a responsive supply chain context, firms strive for ongoing innovation, and in some cases achieve radical innovation. Thus,

H4a: Standardized products positively (as a moderator) influence the relationship between perceived global challenges and a lean supply chain design.

H4b: Innovative products positively (as a moderator) influence the relationship between perceived global challenges and a responsive supply chain design.

3.3.5 Research Hypothesis 5: A Lean supply chain design has a positive relationship with operational collaboration.

The characteristics of a lean (exploitative) supply chain design include elimination and reduction of waste (Gunasekaran et al., 2008; Vonderembse et al., 2006; Shah and Ward, 2003; Aitken, Christopher and Towill, 2002). The goal of a lean supply chain design is to produce multiple products at one time, reduce non-value activities in scheduling, or set queuing time to zero (Hobbs, 2004). In order to achieve the objectives of a lean supply chain design, efforts to eliminate waste should be both intra-organizational and inter-organizational. Waste reduction and elimination mainly focus on the current activities in the supply chain. Efforts to eliminate and reduce waste cannot

happen without collaboration. Supply chain collaboration happens when two or more entities work together, based on similar goals, to create mutual benefit (Simatupang and Sridharan, 2008). Since the goal of the lean supply chain is to reduce costs and to achieve efficiency, most of the collaboration in terms of identifying opportunities for re-use, elimination of waste etc happen essentially at the _factory floor'. These collaborations aim at small, continuous and incremental ways of reducing cost, improving quality and the time to market. Thus, collaborations in a lean context are more operational in nature and:

H5: A Lean supply chain design has a positive relationship with operational collaboration.

3.3.6 Research Hypothesis 6: A responsive supply chain design has a positive relationship with strategic collaboration:

Gunasekaran et al., (2008) define a responsive supply chain as a network of firms that has the capability of creating wealth, by responding to the market timely and effectively. When firms are responsive, they are able to manage and fulfill customers' requests timely and effectively. Because customers are demanding, unpredictable and uncertain in an intense global competition, they want fast reactions for their requests and firms have to be responsive to address these requests. Firms need to constantly work on finding new ideas and developing new products, not only to satisfy customers' needs, but also to develop their products before the competitors' products reach the market. This imposes the need for an organization to arrive at strategic collaborations with its workforce, suppliers and various other players in the supply chain such as retailers and

wholesalers. This kind of collaboration is usually long term in nature, and caters not only to the current short term agenda, but also to future prospective products of a firm. A responsive supply chain design imposes a need to share information on buyer behavior, competitive strategies, demand patterns etc amongst all the constituent parts of a supply chain such as suppliers of spare parts, manufacturers, wholesalers, retailers etc. This kind of collaboration spreads outside the boundaries of an organization, and exists in an intra – supply chain context and is therefore essentially strategic in nature. Thus"

H6: A responsive supply chain design has a positive relationship with strategic collaboration

3.3.7 Research Hypotheses 7: Operational Collaboration has a positive relationship with the performance of a Lean Supply chain.

Operational collaboration is the activity between buyers and suppliers that is related to the current product and process development activities. Since the activity is at an operational level, it fits in with the characteristics of the lean supply chain design (Ragadtz, Handfield and Scannell, 1996). Lean production favors standardized products and applies the economy of scale concept (Aiken, Christopher and Towill, 2002). Operational collaboration, in the lean supply chain design, uses a network of collaboration to communicate with suppliers. Application of this network adds value to organizational learning, and the knowledge input through this collaboration is incremental. Since operational collaboration favors the characteristics of the lean supply chain design, operational collaboration is predicted to have a positive relationship with the lean supply chain design performance. Thus;

H7: Operational collaboration has a positive relationship with the performance of a lean supply chain.

3.3.8 Research Hypotheses 8: A Lean Supply Chain performance has a positive relationship with the organization's operational performance

Cost efficiency increases a firm's performance not only through product and process waste reduction, but also by saving an abundance of time through information sharing. Active information sharing at the operational level reduces uncertainty. Errors or problems on current issues could immediately be addressed by both suppliers and buyers. Costs reduced at the global supply chain level can lead to costs reduced at the firm's level. Thus;

H8: Lean supply chain performance has a positive relationship with the organization's operational performance.

3.3.9 Research Hypotheses 9: Strategic Collaboration has a positive relationship with the performance of a responsive supply chain.

Strategic collaboration in the supply chain refers to the continuous efforts of a long-term commitment. It involves long-term collaboration and continuous learning. Learning in the strategic collaboration does not stop at any stage, but is a continuous process; yet it is experiential and risky. The risks can be reduced if firms have accurate and reliable information sharing between buyers and suppliers. It is also important to have reliable information regarding the market's needs and the customers' requests. Strategic collaboration involves continuous collaboration and cooperation particularly in the

activities which lead to innovation (Hult, 1998; Anderson & Weitz, 1992). The quality of innovation is shadowed by the trust and commitment among the participants. The more the participants communicate, the faster the information is captured; the cycle time can be reduced, and innovation performance should increase. Active innovation should lead to a higher performance of the supply chain. Thus

H9: Strategic Collaboration has a positive relationship with the performance of a responsive supply chain.

3.3.10 Research Hypotheses 10: The responsive supply chain performance has a positive relationship with the organization's strategic performance.

The attributes of a responsive supply chain performance are to be innovative, responsible, and the first in the market. If the products are executed faster than those of rivals, and the products are innovative, the firm should receive fruitful returns. The global supply chain that has the capability to increase performance through being responsive to customers certainly could increase organizational performance. If the suppliers are fast in delivering their customers' information and needs, the end product could be developed and processed faster. These situations lead to faster production, which eventually could satisfy customers' needs. Thus, the hypothesis is;

H10: The responsive supply chain performance has a positive relationship with the organization's strategic performance

CHAPTER 4

INSTRUMENT DEVELOPMENT – ITEM GENERATION AND PILOT-TEST

The focus of this chapter will be to discuss the methodology involved in the development and testing of instruments that would be required to support the hypotheses of this study. A total of twenty one sub-constructs have been conceptualized to support the analysis, and measures for each of these were developed. The sub-constructs conceptualized are: technology uncertainty, market internationalization, intellectual property protection, economic uncertainty, managerial cultural intelligence, structural cultural intelligence, competitive cultural intelligence, standardized product, innovative product, lean supply chain design, responsive supply chain design, operational collaboration, strategic collaboration, current commitment, continuous commitment, incremental learning, experiential learning, cost efficiency, lead time reduction, innovativeness, time to market, operational performance and strategic performance.

The development of these sub-constructs was carried out in three distinct stages:

I. Items generation and pre-test

II. Pilot study using Q-sort method

III. Large scale data analysis and instruments validation

The first stage involved defining the constructs, and developing of the initial items with the support of the theory and the relevant literature. A comprehensive and extensive review of the literature was conducted to ensure the correct definition of the construct. This also ensured that the instrument fulfilled the requirements of content validity and face validity. Content validity is the degree to which the elements of the instrument are relevant to, and representative of the targeted construct. Validation of the face validity finds out how representative is the item to the construct; i.e. the item should represent the construct‘s definition.

The second stage was a pilot study using the Q-sort method. The purpose of the Q-sort method is to pre-assess the convergent and discriminant validity of the scales (Moore and Benbasat, 1991). Convergent validity shows that the measures that are related should converge in one construct and are, in reality, related. Discriminant validity shows that measures that should not be related are, in reality, not related.

The third stage of instrument validation was large scale data collection. The instrument‘s validation for the third stage was conducted using the statistical packages, AMOS and SPSS. The third stage of instrument validation through large scale analysis will be discussed further in chapter 5. The detailed explanation of the first and second stages follows in this chapter.

4.1 Items Generation and Pre-Test

This section discusses the development and validation of the instrument through items generation and pre-test. The construct‘s definition and the items generation were developed through an intensive and comprehensive review of the available literature. The main requirement for instrument development and validation, in empirical research, is to

ensure that the instrument satisfies both content and face validity. Both content and face validity can be achieved through extensive support by the relevant literature, and consultations with academicians and practitioners. The list of the constructs and sub-constructs are briefly discussed below.

The items for perceived global challenges (i.e., technology uncertainty, market internationalization, intellectual property protection, and economic uncertainty), the type of product (i.e., standardized or innovative products), the design of the supply chain (lean and responsive), strategic collaboration (i.e., strategic collaboration, continuous commitment and experiential learning) and operational collaboration (operational collaboration, current commitment, and incremental learning) were developed from literature review and modified from previous research. The items for cultural intelligence (i.e., managerial cultural intelligence, structural cultural intelligence, and competitive cultural intelligence) were adopted and modified from a previous study of cultural intelligence conceptual research by Ang and Easley, 2003. The items for supply chain performance (i.e., innovativeness and time-to-market), operational supply chain collaboration (i.e., cost efficiency and lead time), operational and strategic performance were modified from previous research (Droge, Jayaram, and Vickery, 2000; Argawal et al., 2007; Droge, Jayaram, and Vickery, 2000;Snow et al. 1980; Crawford 1992; Song and Perry, 1997). Details of the literature that supported the sub-constructs were explained in chapter 2.

As explained above, the instruments that were developed in this study were a combination of modified and new measures. The measurements that were adopted from previous study had been tested in the United States. Since the large data collection was

conducted in Malaysia, the modified measurements needed to have another round of research validation. The step of the validation process involved consultations with the experts in supply chain management, i.e., academicians and practitioners. First, the items and definition of each construct were reviewed by two academicians. At this stage, the items sentence structure and definition of the constructs were clarified and, if necessary, modified. To strengthen the content and face validity of the instrument, items and definition of each construct were also reviewed by two practitioners. The practitioners were asked to evaluate the clarity of the construct definition and the items that represent each construct.

Based on the practitioners‘ comments, the items were reanalyzed; the ambiguous and unclear items were modified. Based on these consultations with academicians and practitioners‘, a pool of items was finalized. There were a total of twenty-one constructs and 137 items at this stage. All these items then entered the next stage of instrument development and validation, which was a pilot study through Q-sort method. Table 1 shows the number of items in each pool entering a Q-sort analysis.

4.2 Pilot Study Using Q-Sort Method

This section discusses the pilot study using Q-sort method. The objective of Q-sort method is to assess the initial convergent and discriminant validity of each construct. The measurement items entering Q-sort are shown in Appendix A. The number of items of each constructs and sub-constructs are shown in table 1. There were a total of 23 sub-constructs and 137 items involved in this process. The process of Q-sorting involves the identification of items that are supposed to belong to a specific construct. In this study, a total of six practitioners, in three rounds (identified as judge 1 and judge 2 for Q-sort

analysis) were asked to voluntarily participate to identify the items of the representative construct. Each Q-sorting method involved two judges. In each round, judges were given a list of items and were asked to read the definition of each construct. Then they were asked to sort the item in its representative construct based on the construct definition, and to their best knowledge.

The first round was considered completed after both judges finalized all items placement. Agreements of the items placement between the two judges were calculated in a composite format. The composite score for each round was calculated and analyzed using inter-rater reliabilities calculation. Detail explanations of inter-rater reliabilities and sorting procedures are discussed below.

4.2.1 Sorting Procedures

Sorting procedures start with a brief explanation of the Q-sort process given to the judges for each round. The definitions for entire constructs and sub-constructs were presented. The sorting procedure starts after the judges read all the construct validation. All the items were printed individually on 3 x 5 inch index cards. The first step was to shuffle the cards for the purpose of random order presentation. Then the cards were given to each judge; each judge sorted the cards into categories based on the construct that represent the item. An additional ―non applicable" category was added to ensure that the judges did not feel that the all the cards have to be in a certain category. Once all the cards were sorted, inter-rater reliabilities were calculated. Before proceeding to the next round, the items were modified or dropped. Appendix A shows the items that were drooped for each round.

Table 4.1: Constructs, sub-constructs and number of items entering Q-sort analysis

Constructs	**Sub-Constructs**	**Label**	**No of Items**
Perceived Global Challenges	Technology Uncertainty	TC	5
	Market Internationalization	MI	7
	Intellectual Property Protection	IPP	6
	Economic Uncertainty	EU	5
Cultural Intelligence	Managerial Cultural Intelligence	MCI	7
	Structural Cultural Intelligence	SCI	9
	Competitive Cultural Intelligence	CCI	7
Type of Product	Type of Product	TP	6
Lean Supply Chain Design	Lean Supply Chain Design	LSC	7
Responsive Supply Chain Design	Responsive Supply Chain Design	RSC	13
Operational Supply Chain Collaboration	Current Commitment	CC	6
	Operational Collaboration	OC	8
	Incremental Learning	IL	6
Strategic Supply Chain Collaboration	Experiential Learning	EL	5
	Continuous Commitment	CC	6
	Strategic Collaboration	SC	8
Operational Supply Chain Performance	Cost efficiency	CE	2
	Lead-Time Reduction	LT	2
Strategic Supply Chain Performance	Innovativeness	IN	4
	Time to Market	TM	6
Operational Performance	Operational Performance	OP	6
Strategic performance	Strategic Performance	SP	6
Total			**137**

4.2.2 Inter-Rater Reliabilities

The reliability of the Q-sort was analyzed using inter-rater reliabilities. The reliability of the procedure was tested by two methods. The first method was inter-judge agreement that is also known as Moore and Benbasat‘s hit ratio (Moore and Benbasat, 1991). The hit ratio is calculated based on the number of items which, both judges

agreed, belonged to a certain category. The second method was measured using Cohen‘s Kappa (Cohen 1960). This index is a method of eliminating change agreements, thus evaluating the true agreement score between the two judges. Both methods are compared with the total number of agreements between two judges for each round.

4.2.3 Results of the Three Round Q-Sorts

The results of the three round Q-sort are discussed in this section. Tables 4.2 to 4.7 present the results of three Q-sort rounds. In each round, two judges placed items into 23 categories. An additional ―non-applicable” category was added for items that did not match with any of the 23 usable categories. Table 4.1shows the name of the category based on the sub-construct name. For the first round of Q-sort, 137 items were placed for sorting procedures. The first round result placement ratio was 82.8% and Cohen‘s Kappa was 80.79%. After analyzing the results and considering the judges‘ recommendations, all the items that are off-diagonal were reworded or removed. A total of four items was removed for the next round of Q-sort. Tables 4.2 and 4.3 show the results from round 1.

After the instrument has been changed, a total of 133 items were entered in the second round Q-sort. In the second round the inter-judge agreement was 91.3% and Cohen‘s Kappa was 87.81%. Items that did not have total agreement between the two judges were removed or reworded. A total of 8 items were removed in this round. For the third round Q-sort, a total of 125 items were entered. The result of the inter-judge agreement for third round is 95.2% and Cohen‘s Kappa is 94.9%. A summary of the Q-sort analysis and Cohen‘s Kappa results are shown in table 4.8. After all the three Q-sort analyses, a final round of interview with one practitioner was conducted to identify the redundancy of the items. The practitioner suggested that product type should be divided

into categories since it represent different type of product. Another round with of final interview with one academician was conducted to get a second opinion of the practitioner‘s opinion. Both interviews suggested that product type should be divided into two sub-constructs. After both interviews, the items were finally analyzed, as a result the number of items that entered the large scale survey were 105 with twenty two sub-constructs. The detailed formula and calculations for each round are shown in Appendix B.

Table 4.2: Items placement ratio round 1

Theoretical	Actual Categories (Moore and Benbasat, 1991) Round 1																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	NA	T	%
1	10																						10	100%
2		13		1																			14	93%
3			10	2																			12	83%
4		1		9																			10	90%
5					12	1	1																14	86%
6						14	4																18	78%
7						2	12																14	86%
8								12															12	100%
9									10										2	2			14	86%
10									2	18								3	1	2			26	69%
11											14	2											16	88%
12											2	14											16	88%
13													12										12	100%
14														11	1								12	92%
15															8	4							12	67%
16															2	6					2		10	80%
17																	8						8	100%
18																		8					8	100%
19																			10	2			12	83%
20																				8	4		12	67%
21																				4	8		12	67%
NA																						0	0	0
Total Items : 274									Number of Hits = 227									Overall Hit Ratio = 82.8%						

No	Constructs	Items
1	Technology Uncertainty	5
2	Market Internationalization	7
3	Intellectual Property Protection	6
4	Economic uncertainty	5
5	Managerial cultural intelligence	7
6	Structural cultural intelligence	9
7	Competitive cultural intelligence	7
8	Types of product	6
9	Lean supply chain design	7
10	Responsive supply chain design	13
11	Operational collaboration	8
12	Strategic collaboration	8
13	Current commitment	6
14	Continuous commitment	6
15	Incremental learning	6
16	Experiential learning	5
17	Cost efficiency and lead time reduction	4
18	Innovativeness	4
19	Time to market	6
20	Operational performance	6
21	Strategic performance	6
	NA	0
Total		137

Table 4.3: Cohen-Kappa round 1: Cohen‘s Kappa coefficient round 1 = 80.79%

		Judge 1		
		Accept	Reject	Total
Judge 2	Accept	111	4	115
	Reject	3	22	22
	Total	114	23	137

Table 4.4: Items placement ratio round 2

Theoretical	Actual Categories (Benbasat and Moore, 1991) Round 2																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	NA	T	%
1	10																						10	100%
2		13		1																			14	93%
3			10																				10	100%
4		1		9																			10	90%
5					11	1																	12	92%
6						15	1																16	94%
7						1	10															1	12	83%
8								12															12	100%
9									11	1										2			14	79%
10									1	19									1	3		2	26	73%
11											16												16	100%
12												16											16	100%
13													12										12	100%
14														12									12	100%
15															12								12	100%
16																10							10	100%
17																	8						8	100%
18																		8					8	100%
19																			11		1		12	92%
20																				9	3		12	75%
21																				3	9		12	75%
NA																						0	266	0
	Total Items : 266						Number of Hits = 243								Overall Hit Ratio = 91.3%									

No	Constructs	Items
1	Technology Uncertainty	5
2	Market Internationalization	7
3	Intellectual Property Protection	5
4	Economic and political uncertainty	5
5	Managerial cultural intelligence	6
6	Structural cultural intelligence	8
7	Competitive cultural intelligence	6
8	Types of product	6
9	Lean supply chain design	7
10	Responsive supply chain design	13
11	Operational collaboration	8
12	Strategic collaboration	8
13	Current commitment	6
14	Continuous commitment	6
15	Incremental learning	6
16	Experiential learning	5
17	Cost efficiency and lead time reduction	4
18	Innovativeness	4
19	Time to market	6
20	Operational performance	6
21	Strategic performance	6
	NA	0
Total		133

Table 4.5 Cohen-Kappa round 2: Cohen‘s Kappa coefficient round 1 = 87.81%

		Judge 1		
Judge 2		Accept	Reject	Total
	Accept	117	4	121
	Reject	3	9	12
	Total	114	17	133

Table 4.6: Items placement ratio round 3

Theoretical	Actual Categories (Benbasat and Moore, 1991) Round 3																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	NA	T	%
1	10																						10	100%
2		13		1																			14	93%
3			10																				10	100%
4		1		9																			10	90%
5					11	1																	12	92%
6						14	2																16	88%
7							10																10	100%
8								12															12	100%
9									11	1													12	92%
10									1	16									1				18	89%
11											16												16	100%
12												16											16	100%
13													12										12	100%
14														12									12	100%
15															12								12	100%
16																10							10	100%
17																	8						8	100%
18																		8					8	100%
19																			10		2		12	92%
20																				9	1		10	90%
21																				1	9		10	90%
NA																						0	0	0%
Total Items : 250									Number of Hits = 238										Overall Hit Ratio = 95.2%					

No	Constructs	Items
1	Technology Uncertainty	5
2	Market Internationalization	7
3	Intellectual Property Protection	5
4	Economic and political uncertainty	5
5	Managerial cultural intelligence	6
6	Structural cultural intelligence	8
7	Competitive cultural intelligence	5
8	Types of product	6
9	Lean supply chain design	6
10	Responsive supply chain design	9
11	Operational collaboration	8
12	Strategic collaboration	8
13	Current commitment	6
14	Continuous commitment	6
15	Incremental learning	6
16	Experiential learning	5
17	Cost efficiency and lead time reduction	4
18	Innovativeness	4
19	Time to market	6
20	Operational performance	5
21	Strategic performance	5
NA		0
Total		125

Table 4.7 Cohen-Kappa round 3: Cohen‘s Kappa coefficient round 3 = 94.92%

		Judge 1		
		Accept	Reject	Total
Judge 2	Accept	114.00	3.00	117.00
	Reject	3.00	0.00	3.00
	Total	117.00	3.00	120.00

Table 4.8: Summary of inter-judge agreement (Benbasat and Moore) and Cohen‘s Kappa

Agreement Measure	**Round 1**	**Round 2**	**Round 3**
Moore and Benbasat hit ratio	**82.80%**	**91.30%**	**95.20%**
Cohen' Kappa	**80.79%**	**87.81%**	**94.92%**
Placement Ratio summary			
Technology Uncertainty	100%	100%	100%
Market Internationalization	93%	93%	93%
Intellectual Property Protection	83%	100%	100%
Economic uncertainty	90%	90%	90%
Managerial cultural intelligence	86%	92%	92%
Structural cultural intelligence	78%	88%	94%
Competitive cultural intelligence	86%	83%	100%
Types of product	100%	100%	100%
Lean supply chain design	86%	79%	92%
Responsive supply chain design	69%	73%	89%
Operational collaboration	88%	100%	100%
Strategic collaboration	88%	100%	100%
Current commitment	100%	100%	100%
Continuous commitment	92%	100%	100%
Incremental learning	67%	100%	100%
Experiential learning	80%	100%	100%
Cost efficiency and lead time reduction	100%	100%	100%
Innovativeness	100%	100%	100%
Time to market	83%	92%	92%
Operational performance	67%	75%	90%
Strategic performance	67%	75%	90%

CHAPTER 5

LARGE SCALE SURVEY AND INSTRUMENT VALIDATION

Chapter 5 discusses the research methodology and validation of the measurement model. The objective of this chapter is to further validate the measurement instrument using the large scale survey results.

5.1 Research Methodology

This section discusses the methodology used for the study. The methodology was designed to focus on 5 main elements:

- Data Collection
- Sample Characteristics of the Respondents and Organizations
- _Between-Response' Bias Analysis
- Large-scale Instrument Assessment

The following subsections will provide complete details about each of the element, the basis on which they were dealt with and their appropriateness to this study.

5.1.1 Data Collection

A large scale web – survey was used for the data collection. Since the study was related to the global supply chain, one of the characteristics that firms needed to possess is exposure to the international market. All the participating firms in the survey should have

been players in the international markets for at least one year. The focal point of the survey was the Malaysia- based international firms, as that country has emerged as a preferred destination for international investors.

Malaysia has more than 5000 foreign companies from more than 40 countries. Based on the Malaysian Industrial Development report (2009), Malaysia ranks within the top 30 countries for its global competitiveness. The global competitiveness report covers 133 countries, involving 110 indicators (MITI, 2009). Eighty percent of these indicators are based on an executive opinion survey and 20 percent are quantitative (gross domestic products, government spending, inflation rate and tax rate) surveys. The survey ranked Malaysia as number 8 in manufacturing innovations and as an efficiency driven country. Thus, Malaysia represented an attractive location for this research to seek an opinion in terms of the challenges facing manufacturers, especially in the context of a global supply chain.

The target respondents for this research comprised of leaders in those companies who understand how their firms‘ supply chain is functioning in a global context. It is therefore comprised of: chief executive officers, top management (including operations directors and supply chain directors), operations managers and purchase managers. Six industrial codes representing the core manufacturing base of Malaysia were selected for the purpose of this study, which are as follows: food, electronics, textiles, chemicals, heavy machinery and automotive.

The mailing lists for the survey were purchased from the Malaysian Industrial Development Authority and the Federation of Malaysian Manufacturers. Both listings

have a total of 2500 organizations. In this study, a web survey was used to collect data. The survey using a web-survey had several challenges. First, email addresses had to be filtered by a server program to guarantee that the email addresses were valid. Second, the undelivered emails were not counted in the final sample size since the respondents never received the survey, which resulted in the removal of 347 names from the list. The final mailing list contained 2153 names.

To ensure a reasonable response rate, the survey was sent in two waves and with two reminders. There were 58 automated email replies mentioning that the person was out of office, or no longer with the company, and these responses were not counted in the final sample size. A total of 225 respondents participated in the survey, out of which twenty one respondents did not complete the survey. Hence, the total usable respondents for this survey were 204 representing a response rate of 9.47%

5.1.2 Sample Characteristics of the Respondents and Organizations

Break up of the Respondents based on Job Titles: 14.6 % of the respondents are CEO's, 43.4 % are directors, 30% are managers and 3.9 % are assigned to the "other" category. Figure 5.1.2 .1 below shows the break-up based on job titles.

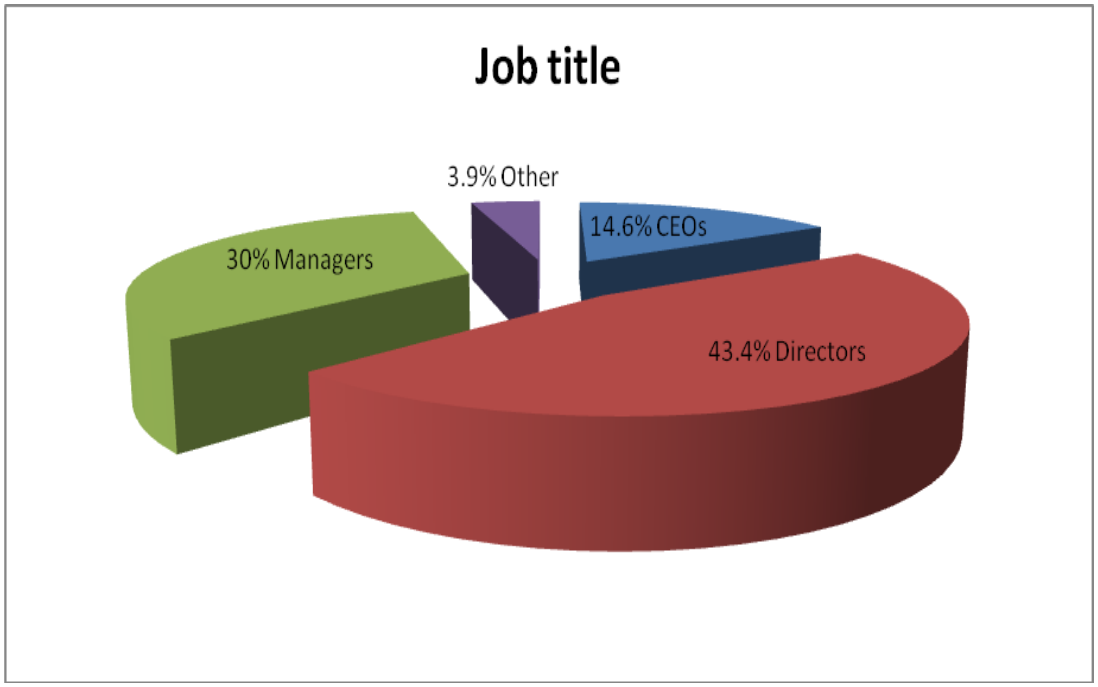


Figure 5.1.2.1 : Job title pie chart

Break up of Respondents based on Years spent in the Organization: 15.1% of the respondents had been in their organization for less than two years. 27.3% of the respondents had been in their organizations between two and five years. 19.0 % of the respondents indicated that they have been in their organizations between five and 10 years. 38.5 % of the respondents reported that they have been in their organizations for more than 10 years.

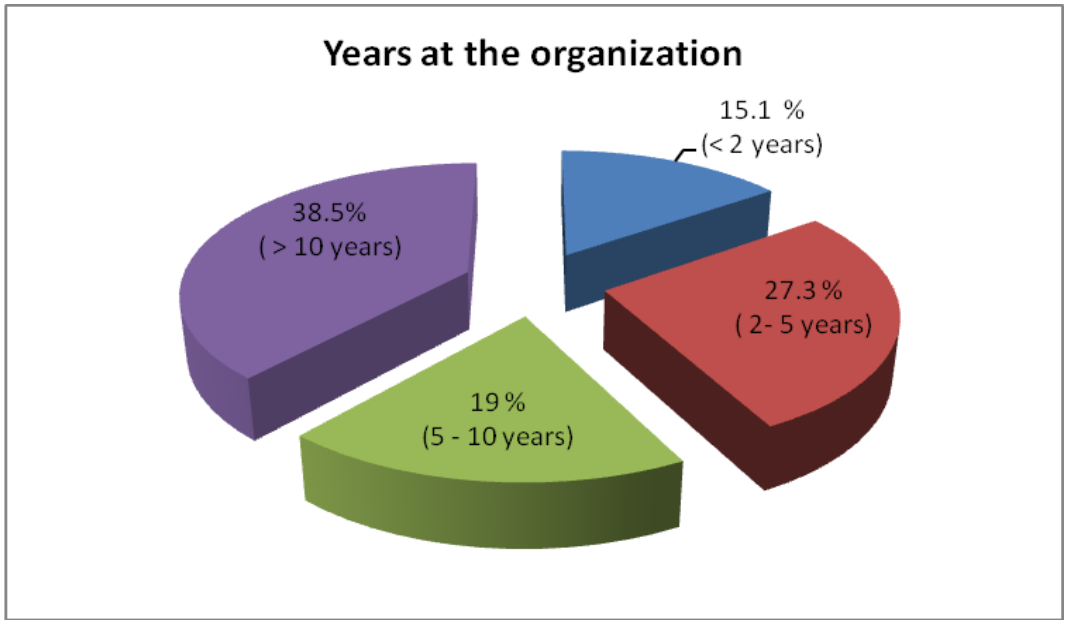


Figure 5.1.2.2 : Years spent at the organization pie chart.

Break up of the respondents based on Parent Company Location: 28.8 % of the organizations' parent companies were located in Japan. 32.2% in the U.S.A, 7.8% in the United Kingdom, 11.2% in China, 14.1% in Malaysia and 5.9% in other locations.

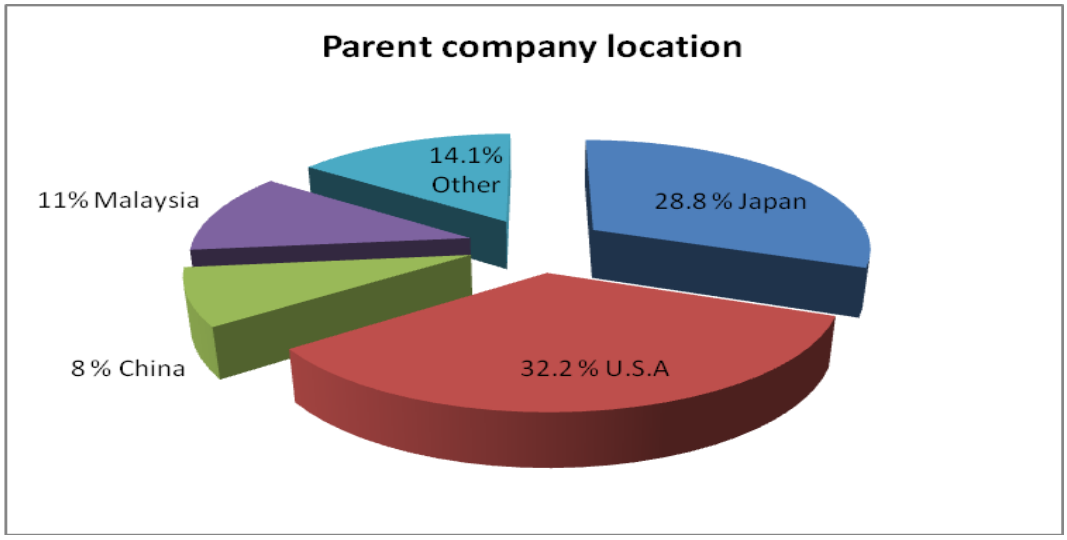


Figure 5.1.2.3 Parent company location pie chart

Break up of the Respondents based on the Number of Employees: 15.1% of the organizations had fewer than 100 employees, 41% of the organizations had 100 – 500 employees, 25.9% of the organizations surveyed had 500 – 1000 employees and 18% of the organizations had more than 1000 employees.

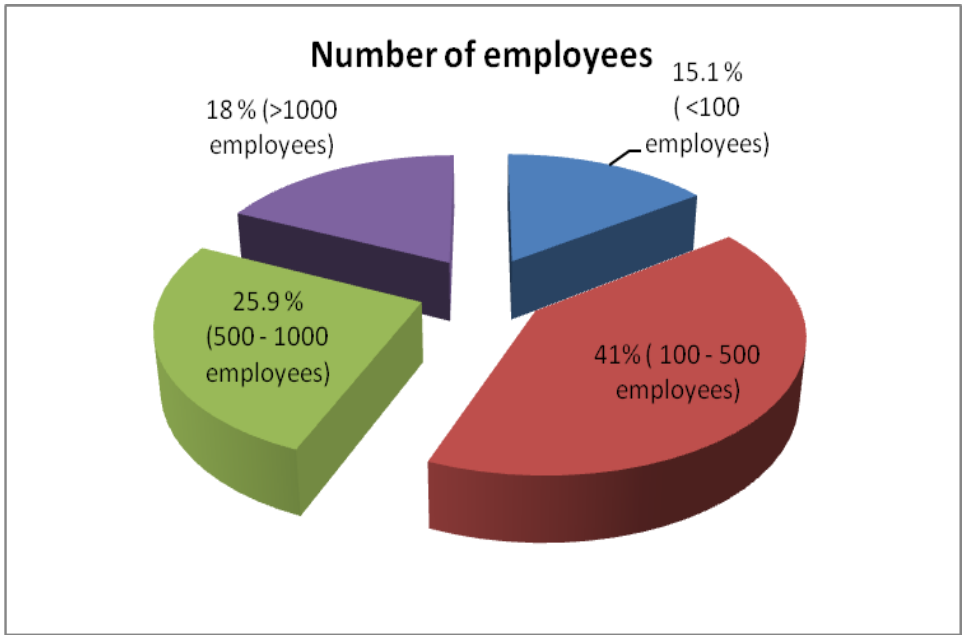


Figure 5.1.2.4 : Number of employees pie chart

Break up of the Respondents based on the Type of Industry: 54.1 % of the organizations were in electronics industry, 8.8 % in the textile industry, 14.1% in the chemical and plastic industry, 3.9% in the heavy machinery industry, 9% in the automotive industry, and 9.7% were in ―other‖ category.

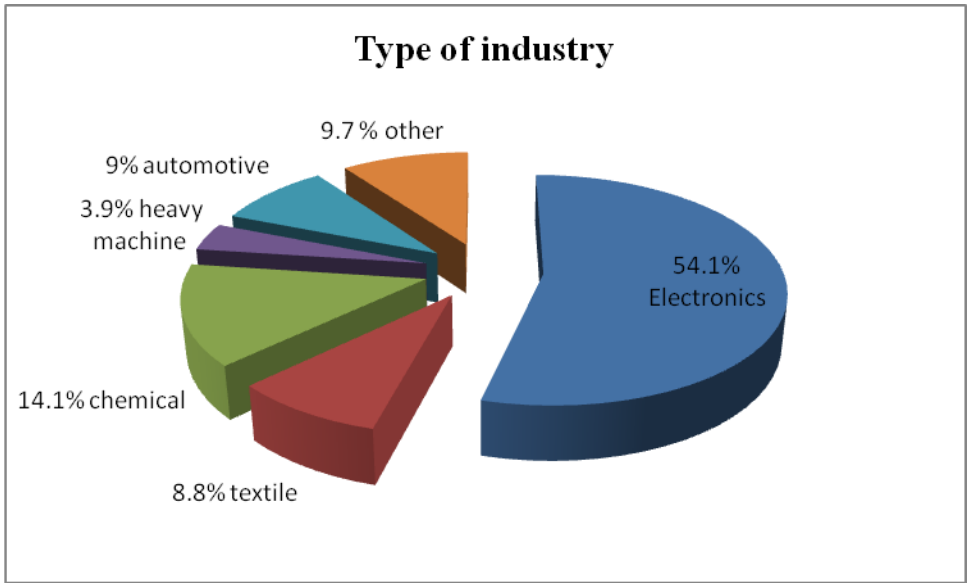


Figure 5.1.2.5 : Type of industry pie chart

Break up of the respondents based on International locations: 2 % of the organizations had two international locations, 27.8% of the organizations had three international locations, 21% of the organizations had more than five international locations, 38.5% of the organizations had more than 10 international locations, and 10% of the organizations had more than 50 international locations.

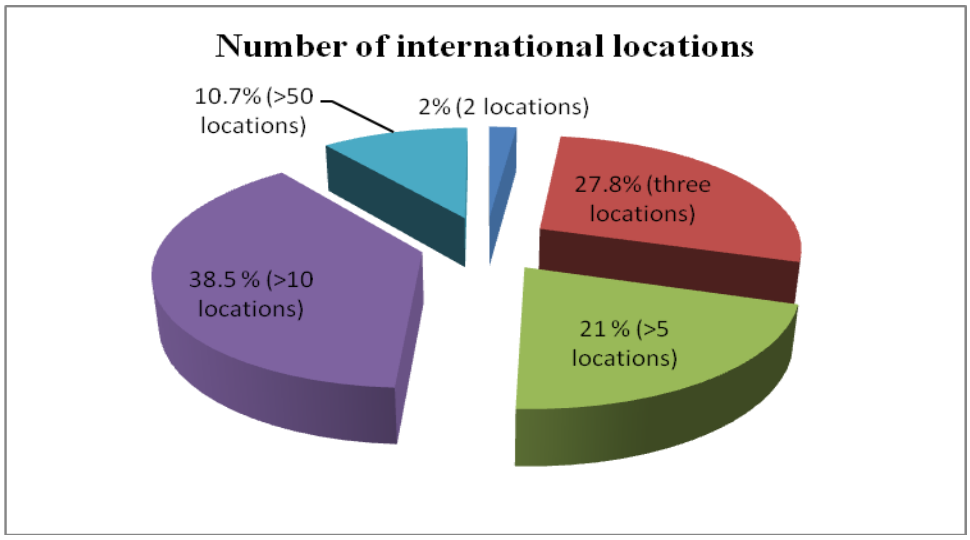


Figure 5.1.2.6 : Number of international locations pie chart

Between-Responses Bias Comparisons: Given that the survey for this research was broken into two waves, a major concern for the researcher was how to handle the possible biases between the first wave and the second wave. To ensure the validity of the survey, a validation similar to non response bias testing in between the first and second waves was necessary. Chi-square technique was deployed for the purpose of comparison between the two waves. Table 5.2 shows the results of Chi-square calculations and indicates that there are no significant differences in the respondent‘s years at the organization, type of industry, parent company location, and number of international locations between the two waves.

Table 5.1: Response comparisons (years at the organization, type of industry, parent company location, and number of international locations)

	First Wave	Second Wave (Expected)	Second Wave (Observed)	Chi-Square test
	Frequency (%)	Frequency (%)	Frequency (%)	
Number of years in Organization				
Less than 2 years	20 (13.60%)	8 (13.6%)	11(18.80%)	$\chi 2 = 5.65$
2 - 5 years	42 (28.60%)	17 (28.6%)	14 (24.30%)	df = 3
5 - 10 years	24 (16.30%)	10 (16.3%)	15 (25.90%)	P > 0.01
More than 10 years	61 (41.50%)	24 (41.5%)	18 (31.00%)	
	First Wave	Second Wave (Expected)	Second Wave (Observed)	Chi-Square test
Type of Industry				
Electronics	78 (30.77%)	31 (30.77%)	33 (56.89%)	
Textile	13 (5.13%)	5 (5.13%)	3 (5.17%)	$\chi 2 = 3.04$
Chemical	22 (8.69%)	9 (8.69%)	8 (13.79%)	df = 5
Heavy Machine	6 (2.37%)	2(2.37%)	2 (3.44%)	P > 0.1
Automotive	6 (2.37%)	2 (2.37%)	4 (6.90%)	
Other	21 (8.28%)	8 (8.28%)	8 (12.07%)	
Parent Company				
Malaysia	16 (10.9%)	6 (10.9%)	6 (10.3%)	$\chi 2 = 4.43$
USA	49 (33.3%)	19 (33.3%)	17 (29.3%)	df = 5
United Kingdom	7 (4.8%)	3 (4.8%)	5 (8.6%)	P > 0.1
China	16 (10.9%)	6 (10.9%)	7 (12.1%0	
Japan	48 (32.7%)	19 (32.7%)	16 (27.6%)	
Other	11 (7.5%)	4 (7.5%)	7 (12.1%)	
Number of International location				
Two	4 (2.7%)	2 (2.7%)	0 (0%)	$\chi 2 = 4.26$
Three	42 (28.6%)	17 (28.6%)	15 (25.9%)	df = 4
more than 5	32 (21.8%)	12 (21.8%)	11 (19%)	P > 0.1
more than 10	56 (38.1%)	22 (38.1%)	23 (39.7%)	
more than 50	13 (8.8%)	5 (8.8%)	9 (15.5%)	

5.1.3 Large-scale Instrument Assessment

This section discusses the assessment used to evaluate reliability and validity of the measurement model. Reliability measures the consistency of an instrument. Validity refers to the degree to which a study assesses the specific concept that a researcher attempts to measure. Following guidelines from Bargozzi and Phillip (1982), the properties used to ensure that the instrument is reliable and valid are content validity, convergent validity, and reliability.

Content validity: Content validity refers to the extent to which all the items in a particular construct represent it accurately. In this study, content validity was measured through a comprehensive review of the literature, and items validation with academicians and practitioners. As a result, several items that did not represent the construct have been reworded or removed. Content validity was completed in chapter 4.

Convergent validity: Convergent validity refers to the measurement of items that converge in a particular construct. To support the evidence of the existence of convergent validity, confirmatory factor analysis (CFA) was conducted. Measurement analysis for convergent validity was conducted though a statistical package software, AMOS. The existence of convergent validity will be supported if the fit parameters show acceptable value. This study uses several fit parameters such as: goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and root mean square residual (RMR). GFI indicates the relative amount of variance and covariance jointly explained by the model. AGFI differs from GFI in the fact that it adjusts the degree of freedom in the model. A good value for GFI is higher than 0.90, although a value between 0.80-0.90 is acceptable

(Joreskog and Sorbom, 1989). RMR indicates the square root amount of the mean squared amount by which the sample variance and covariances differ from the corresponding estimated variances and covariances. The acceptable value for RMR is below 0.05 (Joreskog and Sorbom, 1989). The smaller the RMR value, the better the fit of the model.

Reliability and purification: The objective of a purification process would be to identify and remove the items that do not fit in with a particular construct. In order to test for the purification, corrected-item total correlation (CITC) was used. CITC indicates whether the variable actually belongs to the construct or not. Items were deleted if their scores were below 0.5, unless there was a clear reason or theoretical justification to keep an item in spite of the low score. Reliability was measured by Cronbach‘s alpha, which measures how well the items measure a single unidimensional latent construct. The acceptable value for Cronbach‘s alpha is 0.70 and above.

Discriminant Validity: The objective of discriminant validity is to measure the independence of the dimension of each construct (Bagozzi and Yi, 1988). Discriminant validity was tested using a pair-wise comparison using structural equation model. Pair-wise comparison follows three steps: 1) analysis of two dimensions in one construct was constructed in a correlated model, and the value of chi-square was recorded, 2) the two dimensions were tested in one single model, and the value of chi-square was recorded, 3) the discriminant validity is supported if the difference between the two chi-square scores (step 1 and 2) is significant at $P < 0.05$ (Bagozzi & Yi, 1988).

5.2 Large Scale Measurement Analysis and Results

The following section presents the large scale measurement result for twelve constructs: perceived global challenges (PGC), cultural intelligence (CI), standardized products (TPS), innovative products (TPV), lean supply chain design (LSC), responsive supply chain design (RSC), operational collaboration (OCC), strategic collaboration (SCC), operational supply chain performance (OSCP), strategic supply chain performance (SCCP), organizational operational performance (OOP) and strategic organizational performance (SOP). For each construct, the assessment methodology described in the previous section has been applied. A summary of total final items, measurement analysis of convergent validity, CITC purification and Cronbach's alpha is shown in table 5.2. Details of measurement model for each construct are explained in the following sections.

Table 5.2: A summary of measurement analysis of convergent validity and CITC

Measurement Model Analysis Summary						
		GFI	**AGFI**	**RMR**	**CITC Range**	**α**
Perceived Global Challenges	**# of final items**					
Technology Uncertainty	3	0.99	0.97	0.02	0.50 - 0.66	0.77
Market Internationalization	3	0.98	0.92	0.04	0.58 - 0.66	0.76
Intellectual Property Protection	4	0.98	0.89	0.03	0.50 - 0.73	0.81
Cultural Intelligence						
Managerial Cultural Intelligence	4	0.98	0.92	0.01	0.60 - 0.75	0.86
Structural Cultural Intelligence	6	0.99	0.98	0.01	0.50 - 0.68	0.82

Competitive Cultural Intelligence	3	0.99	0.98	0.01	0.75 - 0.85	0.89

Standardized Product	3	0.99	0.97	0.02	0.57 - 0.78	0.87
Innovative Product	2	0.98	0.84	0.04	0.57- 0.57	0.73
Lean Supply Chain Design	4	0.99	0.96	0.01	0.72 - 0.76	0.87
Responsive Supply Chain Design	7	0.99	0.96	0.02	0.65 -0.80	0.89

Operational Collaboration						
Current Commitment	4	0.99	0.96	0.01	0.63 - 0.78	0.85
Incremental Learning	5	0.97	0.87	0.01	0.76 - 0.89	0.94
Operational Collaboration	5	0.98	0.92	0.01	0.79 -0.85	0.91

Strategic Collaboration						
Continuous Commitment	4	0.98	0.82	0.01	0.76 - 0.81	0.90
Experiential Learning	5	0.95	0.86	0.03	0.56 - 0.91	0.89
Strategic Collaboration	8	0.98	0.82	0.01	0.75 -0.85	0.92

Operational Supply Chain Performance						
Lead time reduction	4	0.99	0.95	0.02	0.56 - 0.79	0.81

Strategic Supply Chain performance						
Time to Market	4	0.97	0.91	0.02	0.57 - 0.84	0.81
Innovativeness	3	0.99	0.95	0.02	0.54 - 0.73	0.80

Operational Organizational Performance	3	0.99	0.99	0.01	0.87 -0.61	0.72
Strategic Organizational Performance	4	0.99	0.99	0.01	0.67 0.78	0.88

5.2.1 Perceived Global Challenges

Four key dimensions, represented by 17 sub-dimensions, were used to depict the perceived global challenges construct as follows: technology uncertainty (TC), which includes 4 items – TC1, TC2, TC3 and TC4; market internationalization (IM), which includes 4 items – IM1, IM2, IM3 and IM4; intellectual property protection (DP), which includes 5 items – DP1, DP2, DP3, DP4, DP5; and economic uncertainty (EU), which includes 4 items – EU1, EU2, EU3 and EU 4.

Convergent Validity: AMOS 7.0 was used to analyze convergent validity. Each of the constructs was analyzed for the measurement model and Table 5.2.1.1 below shows the result of the measurement model for analysis of each dimension.

The TC dimension shows good model fit indices with GFI = 0.99, AGFI = 0.97 and RMR = 0.02. For this dimension, the indices show a good model fit with no modification index that shows error correlation. The IM dimension also shows good model fit with GFI = 0.98, AGFI = 0.92 and RMR = 0.04. There is no evidence of error correlation in this dimension. These indices are evidence of good model fit and no further elimination is needed for this dimension.

The initial model fit for dimension DP consisted of GFI = 0.89, AGFI = 0.68 and RMR = 0.08; these indices showed a poor fit for this dimension. Further analysis of this modification index dimension shows that strong error correlation existed between DP4 and DP5. The high modification index (MI) for these items shows that these items somehow are correlated or redundant. After full consideration, we decided to drop DP5.

The new model fit indices improved significantly to GFI = 0.98, AGFI = 0.89 and RMR = 0.03.

The initial model fit for EU consisted of GFI = 0.95, AGFI = 0.77 and RMR = 0.09. These indices did not show a reasonable model fit. MI shows correlation exists between EU1 and EU3. Further analysis showed that both items did not represent the same meaning; however, item EU 1 might be a leading factor for EU3. We decided to correlate both items; the new modification indices improved with GFI = 0.98, AGFI = 0.83 and RMR = 0.07. These indices show a reasonable model fit.

Table 5.2.1.1 Convergent validity (PGC)

Coding	**Items**	**Initial model fit**	**Final model fit**
	Technology Uncertainty (TC)		
TC1	Technology changes in our industry are frequent.	GFI = 0.99	GFI = 0.99
TC2	Technology changes in our industry are unpredictable	AGFI = 0.97	AGFI = 0.97
TC3	Technology changes in our industry are fairly major.	RMR= 0.02	RMR= 0.02
TC4	Technology changes in our industry give us advantages over our competitors.		
	International Market (IM)		
IM1	Our competitors are primarily foreign/international companies.	GFI = 0.98	GFI = 0.98

IM2	We have loyal customers in the international market.	AGFI = 0.92	AGFI = 0.92
IM3	We have gained more market share in the international market.	RMR= 0.04	RMR= 0.04
IM4	We have higher risk in the international market.		
	Intellectual Property Protection (DP)		
DP1	We have agreements with our suppliers about our data protection.	GFI = 0.89	GFI = 0.98
DP2	We feel safe to share our confidential information with our suppliers.	AGFI = 0.68	AGFI = 0.89
DP3	We can trust our suppliers on issues regarding security.	RMR= 0.08	RMR= 0.03
DP4	Our suppliers do not expose our intellectual property to a third party.		**DP 5 deleted**
DP5	Our suppliers ensure that only authorized employees log into confidential databases.		
	Economic Uncertainty (EU)		
EU1	We are looking forward to having the Free Asian Trade Agreement.	GFI = 0.95	GFI = 0.98
EU2	We do not have any problems or issues related to a country's currency fluctuation.	AGFI = 0.77	AGFI = 0.83
EU3	We have strategies in place to respond to changes in the global economy.	RMR= 0.09	RMR= 0.07
EU4	Current economic situations have a major impact on our business.		**EU1 and EU4 are correlated**
EU5	Current economic situations have a minor impact on our business.		

Reliability: CITC analysis for TC shows that only two out of four items of TC are above 0.5. The CITC value of these two items (TC3 and TC4) are below the cut-off value. Careful examination of the items reveals that TC3 is too general and cannot be applied to all types of industries. Item TC3 was deleted and CITC was re-run without TC3. CITC second round reveals that all three items are above 0.50. The TC reliability for the first round is 0.73 and for the second round is 0.77. For IM dimensions, only one item (IM4) has a CITC below 0.5. Item four was deleted and CITC 2 shows that all items are above 0.5. The CITC scores for all items in dimension DP are above 0.5. The Cronbach's alpha for this dimension is 0.80. Second analysis of CITC shows all items are above 0.50 with 0.81 Cronbach's alpha.

The next dimension is EU. This dimension did not show good or acceptable CITC and reliability. Cronbach's alpha for this dimension was 0.51, which was below the recommended value. Careful examination of the items revealed a reason for this result: an organization that has multiple international locations faces different economic situations differently, so one respondent cannot justify all economic situations in one research question. Since the statistical value is below the required value for reliability, we decided to drop the EU dimension. Table 5.2.1.2 shows the result of measurement model analysis for each dimension.

Table 5.2.1.2 Reliability assessment for PGC

Coding	Technology Uncertainty	CITC 1	α	CITC 2	α
TC1	Technology changes in our industry are frequent.	0.65		0.66	
TC2	Technology changes in our industry are unpredictable.	0.66	0.73	0.67	0.77
TC3	Technology changes in our industry are fairly major.	0.34			
TC4	Technology changes in our industry give us advantages over our competitors.	0.46		0.50	
	International Market (IM)				
IM1	Our competitors are primarily foreign/international companies.	0.61		0.58	
IM2	We have loyal customers in the international market.	0.51	0.73	0.58	0.76
IM3	We have gained more market share in the international market.	0.65		0.66	
IM4	We have higher risk in the international market.	0.32			
	Data Protection (DP)				
DP1	We have agreements with our suppliers about our data protection	0.61		0.61	
DP2	We feel safe to share our confidential information with our suppliers.	0.67	0.8	0.73	0.81
DP3	We can trust our suppliers on issues	0.69		0.73	

	regarding security.				
DP4	Our suppliers do not expose our intellectual property to a third party.	0.56		0.50	
	Economic Uncertainty (EU)				
EU1	We are looking forward to having the Free Asian Trade Agreement.	0.41			
EU2	We do not have any problems or issues related to a country's currency fluctuation.	0.41	0.51		NA
EU3	We have strategies in place to respond to changes in the global economy.	0.40			
EU4	Current economic situations have a major impact on our business.	0.27			
EU5	Current economic situations have a minor impact on our business.	0.29			

Discriminant Validity: Table 5.2.1.3 below shows the result from discriminant analysis; the difference between the chi-square value for the difference in the degrees of freedom is statistically significant at $P < 0.01$. This result supports the existence of discriminant validity for the construct.

Table 5.2.1.3 : Discriminant validity assessment for PGC

	Chi Square/d.f.		
Construct	Single	Correlated	Diff.
TC - IM	215(20)	55(19)	160(1)
TC - DP	204(14)	57(13)	147(1)
IM - DP	114 (14)	76(13)	38(1)

5.2.2 Cultural Intelligence Construct

The initial perceived cultural intelligence (CI) construct was represented by three dimensions and 14 items, including managerial cultural intelligence (MCI), which includes 5 items – MC11, MCI2, MCI3, MCI4 and MCI5; structural cultural intelligence (SCI), which includes 6 items – SC11, SCI2, SCI3, SCI4, SCI5 and SCI6; and competitive cultural intelligence (CCI), which includes 3 items – CC11, CCI2, and CCI3.

Convergent Validity: Data analysis for this convergent validity was done using AMOS 7.0. Each of the constructs was analyzed for measurement model. Table 5.2.2.1 shows the result of measurement model analysis for each dimension.

The initial model fit indices for MCI consisted of GFI = 0.83, AGFI = 0.50 and RMR = 0.06. These indices were not a good reasonable fit. After reviewing the output, the result of covariance of error indicated that error in MCI5 is correlated with MCI3 and MCI2 with high value. Therefore, we decided to remove item MCI5. Item MCI5 represents non-verbal communication; elimination of the item should not have substantial

impact on the construct. New indices show GFI = 0.98, AGFI = 0.92 and RMR = 0.01. The final indices represent a good fit to the data.

The initial model fit indices for SCI consisted of GFI = 0.83, AGFI = 0.59 and RMR = 0.05; these indices indicated poor model fit. Analysis of AMOS covariance correlated error reveals that SCI6 and SCI4 are highly correlated with SCI5 and SCI3. Instead of removing all items that have high error correlation, only one item (SCI4) is removed, and further analysis correlates SCI6 with SCI5. Final analysis improved significantly and consists of GFI = 0.99, AGFI = 0.98 and RMR = 0.01. The final indices represent a good model fit.

The CCI dimension consists of only 3 items. For the purpose of measurement validation analysis, one item from MCI was added to the dimension. The results show a good model fit with GFI = 0.99, AGFI – 0.98 and RMR = 0.01.

Table 5.2.2.1: Convergent validity (model fit) assessment for CI

Coding	Items	Initial model fit	Final model fit
	Managerial Cultural Intelligence (MCI)		
MCI1	Our managers are able to understand cultural differences when interacting with culturally different suppliers.	GFI = 0.83	GFI = 0.98
MCI2	Our managers are able to understand the legal and economic systems of other cultures.	AGFI = 0.50	AGFI = 0.92
MCI3	Our managers are able to understand the cultural	RMR=	RMR= 0.01

	values and religious beliefs of other cultures.	0.06	
MCI4	Our managers are able to modify their verbal behavior (words, tone, style) when cross-cultural communication requires it.		MCI5 deleted
MCI5	Our managers are able to modify their nonverbal behavior (gestures, time, and space orientation) when a cross-cultural interaction requires it.		
	Structural Cultural Intelligence (SCI)		
SCI1	Our managers are able to convey the expectations we have of our international business partners.		
SCI2	Our managers are able to understand the expectations our international business partners have of us.	GFI = 0.83	GFI = 0.99
SCI3	Our managers are able to develop culturally appropriate standard operating procedures with our international business partners.	AGFI = 0.59	AGFI = 0.98
SCI4	Our managers are able to develop knowledge-sharing strategies (culture-related) with our international business partners.	RMR= 0.05	RMR= 0.01
SCI5	Our managers are able to build culturally appropriate plans that ensure smooth transitions when activities are moved to offshore partners.		SCI 14 deleted
SCI6	Our managers are able to resolve cultural differences in expectations with our international business partners.		
Coding	**Items**	**Initial model fit**	**Final model fit**
	Competitive Cultural Intelligence (CCI)		

CCI1	Our firm has the strategy in place to evaluate the competitive risks of off-shoring.	GFI = 0.97	GFI = 0.97
CCI2	Our firm has the legal mechanisms in place to manage risks associated with proprietary firm knowledge.	AGFI = 0.98	AGFI = 0.98
CCI3	Our firm has the resources to assess the cultural compatibility of international business partners.	RMR= 0.01	RMR= 0.01

Reliability: The result of the analysis for CITC purification for cultural intelligence appears in Table 5.2.2.2. All the items are above 0.50, and reliability for all three dimensions is above the cut-off value, which is 0.70.

Table 5.2.2.2 Reliability assessment for CI

Coding	**Managerial Cultural Intelligence (MCI)**	**CITC**	**α**
MCI1	Our managers are able to understand cultural differences when interacting with culturally different suppliers.	0.75	0.86
MCI2	Our managers are able to understand the legal and economic systems of other cultures.	0.74	
MCI3	Our managers are able to understand the cultural values and religious beliefs of other cultures.	0.74	
MCI4	Our managers are able to modify their verbal behavior (words, tone, style) when cross-cultural communication requires it.	0.60	
	Structural Cultural Intelligence (SCI)		
SCI1	Our managers are able to convey the expectations we have of our international business partners.	0.68	

SCI2	Our managers are able to understand the expectations our international business partners have of us.	0.58	0.82
SCI3	Our managers are able to develop culturally appropriate standard operating procedures with our international business partners.	0.63	
SCI5	Our managers are able to build culturally appropriate plans that ensure smooth transitions when activities are moved to offshore partners.	0.50	
SCI6	Our managers are able to resolve cultural differences in expectations with our international business partners.	0.60	
Coding	**Competitive Cultural Intelligence (CCI)**	**CITC**	**α**
CCI1	Our firm has the strategy in place to evaluate the competitive risks of off shoring.	0.85	0.89
CCI2	Our firm has the legal mechanisms in place to manage risks associated with proprietary firm knowledge.	0.75	
CCI3	Our firm has the resources to assess the cultural compatibility of international business partners.	0.79	

Discriminant Validity: Table 5.2.2.3 below shows the result from discriminant analysis; the difference between the chi-square value for the difference in the degrees of freedom is statistically significant at $P < 0.01$. This result indicates support for the existence of discriminant validity for the construct.

Table 5.2.2.3 Discriminant validity assessment for CI

	Chi Square/d.f.		
Construct	Single	Correlated	Diff.
SCI - MCI	486(35)	432(34)	54(1)
SCI - CCI	332(20)	139(19)	193(1)
CC - CCI	447 (20)	134(19)	313(1)

5.2.3 Product Type

Product Type construct was represented by two dimensions and 6 items, including standardized product (TPS), which includes 3 items – TPS1, TPS2, and TPS3; and innovative product (TPV), which includes 3 items – TPV1, TPV2 and TPV3

Convergent Validity: Data analysis for this convergent validity was done using AMOS 7.0. Each of the constructs was analyzed for measurement model. Table 5.2.3.1 below shows the results of measurement model analysis for each dimension.

The TPS dimension consists of only 3 items. For the purpose of measurement validation analysis, one item from TPV was added to the dimension. The results shows a good model fit with GFI = 0.99, AGFI – 0.97 and RMR = 0.02. For TPV dimension analysis, one item was added to the analysis for the purpose of instruments validation. The result indicates that the construct has a moderate model fit with GFI = 0.98, AGFI = 0.84 and RMR = 0.04.

Table 5.2.3.1 Convergent validity (model fit) assessment for TP.

Coding	Items	Initial model fit	Final model fit
	Standardized Products (TPS)		
TPS1	Our firm produces products that have a short life-cycle.	GFI = 0.99	GFI = 0.99
TPS2	Our firm produces standardized products.	AGFI = 0.97	AGFI = 0.97
TPS3	Our firm produces products that have stable demand.	RMR= 0.02	RMR= 0.02
	Innovative Products (TPV)		
TPV1	Our firm produces innovative/complex products.	GFI = 0.98	GFI = 0.98
TPV2	Our firm produces products that have unpredictable demand.	AGFI = 0.84	AGFI = 0.84
TPV3	Our firm produces products that have unstable demand	RMR= 0.04	RMR= 0.04

Reliability: The result of the analysis for CITC purification for the type of product appears in table 5.2.3.2. All the items are above 0.50, and the reliability for all three dimensions is above the cut-off value, which is 0.70.

Table 5.2.3.2 Reliability assessment for TP

Coding	Items	CITC	α
	Standardize Products (TPS)		
TPS1	Our firm produces products that have a short life-cycle.	0.76	0.87
TPS2	Our firm produces standardized products.	0.78	
TPS3	Our firm produces products that have stable demand.	0.72	
	Innovative Products (TPV)		
TPV1	Our firm produces innovative/complex products.	0.57	
TPV2	Our firm produces products that have unpredictable demand.	0.57	0.73
TPV3	Our firm produces product s that have unstable demand	0.56	

Discriminant Validity: Table 5.2.3.3 below shows the result from discriminant analysis; the difference between the chi-square value for the difference in the degrees of freedom is statistically significant at $P < 0.01$. This result indicates support for the existence of discriminant validity for the construct.

Table 5.2.3.3 Discriminant validity analysis for TP

Construct	Innovative Products (TPV) Chi Square (d.f.)		
	Single	Correlated	Diff.
TPS	61(5)	26(4)	35(1)

5.2.4 Lean Supply Chain Design

The initial lean supply chain is represented by one dimension and 5 items, including LS1, LS2, LS3, LS4 and LS5.

Convergent Validity: Data analysis for this convergent validity was performed using AMOS 7.0. The lean supply chain construct has one dimension. Table 5.2.4.1 below shows the results of measurement model analysis for the dimension. The results showed a moderately poor model fit with GFI = 0.89, AGFI – 0.67 and RMR = 0.04. Further modification was conducted based on modification index. Error correlation existed between LS5 and LS1 and LS 4 and LS2. Since LSC is correlated with three other items, we decided to delete LS5. The new fit indices improved with GFI = 0.99, AGFI = 0.96 and RMR = 0.01.

Table 5.2.4.1: Convergent validity for LSC

Coding	**Lean Supply Chain Design (LSC)**	**Initial model fit**	**Final model fit**

LS1	We eliminate non-value product development processes.		
LS2	We simplify our process development to eliminate waste.	GFI = 0.95	GFI = 0.99
LS3	We use the same quality programs (to eliminate double-step processes) as our suppliers.	AGFI = 0.75	AGFI = 0.96
LS4	We mainly use forecasting methods to project our production resources.	RMR= 0.02	RMR= 0.01
LS5	We work with our suppliers to save costs in our current production plan.		LS5 deleted,

Reliability: The results of the analysis for CITC purification for lean supply chain design are shown in table 5.2.4.2. All the items are above 0.50, and the reliability for all three dimensions is above the cut-off value, which is 0.70.

Table 5.2.4.2: Reliability for LSC

Coding	**Lean Supply Chain Design (LSC)**	**CITC**	**α**
LS1	We eliminate non-value product development processes.	0.76	
LS2	We simplify our process development to eliminate waste.	0.72	
LS3	We use the same quality programs (to eliminate double-step processes) as our suppliers.	0.79	0.87
LS4	We mainly use forecasting methods to project our production resources.	0.74	

5.2.5 Responsive Supply Chain Design

The initial responsive supply chain design construct was represented by one dimension and 8 items, including RS1, RS2, RS3, RS4, RS5, RS6, RS7 and RS8.

Convergent Validity: Data analysis for this convergent validity was performed using AMOS 7.0. The responsive supply chain construct has one dimension; it was analyzed for measurement model. Table 5.2.5.1 below shows the results of measurement model analysis for the dimension. The results showed a moderately poor model fit with GFI = 0.77, AGFI = 0.62 and RMR = 0.04. Further modification was conducted based on modification index. Error correlation existed between RS8 and RS4 and RS3 and RS2. Since all items represent different aspects, and after full consideration, only item RS8 was deleted; the remaining items were kept for further analysis. Item 8 was deleted because of low alpha coefficient. The new fit indices improved with GFI = 0.99, AGFI = 0.96 and RMR = 0.02.

Table 5.2.5.1: Convergent validity (model fit) assessment for RSC

Coding	Responsive Supply Chain Design (RSC)	Initial model fit	Final model fit
RS1	We modify our products as per customer request.		
RS2	We increase our level of customization as per customer request.	GFI = 0.79	GFI = 0.99
RS3	We constantly interact with our customers.	AGFI = 0.62	AGFI = 0.96

RS4	We constantly commit to improve on product performance.	RMR= 0.03	RMR= 0.02 RS8 deleted
RS5	We deliver in less cycle time.		
RS6	We pay attention to our innovation process.		
RS7	We consider our innovation activity highly active.		

Reliability: The results of the analysis for CITC purification for responsive supply chain design appear in table 5.2.5.2. All the items are above 0.50, and the reliability for all three dimensions is above the cut-off value, which is 0.70.

Table 5.2.5.2 Reliability assessment for RSC

	Responsive Supply Chain Design	**CITC**	**α**
RS1	We modify our products as per customer request.	0.65	0.89
RS2	We increase our level of customization as per customer request.	0.78	
RS3	We constantly interact with our customers.	0.73	
RS4	We constantly commit to improve our product performance.	0.79	
RS5	We deliver in less cycle time.	0.82	
RS6	We pay attention to our innovation process.	0.80	
RS7	We consider our innovation activity highly active.	0.69	

5.2.6. Operational Collaboration

The initial operational collaboration construct was represented by three dimensions and 18 items, including operational collaboration (OCC), which includes 8 items – OC1, OC2, OC3, OC4, OC5, OC6, OC7 and OC8; current commitment (CC), which includes 4 items – CC1, CC2, CC3 and CC4; incremental learning (IL), which includes 6 items – IL1, IL2, IL3, IL4, IL5 and IL6.

Convergent Validity: Data analysis for this convergent validity was done using AMOS 7.0. The operational collaboration dimension has eight items. Table 5.2.6.1 below shows the results of measurement model analysis for all the dimensions in construct OC.

The initial analysis for dimension OC shows a reasonable fit with GFI = 0.90, AGFI = 0.76 and RMR = 0.04. Modification indices were analyzed; OC 7 and OC5 are highly correlated with OC3 and OC1. Since these items represent similar meaning, the items (OC 5 and OC7) were deleted. OC1 also slightly correlated with OC6 and OC8. We decided to correlate and keep the items for further analysis. The final result was highly improved with GFI = 0.98, AGFI = 0.92 and RMR = 0.01.

The initial model fit for CC consists of GFI = 0.95, AGFI = 0.77, RMR = 0.04. These indices represent moderate model fit. Item CC4 and CC3 are correlated. We decided to keep both items because items indicate that CC4 could lead to CC5. Further analysis after correlation reveals a better model fit with GFI = 0.97, AGFI = 0.96 and RMR = 0.01.

The initial model fit for IL consisted of GFI = 0.94, AFGI = 0.99 and RMR = 0.02. In reviewing the modification indices, IL3 was highly correlated with IL4. IL3 was deleted. Further analysis after the correlation reveals a better model fit with GFI = 0.97, AGFI = 0.87 and RMR = 0.01.

Table 5.2.6.1: Convergent validity (model fit) assessment for OCC

Coding	**Operational Collaboration (OC)**	**Initial model fit**	**Final model fit**
OC1	Our suppliers communicate with us regarding their current capacity plans.		
OC2	Our suppliers communicate with us regarding their current quality issues.	GFI = 0.90	GFI = 0.98
OC3	Our suppliers communicate with us regarding their current logistics issues.	AGFI = 0.76	AGFI = 0.92
OC4	Our suppliers communicate with us regarding their current production plans.	RMR= 0.03	RMR= 0.01
OC5	Our suppliers share with us their current capacity plans.		
OC6	Our suppliers share with us their current quality issues.		
OC7	Our suppliers share with us their current logistics issues.		OC5 and OC 7 were deleted
OC8	Our suppliers share with us their current production plans.		
	Current Commitment (CC)		

CC1	We keep our commitment with our suppliers based on our current production plans.	GFI = 0.95	GFI = 0.99
CC2	We keep our commitment with our suppliers based on our current operational issues.	AGFI = 0.77	AGFI = 0.96
CC3	We keep our commitment with our suppliers to maintain current/short-term quality standards.	RMR= 0.037	RMR= 0.01
CC4	We keep our commitment with our suppliers to maintain current production capacity.		CC3 and CC4 correlated

Table 5.2.6.2 Convergent validity (model fit) assessment for OCC

Coding	**Incremental learning (IL)**	**Initial model fit**	**Final model fit**
IL1	Our daily/frequent communication with our suppliers improves our knowledge regarding our product development.	GFI = 0.94	GFI = 0.97
IL2	Our daily/frequent communication with our suppliers improves our knowledge regarding our process development.		
IL3	Our daily/frequent communication with our suppliers improves our knowledge regarding our product quality.	AGFI = 0.79	AGFI = 0.87
IL4	Our daily/frequent communication with our suppliers increases our knowledge regarding our operational product improvement.	RMR= 0.022	RMR= 0.01
IL5	Our daily/frequent communication with our suppliers increases our knowledge regarding our operational process improvement.		IL3 and IL 6 : deleted

IL6	Our daily/frequent communication with our suppliers increases our knowledge regarding our operational quality improvement.		

Reliability: The results of the analysis for CITC purification for operational collaboration appear in table 5.2.6.2. The reliability for OC is 0.92, for CC is 0.84 and for IL is 0.94. All reliabilities show high numbers. The purification process with CITC also shows good results.

Table 5.2.6.2: Reliability results for OCC

	Operational Collaboration (OC)	**CITC**	**A**
OC1	Our suppliers communicate with us regarding their current capacity plans.	0.74	0.91
OC2	Our suppliers communicate with us regarding their current quality issues.	0.77	
OC3	Our suppliers communicate with us regarding their current logistics issues.	0.85	
OC4	Our suppliers communicate with us regarding their current production plans.	0.81	
OC6	Our suppliers share with us their current quality issues.	0.66	
OC8	Our suppliers share with us their current production plans.	0.66	
	Current Commitment (CC)		
CC1	We keep our commitment with our suppliers based on our current productions plans.	0.78	

CC2	We keep our commitment with our suppliers based on our current operational issues.	0.69	0.85
CC3	We keep our commitment with our suppliers to maintain current/short-term quality standards.	0.71	
CC4	We keep our commitment with our suppliers to maintain current production capacity.	0.63	
	Incremental learning (IL)		
IL1	Our daily/frequent communication with our suppliers improves our knowledge regarding our product development.	0.89	
IL2	Our daily/frequent communication with our suppliers improves our knowledge regarding our process development.	0.88	
IL4	Our daily/frequent communication with our suppliers increases our knowledge regarding our operational product improvement.	0.76	0.94
IL5	Our daily/frequent communication with our suppliers increases our knowledge regarding our operational process improvement.	0.88	

Discriminant Validity: Table 5.2.6.3. below shows the result from discriminant analysis for OCC; the difference between the chi-square value for the difference in the degrees of freedom is statistically significant at $P < 0.01$. This result indicates support for the existence of discriminant validity for the construct.

Table 5.2.6.3: Discriminant Validity Result for OCC

	Chi Square/d.f.		
Construct	Single	Correlated	Diff.
IL - CC	366(20)	153(19)	213(1)
IL - OC	474 (26)	103(25)	371(1)
CC-OC	267(14)	29(13)	238(1)

5.2.7 Strategic Collaboration

The initial strategic collaboration construct was represented by three dimensions and 16 items, including strategic collaboration (SCC), which includes 8 items – SC1, SC2, SC3, SC4, SC5, SC6, SC7 and SC8; future commitment (SC), which includes 4 items – SC1, SC2, SC3 and SC4; experiential learning (EL), which includes 4 items – EL1, EL2, EL3, and EL4.

Convergent Validity: Data analysis for this convergent validity was performed using AMOS 7.0. The operational collaboration dimension has eight items. Table 5.2.7.1 below shows the results of measurement model analysis for all the dimensions in construct SCC.

Measurement model analysis for SC showed a moderately poor model fit with GFI = 0.79, AGFI = 0.61 and RMR = 0.05. Further modification was conducted based on modification index. SC3 and SC6 showed poor indication of error correlation. These two items were deleted. Analysis also shows that SC6 and SC7 are correlated. Since the two

items are important for our construct, we decided to keep the two items. Final analysis indicates a moderately better model fit with GFI = 0.98, AGFI = 0.82 and RMR = 0.01.

The initial results of the continuous commitment (FC) dimension did not show a good model fit. Analysis of modification indices showed that error correlation existed in FC3 and FC4. Since both items are important we decided to correlate the items. Further analysis shows a better model fit with GFI = 0.98, AGFI = 0.82 and RMR = 0.01. The results of measurement model analysis for EL show a moderately good model fit. The results indicate that GFI = 0.95, GFI = 0.86 and RMR = 0.01.

Table 5.2.7.1 Convergent validity (model fit) assessment for SCC

Coding	**Strategic Collaboration(SC)**	**Initial model fit**	**Final model fit**
SC1	Our suppliers share with us their future/long-term capacity plans.	GFI = 0.79 AGFI = 0.61 RMR= 0.04	GFI = 0.98 AGFI = 0.82 RMR= 0.01 SC3 and SC6 deleted
SC2	Our suppliers share with us their future/long-term quality issues.		
SC3	Our suppliers share with us their future/long-term logistics issues.		
SC4	Our suppliers share with us their future/long-term production plans.		
SC5	Our suppliers communicate with us regarding their future/long-term production plans.		
SC6	Our suppliers communicate with us regarding their future/long-term quality issues.		

SC7	Our suppliers communicate with us regarding their future/long-term logistics issues.		
SC8	Our suppliers communicate with us regarding their future/long-term capacity plans.		
	Continuous Commitment(FC)	**Initial model fit**	**Final model fit**
FC1	We keep our commitment with our suppliers based on our future productions plans.	GFI = 0.89	GFI = 0.98
FC2	We keep our commitment with our suppliers based on future operational issues.	AGFI = 0.66	AGFI = 0.82
FC3	We keep our commitment with our suppliers to maintain future/long-term quality standards.	RMR= 0.04	RMR= 0.01
FC4	We keep our commitment with our suppliers to maintain future production capacity.		FC3 and FC4 correlated
	Experiential Learning(EL)	**Initial model fit**	**Final model fit**
EL1	We continuously value information (knowledge) from external sources as new knowledge.	GFI = 0.95	GFI = 0.95
EL2	We continuously value information (knowledge) from internal sources as new knowledge.	AGFI = 0.86	AGFI = 0.86
EL3	We continuously learn (through communication/information sharing) from our suppliers and customers.	RMR= 0.03	RMR= 0.03
EL4	We continuously rely on external information for our innovation activity.		
EL5	We consider this learning process as an		

	ongoing activity.		

Reliability: The results of the analysis for CITC purification for strategic collaboration are shown in table 5.2.7.2. Reliability for OC is 0.92, for CC is 0.90 and for IL is 0.89. All reliabilities show high numbers. The purification process with CITC also shows good results.

Table 5.2.7.2: Reliability result for SCC

Coding	**Strategic Collaboration(SC)**	**CITC**	**α**
SC1	Our suppliers share with us their future/long-term capacity plans.	0.75	0.92
SC2	Our suppliers share with us their future/long-term quality issues.	0.85	
SC4	Our suppliers share with us their future/long-term production plans.	0.82	
SC5	Our suppliers communicate with us regarding their future/long-term production plans.	0.80	
SC7	Our suppliers communicate with us regarding their future/long-term logistics issues.	0.75	
SC8	Our suppliers communicate with us regarding their future/long-term capacity plans.	0.65	
	Continuous Commitment(FC)		
FC1	We keep our commitment with our suppliers based on our future productions plans.	0.81	0.9
FC2	We keep our commitment with our suppliers based on future	0.78	

	operational issues.		
FC3	We keep our commitment with our suppliers to maintain future/long-term quality standards.	0.78	
FC4	We keep our commitment with our suppliers to maintain future production capacity.	0.76	
	Experiential Learning(EL)		
EL1	We continuously value information (knowledge) from external sources as new knowledge.	0.83	0.89
EL2	We continuously value information (knowledge) from internal sources as new knowledge.	0.62	
EL3	We continuously learn (through communication/information sharing) from our suppliers and customers.	0.91	
EL4	We continuously rely on external information for our innovation activity.	0.75	
EL5	We consider this learning process as an ongoing activity.	0.56	

Discriminant Validity: Table 5.2.7.3 below shows the result from discriminant analysis for SCC; the difference between the chi-square value for the difference in the degrees of freedom is statistically significant at $P < 0.01$. This result indicates support for the existence of discriminant validity for the construct.

Table 5.2.7.3: Discriminant Validity Result for SCC

	Chi Square/d.f.		
Construct	Single	Correlated	Diff.

OC - FC	615(35)	252(34)	363(1)
OC - EL	798 (44)	196(43)	602(1)
FC - EL	507(27)	174(26)	333(1)

5.2.8 Operational Supply Chain Performance

The initial operational supply chain performance construct was represented by one dimension and 4 items, – LTC, LTC2, LTC3, and LTC4.

Convergent validity: Measurement model analysis for OSCP shows a highly acceptable model fit with GFI = 0.99 AGFI = 0.95 and RMR = 0.02. Table 5.2.8.1 shows the results for operational supply chain performance measurement model assessment.

Table 5.2.8.1: Convergent validity result for OSCP

Coding	Operational Supply Chain Performance (OSCP)	Model fit
LTC1	We fill customer orders in less lead time.	GFI = 0.99 AGFI 0.95 RMR = 0.02
LTC2	We have low inventory levels.	
LTC3	We have low overhead costs.	
LTC4	We have shorter lead times compared to our rivals.	

Reliability: The results of the analysis for CITC purification for operational supply chain performance appear in table 5.2.8.2. Reliability for OC is 0.92, for CC is

0.84 and for IL is 0.94. All reliabilities show high numbers. The purification process with CITC also shows good results.

Table 5.2.8.2: Reliability result for OSCP

Coding	Operational Supply Chain Performance (OSCP)	CITC	α
LTC1	We fill customer orders in less lead time.	0.64	0.81
LTC2	We have low inventory levels.	0.56	
LTC3	We have low overhead costs.	0.79	
LTC4	We have shorter lead times compared to our rivals.	0.66	

5.2.9 Strategic Supply Chain Performance

The initial operational supply chain performance construct was represented by two dimensions and 8 items, including time to market (TM), which includes 5 items – TM1, TM2, TM3, TM4 and TM5, and innovativeness (INV), which includes 3 items – INV1, INV2 and INV 3.

Convergent validity: Measurement model analysis for TM shows a highly acceptable model fit with GFI = 0.97 AGFI = 0.91 and RMR = 0.02. TM5 is deleted due to low alpha coefficient. For dimension INV, since the dimension has three items, one item from TM has to be added to run the measurement model analysis. Measurement model analysis indicates a good model fit with GFI = 0.99, AGFI = 0.95 and RMR =

0.02. Table 5.12.9.1 shows the results for operational supply chain performance measurement model analysis.

Table 5.2.9.1: Convergent validity results for SSCP

Coding	Time to Market (TM)	Model fit
TM1	Our products are commercialized faster than expected.	GFI = 0.97 AGFI 0.91 RMR = 0.02 TM5 deleted
TM2	Our products are the first in the market.	
TM3	Our products reach the market faster than industry average time.	
TM4	Our products reach the market faster than our competitors'.	
TM5	Our products take a longer time to design than expected.	
	Innovativeness (INV)	GFI = 0.99 AGFI = 0. 95 RMR = 0.02
INV1	Our products are significantly different from our competitors'.	
INV2	Our products are more innovative than our competitors'.	
INV3	Our products have better quality than similar products produced by our competitors.	

Reliability: The results of the analysis for CITC purification for strategic supply chain performance are shown in table 5.2.9.2. Reliability for TM is 0.81, for INV is 0.90 and for IL is 0.80. All reliabilities show high numbers. The purification process with CITC also shows good results.

Table 5.2.9.2: Reliability results for SSCP

Coding	Time to Market (TM)	CITC	α
TM1	Our products are commercialized faster than expected.	0.57	0.81
TM2	Our products are the first in the market.	0.77	
TM3	Our products reach the market faster than the average time required for such industry	0.84	
TM4	Our products reach the market faster than our competitors‘.	0.70	
	Innovativeness (INV)		
INV1	Our products are significantly different from our competitors‘.	0.68	
INV2	Our products are more innovative than our competitors‘.	0.73	0.8
INV3	Our products have better quality than similar products produced by our competitors.	0.54	

Discriminant Validity: Table 5.2.9.3 below shows the result from discriminant analysis (SSCP); the difference between the chi-square value for the difference in the degrees of freedom is statistically significant at $P < 0.01$. This result indicates support for the existence of discriminant validity for the construct.

Table 5.2.9.3 Discriminant Validity for SSCP

	Chi Square/d.f.		
Construct	Single	Correlated	Diff.
TM - INV	160(14)	56(13)	104(1)

5.2.10 Operational Organizational Performance

The initial operational supply chain performance (OOP) construct was represented by one dimension and 4 items– PFO, PFO2, PFO3, and PFO4.

Convergent validity: For dimension OOP, since the dimension has three items, one item from TM has to be added to run the measurement model analysis Measurement model analysis for OSP shows a highly acceptable model fit with GFI = 0.99 AGFI = 0.95 and RMR = 0.02. Table 5.1.8.1 shows the results for operational supply chain performance measurement model analysis.

Table 5.2.10.1: Convergent validity results for OOP

Coding	**Operational Organization Performance (OOP)**	**Model fit**
PFO1	Our firm has an increasing sales growth.	
PFO2	Our firm has an increasing profit margin on sales.	GFI = 0.99
PFO3	Our firm short term revenue is growing	AGFI = 0.99

PFO4	Our firm is perceived to be competitive by our short-term suppliers.	RMR= 0.01 PFO2 deleted : low loading

Reliability: The results of the analysis for CITC purification for operational organizational performance appear in table 5.2.10.2. The reliability shows moderately acceptable parameters.

Table 5.2.10.2: Reliability results for OSCP

Coding	Operational Organization Performance	CITC	A
PFO1	Our firm has increasing sales growth.	0.57	0.72
PFO3	Our firm‘s short-term revenue is growing	0.50	
PFO4	Our firm is perceived to be competitive by our short-term suppliers.	0.61	

5.2.11 Strategic Organizational Performance

The initial strategic supply chain performance (SOP) construct was represented by one dimension and 4 items– PFO, PFO2, PFO3, and PFO4.

Convergent validity: Measurement model analysis for SOP shows a highly acceptable model fit with GFI = 0.99 AGFI = 0.99 and RMR = 0.01. Table 5.2.11..1 shows the results for operational supply chain performance measurement model analysis.

Table 5.2.11.1: Convergent validity results for SOP

Coding	Strategic Organization Performance (SOP)	Model fit
PFS1	Our firm has long-term market growth.	GFI = 0.99 AGFI = 0.99 RMR= 0.01
PFS2	Our firm has an increasing return on investment.	
PFS3	Our firm‘s long-term revenue is growing.	
PFS4	Our firm is perceived to be competitive by our long-term suppliers.	

Reliability: The results of the analysis for CITC purification for strategic supply chain performance are shown in table 5.2.11.2. The reliability for SOP is higher than the acceptable value, indicating that the construct is highly reliable.

Table 5.2.11.2: Convergent validity results for SOP

Coding	Strategic Organization Performance (SOP)	CITC	α
PFS1	Our firm has long-term market growth.	0.77	0.88
PFS2	Our firm has an increasing return on investment.	0.78	
PFS3	Our firm‘s long-term revenue is growing.	0.71	
PFS4	Our firm is perceived to be competitive by our long-term suppliers.	0.67	

CHAPTER 6

STRUCTURAL MODEL ANALYSIS AND SUMMARY OF RESULTS

The purpose of this chapter is to discuss the results of large scale data collection and to validate hypotheses that support the models proposed in the study. This chapter contains the following topics:

6.1 Methodology for Structural Equation Modeling

6.2 Test Results of Structural Equation Modeling

6.3 Revised structural model

6.4 Discussion on proposed new paths

6.5 Summary of the chapter

6.1. Methodology for Structural Equation Modeling

Structural equation model (SEM) methodology is a statistical technique for testing and estimating the causal relationships amongst various constructs (Bollen, 1989:1993) Analysis for this research followed a two-step approach based on suggestions by Anderson & Gerbing, 1982; 1988). The two-step approach includes:

1) Estimation of the Measurement Model

2) Analysis of the Full Structural Model.

Estimation of measurement model specifies relationships of the observed measures with a particular construct (Anderson & Gerbing, 1982; 1988). Chapter 5 of this research discussed measurement properties of each construct and how it was validated. This chapter will focus on the analysis of the full structural model and examines the causal relationships that are based on the underlying theory explained in Chapter 3. This study used Smart Partial Least Squared (PLS) statistical technique (Chin and Frye, 1995) to test the casual model. The PLS technique was the most appropriate for this study as it allowed the study of moderating effects of interactions required for this study. Before proceeding to the PLS model test result, the structural equation modeling evaluation indicators (T-value and beta coefficient) used in the PLS analysis are briefly discussed in the following paragraphs:

T-value evaluates the level of significance in the proposed hypothesis (Rosnow, 2000; Chin, Marcolin and Newstead, 2003; Cohen, 1988). A T-value that is below 1.6 indicates that the relationship in the hypothesis is not significant and also indicates that the statistical power of significance is less than five percent. At this level of T-value, the hypothesis is not supported, whereas for a T value between 1.6 to 2.00, the relationship in the hypothesis is considered significant at 0.05 level. For a T –value between 2.00 – 3.00 the hypothesis is significant at 0.01 level and for a T- value above 3.00 the hypothesis is considered significant at 0.001 level (Chin et al., 2003).

Standardized coefficient assesses the interaction of the path coefficient between two constructs (Chin, 1998). The cut-off value for the standardized beta coefficient is

0.20. The coefficient that is higher than this value is considered as indicating a meaningful relationship (Chin, 1998) between the constructs.

6.2 Structural Model Testing Results

For the purpose of ease of discussion, the structural equation model depicted in Figure 3.2, Chapter 3, is replicated in this section (Figure 6.1). As discussed in chapter-3, twelve hypotheses provide causal relationships of the structural equation model (SEM). Figure 6.2 shows the results of path analysis of the structural equation model using Smart PLS and detailed results of the hypotheses is presented in Table 6.1.

It was found that out of twelve proposed hypotheses, six were not supported and six were significant. While hypotheses 5, 6, 7, 8, 9 and 10 were significant at 0.001, moderating effects of hypotheses 3a, 3b, 4a and 4b were not significant. The direct relationships in hypotheses 1 and 2 also were found not significant. A detailed discussion of each result is provided in the following sections:

6.2.1 Discussion of Structural Modeling and Results of Hypotheses

H1: Perceived Global Challenges will lead to a Lean Supply Chain

A non-significant at coefficient = 0.02, t = 0.44 indicated an absence of a direct relationship between perceived global challenges and a lean supply chain design. This meant that the immediate decision of selecting a lean supply chain design in a global market was not directly influenced by the perceived global challenges such as market internationalization, technology uncertainty, and intellectual property protection. Since the fundamental premise of a lean supply chain is ~~–e~~limination and reduction of waste", global challenges did not directly influence firms to achieve this goal

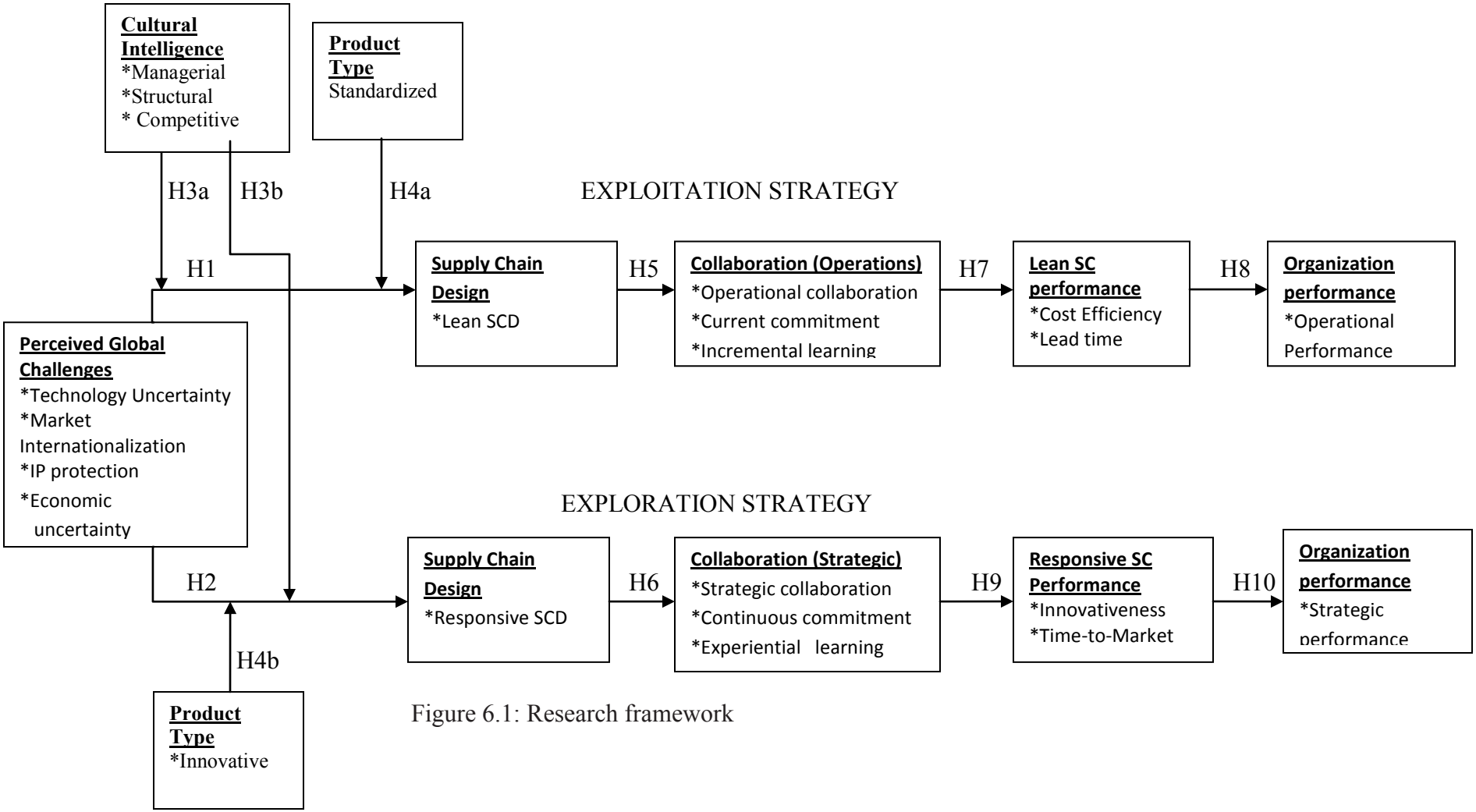


Figure 6.1: Research framework

Results of the tests for H2 indicate that a firm‘s decision of selecting a responsive supply chain is not influenced by the global challenges. Statistical analysis showed a non significant coefficient of beta coefficient = 0.12 and t = 0.97, indicating the absence of any relationship between global challenges and a firm‘s decision to select a responsive supply chain design. Thus, elements of the global challenges such as market internationalization, technology uncertainty, and intellectual property selection did not have a direct relationship with a firm‘s decision to adopt responsive supply chain. This again meant that the firms may not necessarily jump into selecting a responsive supply chain to over come global challenges and that there might be other factors that mediate a firm‘s decision to apply a responsive supply chain such as type of product produced, or the location in which the business operates.

H3a: Cultural intelligence positively influences the relationship between perceived global challenges and Responsive Supply Chain design.

A moderating effect means that the moderating variable indirectly influences the strength of the relationship between the two constructs. The moderating relationship for hypothesis 3a is found to be non-significant at coefficient = 0.04, t = 1.04 and this result indicates that cultural intelligence does play a significant role in a firm‘s ability to handle global challenges. Thus, statistically, there is no evidence of a moderating effect on the relationship between global challenges and a lean supply chain design. The two constructs between which the moderating effects was tested are global challenges and lean supply chain design. Statistical results indicate that the direct relationships for these

two constructs are also not significant (H1). This means that cultural intelligence does not play any role in moderating the strength of the relationship between global challenges and a lean supply chain design. This is probably because of the fact that a lean supply chain design is built on the premise of exploitation that is not characterized by risk or variation, but by refinement and efficiency, cultural intelligence does not play a critical role.

H3b: Cultural intelligence positively influences the relationship between perceived global challenges and Responsive Supply Chain design.

While hypothesis 3b was predicted to have a moderating effect on the strength and direction of the relationship between global challenges and a responsive supply chain design, the moderating relationship was found to be non significant at coefficient = 0.14, t = 0.98. This indicates that cultural intelligence does not influence the strength of the relationship between perceived global challenges and a responsive supply chain design. Statistically, there is no evidence of a moderating effect on the relationship between global challenges and a responsive supply chain design. Hence, cultural intelligence does not influence the relationship between global challenges and a responsive supply chain design.

H4a: Standardized products positively (as a moderator) influence the relationship between perceived global challenges and a lean supply chain design.

H4b: Innovative products positively (as a moderator) influence the relationship between perceived global challenges and a responsive supply chain design.

The moderating relationship for hypothesis 4a is found to be non significant at coefficient = 0.03, t = 0.61 and thus, there is no statistical evidence that a standardized product moderates the relationship between global challenges and a Lean supply chain design. The moderating relationship for hypothesis 4b was also found to be non significant (coefficient = 0.14, t = 0.32); thus there was insufficient evidence of a moderating influence of a product type on the relationship between global challenges and a responsive supply chain design.

H5: A Lean supply chain design has a positive relationship with operational collaboration.

The research premise that a Lean Supply Chain has a positive relationship with operational collaboration was supported through a highly significant coefficient = 0.45, t = 5.02. A Lean supply chain design showed a positive significant relationship with operational collaboration and thus supported that firms that selected the lean supply chain design pay attention to operational collaboration that result in short term/operational collaboration, incremental learning and short term commitments across players in supply chain. This makes sense since lean characteristics focus on product and process efficiency, which follows that firms that target efficiency need to constantly pay attention to the activities that contribute to cost saving and elimination of waste. These activities are operational in nature and require operational collaboration in the short term. The degree of collaboration is highly affected by the type of collaboration and the levels of collaboration (Lamming, 1996) and thus, the level and type of collaboration create the

status of relationship. The relationship that exists through operational collaboration is based on common interests. In this case, common interest is based on the product produced.

H6: A responsive supply chain design has a positive relationship with strategic collaboration

The research premise of H6 that a responsive supply chain has a positive relationship with strategic collaboration among players of supply chain is evidenced through a highly significant coefficient at = 0.67, t = 8.77. The result indicated the existence of a strong and direct relationship between a responsive supply chain design and strategic collaboration. Thus, the type of collaboration that exists in a responsive supply chain is most likely to be strategic in nature. As discussed in earlier chapters, a responsive supply chain design is built on an exploratory concept which forces them to pay more attention to innovativeness. By its very nature, innovation carries inherent risks and thus involves uncertain returns and unpredictable outcomes, thus a supply chain carrying such characteristics will necessarily require long-term, strategic collaboration amongst the various players of supply chain.

H7: Operational Collaboration has a positive relationship with the performance of a Lean Supply chain.

The research premise of hypothesis 7 that operational collaboration has a positive relationship with a lean supply chain performance is evidenced through a significant coefficient at = 0.23, t = 2.81. This result indicates that there is a strong and direct relationship between operational collaboration and the performance of a lean supply

chain. As operational collaboration involves the activities between buyers and suppliers that are related to the current product and process development, it involves an incremental organizational learning focused on short term, operational cost efficiencies and reduction of waste or redundancy. The incremental learning aimed at reducing cost and improving quality lead to firms producing better quality products at lower costs with optimizations spread across supply chain, and thus result in better organization performance in a lean supply chain.

H8: Lean supply chain performance has a positive relationship with the organization's operational performance.

Research premise of hypothesis 8 that a lean supply chain performance has a positive relationship with operational organizational performance and lean supply chain was evidenced by a highly significant coefficient at = 0.37, t = 3.41. This finding is consistent with the findings of Aiken, Christopher and Towill (2002) that lean production improves operational performance by reducing lead-time and increasing cost efficiency. These goals are short-term oriented and operational and the results of this study support findings of literature (Chen and Paulraj, 2004) that operational activities lead to operational performance.

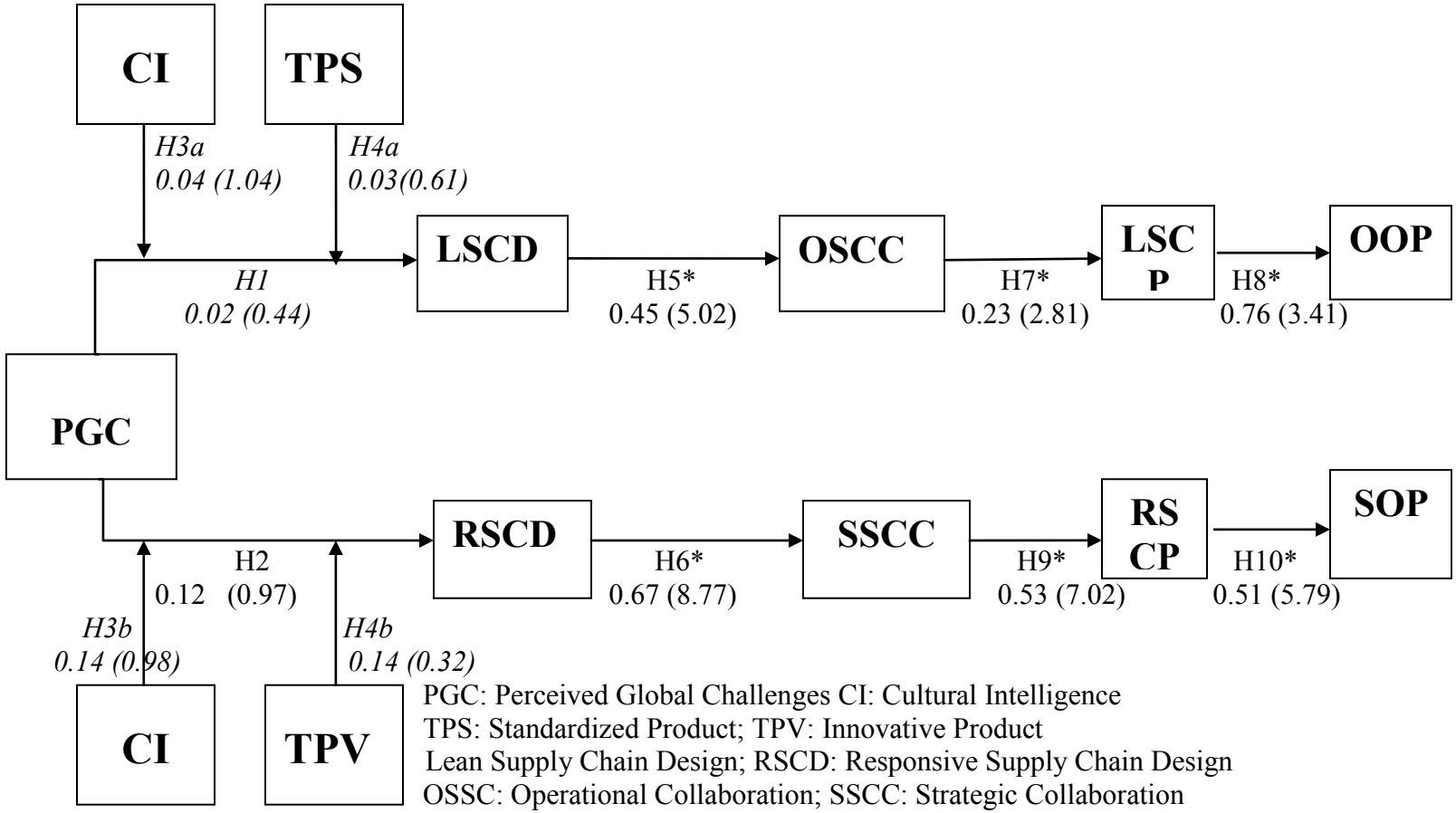
H9: Strategic Collaboration has a positive relationship with the performance of a responsive supply chain.

Research hypothesis 9 postulates that a responsive supply chain supports a strategic collaboration and was evidenced by a significant relationship of coefficient at =

0.53, t = 7.02. This result indicates strong and direct relationship between strategic supply chain collaboration and the performance of a responsive supply chain. Strategic collaboration requires continuous collaboration between buyers and suppliers and leads to learning experience and knowledge accumulation. Firms having higher knowledge can use that knowledge as their weapon against competitors (Hult, 1998; Anderson & Weitz, 1992), possession of higher knowledge leads to a better understanding of customers' needs and therefore a greater supply chain performance.

H10: A responsive supply chain performance has a positive relationship with strategic organizational performance.

The hypothesis 10 postulates that a responsive supply chain performance has a positive relationship with strategic organization performance was evidenced through a highly significant coefficient at = 0.51, t = 5.79 . This result indicates that there is a strong and direct relationship between a responsive supply chain performance and strategic performance.



PGC: Perceived Global Challenges CI: Cultural Intelligence
TPS: Standardized Product; TPV: Innovative Product
Lean Supply Chain Design; RSCD: Responsive Supply Chain Design
OSSC: Operational Collaboration; SSCC: Strategic Collaboration
OSCP: Operational Supply Chain Performance; SSCP: Strategic SC Performance
OOP: Operational Organizational Performance: SOP: Strategic Org. Performance
* Significant at 0.01 level

Figure 6.2 : PLS Structural modeling results

Table 6.1 Initial PLS structural equation modeling results

Hypothesis	Relationship	Type	Coefficient	T-Value	Significant
H1	PGC - LSCD	Direct	0.02	0.44	No
H2	PGC - RSCD	Direct	0.12	0.97	No
H3a	CI -PGC/LSCD	Moderating	0.04	1.04	No
H3b	CI -PGC/RSCD	Moderating	0.14	0.98	No
H4a	TPS - PGC/LSCD	Moderating	0.03	0.61	No
H4b	TPV - PGC/RSCD	Moderating	0.14	0.32	No
H5	LSCD - OSCC	Direct	0.45	5.02	Yes
H6	RSCD - SSCC	Direct	0.67	8.77	Yes
H7	OSCC - LSCP	Direct	0.23	2.81	Yes
H8	LSCP - OOP	Direct	0.37	3.41	Yes
H9	SSCC - RSCP	Direct	0.53	7.02	Yes
H10	RSCP - SOP	Direct	0.51	5.79	Yes

6.3 Revised Structural Model

The original structural model for this research had six hypotheses that were later found to be not significant through statistical analysis of large-scale data collection and measurement. The non-significant relationships indicated probable deficiencies of the proposed model and that it required modifications. Therefore, the hypotheses for which statistical analysis showed non-significant relationships for the original structural model and the overall model were re-analyzed. While the constructs for which non-significant results were evidenced were not removed, the non-significant paths were modified. Following paragraphs explain the rationale behind why and how paths were modified and Table-3 shows results of such a revised model.

6.4 Discussion of the New Paths

The original structural model indicated that there were six relationships that were not significant and out of those four of them were moderating paths and two of them were direct relationships and these were chosen to be modified. Table 6.2 shows a summary of non-significant relationships and modified relationships

The non-significant relationships indicate that the construct does not play a role in moderating the other two constructs. Four of the total six non-significant relationships had been represented by moderating effects and two of them with direct relationships. Given that all the constructs were critical to the study, a modification was made to change the moderating and direct effects to mediating effects in the respective constructs. While a moderating effect of a third variable influences the strength and direction of two constructs, a mediating effect of a third variable, between two variables is a –cause effect" of the relationship between them. That is, it does not influence the strength of their relationship but it is the cause of the existence of the relationship (Stacy, Newcomb and Bentler, 1991). This means that a mediating effect directly influences the relationship while a moderating effect is an interactive effect.

When the modifications to the model as shown in Figure 6.3. were made to change type of effect from moderating to mediating and direct to mediating, all new relationships, except one (H4a) showed significant results; indicating that the respective constructs have mediating rather than earlier postulated (direct/moderating) effects. There are six modifications made in this model. Results for T-value bootstrapping analysis are

shown in figure 6.3. The results (T-value and standardized coefficient) for the new relationships are shown in table 6.2 and figure 6.3. Following paragraphs discuss briefly the new paths arising out of modifications to the model:

The new path 1 (1a and 1b) is a new relationship between perceived global challenges and a lean supply chain design, mediated by a standardized product. New path 1a (relationship between global challenges and standardized products) shows a significant relationship with T-value 6.96 and 0.41 coefficient. Path 1b (relationship between standardized products and a lean supply chain) is also significant with T value 90.6 and 0.97 coefficient. This result indicates that global challenges influence lean supply chain design through standardized products.

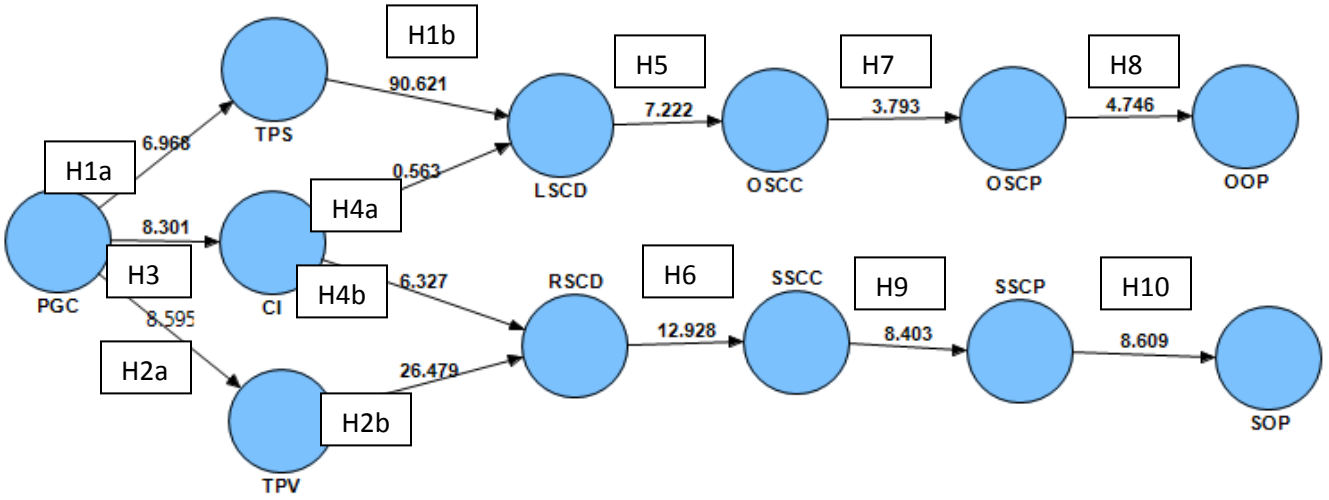
The new path 2 (2a and 2b) is the relationship between perceived global challenges and a responsive supply chain design, mediated by innovative products. New path 2a (relationship between global challenges and innovative products) shows a significant relationship with T-value 8.59 and 0.45 coefficient. Path 1b (relationship between innovative products and a responsive supply chain design) is also significant with T value 26.5 and 0.79 coefficient. This result indicates that global challenges do influence responsive supply chain through innovative product.

The new path 3 and 4 (4a and 4b) is the relationship between perceived global challenges and a supply chain design, mediated by cultural intelligence. New path 3 (relationship between global challenges and cultural intelligence) shows a significant result with 8.3 T value and 0.47 standardized coefficient. New Path 4a (relationship between cultural intelligence and a lean supply chain design) is not significant. This

indicates that cultural intelligence does not have any effect on the relationship between global challenges and lean supply chain design. New Path 4b (relationship between cultural intelligence and a responsive supply chain design is significant with 6.32 T-value and 0.22 standardized coefficient. In summary, these results indicate that cultural intelligence has an indirect effect only on the relationship between global challenges and responsive supply chain design.

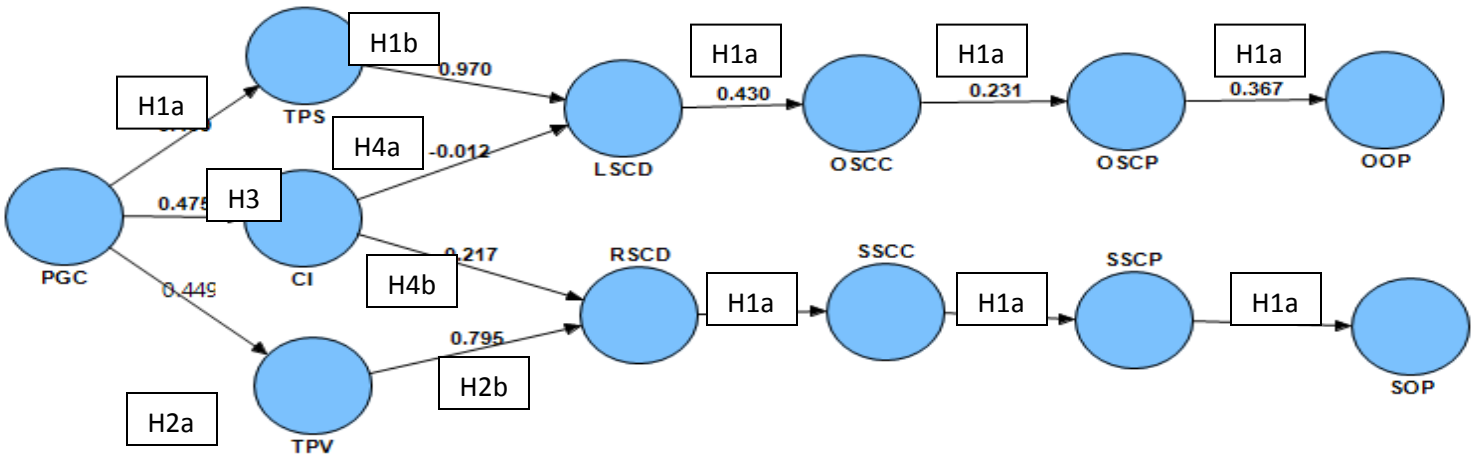
While modifications of the paths for this relationship were done by substituting moderation with mediation it should be understood that the basic constructs remained same. A moderating variable acts as an ‗influencer' where as a mediating variable acts as a causal factor, thus changing the relationship from influence to causal. Table 6.3, shows the results of revised PLS structural equation modeling.

This chapter depicted the process of assessing the structural model for testing the hypotheses. According to the result of the revised model, twelve hypotheses were significant. In general the result presents a good empirical support for Exploitation and Exploration theory which is the foundation of the hypothesized research model. The next chapter will discuss the summary of research finding, academic and practitioner implications, limitations of the research and suggestions for future research.



PGC: Perceived Global Challenges
CI: Cultural Intelligence
TPS: Standardized Product
TPV: Innovative Product
LSCD: lean Supply Chain Design;
RSCD: Innovative Supply Chain Design
OSSC: Operational Collaboration
SSCC: Strategic Collaboration
OSCP: Operational Supply Chain Performance
SSCP: Strategic SC Performance
OOP: Operational Organizational Performance
SOP: Strategic Org. Performance
All values are significant at 0.001, except for value 0.563 (CI-LSCD)

Figure 6.3: Revised model of bootstrapping analysis (T-value).



PGC: Perceived Global Challenges : CI: Cultural Intelligence
TPS: Standardized Product
TPV: Innovative Product
LSCD: lean Supply Chain Design;
RSCD: Innovative Supply Chain Design
OSSC: Operational Collaboration
SSCC: Strategic Collaboration
OSCP: Operational Supply Chain Performance
SSCP: Strategic SC Performance
OOP: Operational Organizational Performance
SOP: Strategic Org. Performance Figure 6.4: Revised model of standardized coefficient.

Table 6.3 Revised PLS structural equation modeling result

Hypothesis	Relationship	NM	Type	Coefficient	T-Value	Significant
H1a	PGC - TPS	Y	Direct	0.41	6.96	Yes
H1b	TPS - LSCD	Y	Direct	0.97	90.6	Yes
H2a	PGC - TPV	Y	Direct	0.45	8.59	Yes
H2b	TPV - RSCD	Y	Direct	0.79	26.5	Yes
H3	PGV - CI	Y	Direct	0.47	8.30	Yes
H4a	CI - LSCD	Y	Direct	-0. 12	0.56	No
H4b	CI -RSCD	Y	Direct	0.21	6.33	Yes
H5	LSCD - OSCC	N	Direct	0.43	7.22	Yes
H6	RSCD - SSCC	N	Direct	0.68	12.93	Yes
H7	OSCC - OSCP	N	Direct	0.23	3.79	Yes
H8	OSCP - OOP	N	Direct	0.36	4.74	Yes
H9	SSCC - SSCP	N	Direct	0.53	8.40	Yes
H10	SSCP - SOP	N	Direct	0.51	8.61	Yes

PGC: Perceived Global Challenges
CI: Cultural Intelligence
TPS: Standardized Product
TPV: Innovative
LSCD: lean Supply Chain Design
RSCD: Innovative Supply Chain Design
OSSC: Operational Collaboration
SSCC: Strategic Collaboration
OSCP: Operational Supply Chain Performance
SSCP: Strategic SC Performance
OOP: Operational Organizational Performance
SOP: Strategic Organizational Performance
MN = Modified/New path (Y = yes; N = no)
*Significant at 0.01 level

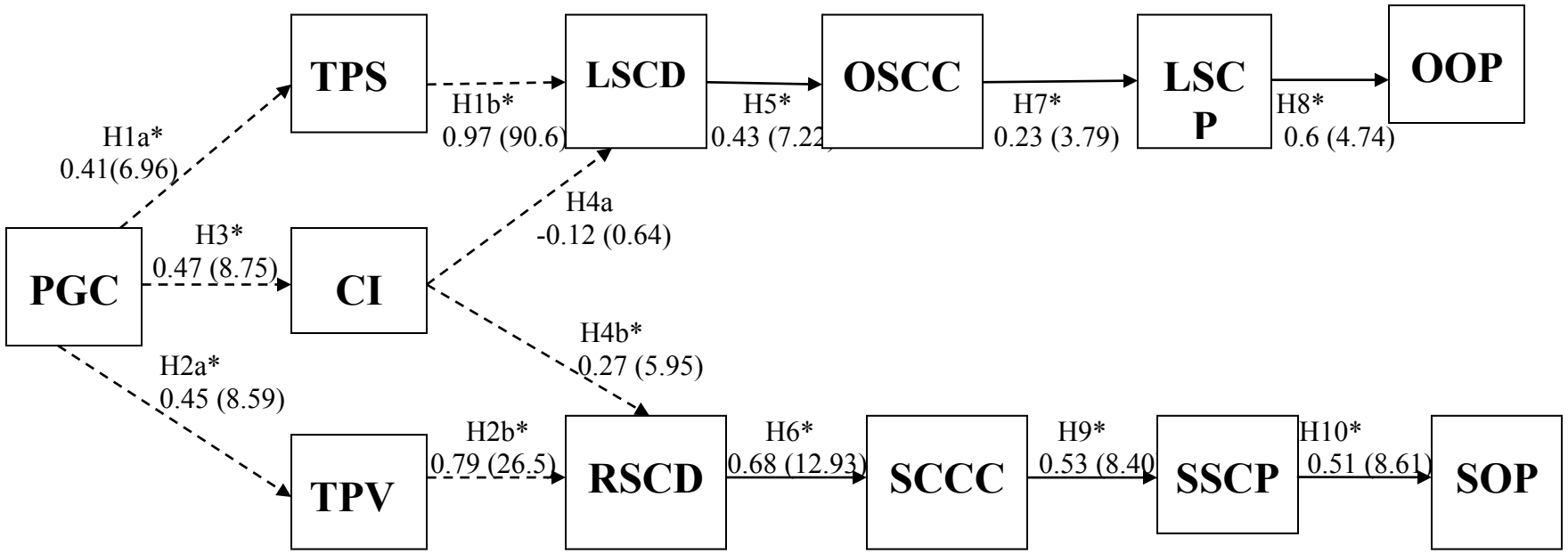


Figure 6.4 Revised PLS Structural Modeling Result

PGC: Perceived Global Challenges CI: Cultural Intelligence

TPS: Standardized Product; TPV: Innovative Product

LSCD: lean Supply Chain Design; RSCD: Innovative Supply Chain Design

OSSC: Operational Collaboration; SSCC: Strategic Collaboration

OSCP: Operational Supply Chain Performance; SSCP: Strategic SC Performance

OOP: Operational Organizational Performance: SOP: Strategic Org. Performance

*Significant at 0.01 level. - - -► = Modified/new path

CHAPTER 7

SUMMARY, IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This chapter provides (1) a summary of the research findings, (2) implications for researchers (3) implications for practitioners (4) the limitations of this study, and (5) suggestions and directions for future research.

7.1 Summary of Research Findings

Supply chain market environments are changing at an accelerated pace throughout the globe, creating significant challenges for firms in maintaining a competitive advantage. To sustain competitiveness, firms should be enabled to embrace global challenges and simultaneously be able to manage the global supply chain effectively. The perceived intensity of global challenges can be reduced through selecting a suitable type of supply chain design, which, by matching the design with the product should lead to an effective relationship among supply chain members, eventually leading to a superior supply chain performance. At the same time, applying a particular supply chain design should take into consideration the type of products firms produce. In addition, since the operations of the supply chains are in the global marketplace where geographical barriers are shadowed by a myriad of cultural differences, preparedness in dealing with different

cultures is necessary. The summary of the research contributions that addressed the above issues are discussed below.

The research findings provide evidence of the need to select a specific supply chain design that matches firm‘s strategy. While the findings from this research indicate that firms can indirectly embrace global challenges by selecting a specific type of supply chain design, the results also indicate that the relationship between global challenges and supply chain design is not direct but is mediated by the type of product, and cultural intelligence. Knowing the type of product is a pre-requisite for any firm to succeed and matching product type with a specific supply chain design will have a direct influence on the type of collaboration among supply chain members.

The findings of this research also indicate that understanding cultural differences is one of the factors that influence the selection of a specific supply chain design. Global supply chain not only deals with norm differences, but also differences in the language, the currency, the legal environment, and the economic situation; cultural intelligence should ease these differences. For example most suppliers from the western societies are not –group oriented" and consequently often may not have a strong sense of group identity, conversely suppliers from the eastern societies have high group affiliations and therefore higher propensity to group loyalty. This value could be carried into the supply chain environment, by knowing the cultural differences, relationships in the supply chain could be improved.

The findings also indicate that firms need to prioritize and differentiate possible contributions from different collaboration patterns. Lean supply chain design need not necessarily have long term or strategic collaboration with suppliers as products involved

are most likely standardized, and do not need differentiation, removing the need for specialized suppliers for these products. Firms can always change suppliers when there is an opportunity to save costs, therefore a long-term commitment might be seen as a limiting factor to the opportunity of saving costs by switching suppliers. On the other hand, in the responsive supply chain design, continuous innovation involves complex products, and requires long term commitment from a variety of suppliers.

This research is one of the first large scale studies on how manufacturers select a type of global supply chain design based on perceived global challenges, and mediated by product type and cultural intelligence. The development of the conceptual model filled the gaps in the existing literature since hitherto, researchers had focused on general supply chain design without looking at the characteristics or needs of the specific global supply chain design. This research divides global supply chain design into two types; lean and responsive and each supply chain design reacts differently to global challenges based on the product type and the cultural intelligence.

7.2 Implications for Researchers

This study makes several contributions to the academic literature. First, it offers a theoretical framework on global supply chain design that incorporates the theory of exploration versus exploitation. This theory is widely discussed in strategic management and innovation management literature but has received little attention in studies on the global supply chain. Its inclusion in the theoretical framework developed for this study takes into considerations two important factors in global supply chain design: product type and cultural intelligence. These two factors offer new insights into the complex

relationships between global supply chain design, inter-firm collaboration, supply chain performance and organizational performance.

Second, the importance of cultural intelligence in global business operations is well recognized and studied in academic literature in general (e.g., Earley and Ang, 2003; Crowne, 2008). Its importance in global supply chain management has, however, not been empirically investigated. Results from this research indicate that to do business in the global market, organizations must ensure that they have adequate knowledge of the cultural background. Ignoring the importance of cultural intelligence could negatively impact business relationships and lead to influencing the overall business performance (Crowne, 2008).

Third, this study offers findings that indicate the importance of the type of product as a mediating variable between perceived global challenges and the global supply chain design. When organizations pursue exploitation strategy, they do not pay attention to new products or are not willing to take risks in developing new products. Their products are standardized, less experimental, and more suitable for an environment of stable demand and have a longer product life cycle and thus, exploitation strategy often leads to early success (Gupta, Smith and Shalley, 2006). On the other hand, when organizations pursue an exploration strategy, their products tend to be innovative and more suitable for markets with uncertain demand potentials and a shorter product life cycle. The findings in this study are consistent with those by Vonderembse et al., (2006) from the domain of general supply chain design, that understanding product characteristics is critically important in selecting a specific supply chain design. Likewise, Reiner and Trcke (2004)

find that to be successful, the design of the supply chain must be product specific. However, both researches have not tested the relationships empirically.

Fourth, this study supports the direct causal relationship between a specific design of a global supply chain, and the type of collaboration it supports. The Lean supply chain design has a positive relationship with operational collaboration whereas the responsive supply chain design has a positive relationship with strategic collaboration. While, previous studies of supply chain design tested the direct relationship between supply chain design and collaboration, this study distinguishes between the two types of collaboration based on the design of the global supply chain and its characteristics.

Fifth, this study develops and validates a set of reliable instruments for the following constructs: perceived global challenges, cultural intelligence, type of product, lean supply chain design, responsive supply chain design, operational collaboration, strategic collaboration, operational supply chain performance, strategic supply chain performance, operational performance and strategic performance. Operational supply chain performance, strategic supply chain performance, operational performance and strategic performance constructs are modified constructs from those found in the literature (Clark and Fujimoto, 1991; Morris and Calantone, 1991; Crawford 1992; Eisenhardt and Tabrizi, 1994; Song and Perry, 1997; Cammish and Keough; Fisher, 1997; Das Narasimhan et al., 2006; Narasimhan and Talluri, 2006; Dyer and Singh, 1998; Hammer, 2001).

7.3 Implications for Practitioners

To date, there is no empirical research evidence that associates the selection of lean and responsive supply chain design with possible factors that influence such a

selection. This research may help practitioners to identify a suitable supply chain design based on perceived global challenges, type of product and cultural intelligence of their organizations. These findings are important and useful for practitioners as the firms can use this as a supporting document to compete effectively and efficiently in the global market. Firms that are uncertain about applying their resources to specific activities can use this model as their benchmark. This study also indicates that the application of the right design will lead to better performance, conversely a wrong design will waste firms‘ resources and will decrease firms‘ performance. Elaborations of the managerial implications are as follows.

To date, there is no empirical evidence in the research that compares the selection of lean and responsive supply chain design and the factors that influence such a selection. This research may help practitioners to identify a suitable supply chain design based on perceived global challenges, type of product and cultural intelligence of their organizations. These findings are important and useful for practitioners as the firms can use this as a supporting document to compete effectively and efficiently in the global market. Firms that are uncertain about applying their resources to specific activities can use this model as their benchmark. This study also indicates that the application of the right design will lead to better performance, conversely a wrong design will waste the firms‘ resources and will decrease the firms‘ performance. Elaborations of the managerial implications are as follows:

First, the findings suggest that cultural intelligence impacts the relationship between global challenges and the supply chain design as a mediating variable. This finding acknowledges the importance of understanding cultural differences in doing

business in the global market. Regardless of the type of supply chain, cultural intelligence is needed for managers to overcome the circumstances and understand global challenges. The ease of doing business globally increases if managers understand cultural differences, and this situation leads to better business relationships with suppliers. Managers that make decisions by considering the other‘s cultural perspective will make fewer mistakes, and this situation should lead to better results in the context of the design of global supply chains. Cultural understanding takes time and effort, and global firms should expose their employees to different cultures through intensive training, expatriation and internship (Crowne, 2008).

Second, the findings identify the type of product (standardized or innovative) as a facilitating factor in the selection of specific design of the supply chain. The study indicates that managers need to understand the characteristics of products produced to match with the design of the supply chain. Products that are innovative have positive relationship with responsive supply chain design and managers need to understand that these type of products have short life cycles. To ensure that firms produce products that satisfy customers‘ needs, managers need to continuously monitor and study the market and may need to maintain long term relationships with suppliers since the need for the product or the design of the product might change frequently. As for standardized products, the life cycle is longer, the market for these products is more stable and thus there is lesser need for longer, strategic collaborations with suppliers.

Third, managers should be aware that different types of collaboration influence performance differently. Strategic collaboration requires long-term commitment with suppliers and it influences strategic supply chain performance. Firms can achieve better

performance if they focus on the type of collaboration that fit with their type of supply chain design.

7.4 Limitations

Even though this research makes several contributions, there are several limitations that need to be addressed.

First, there is only a single respondent for each organization involved in this survey and leads to an issue of how the individual perceived the survey and whether this single individual would represent a collective _organizational‘ standpoint. The survey could be more strongly supported if more than one person in an organization responded to the survey as comparisons could have been made if this survey had more than one respondent for one organization, and the collective organizational perception might have been strengthened.

Second, while the survey was conducted on ostensibly global organizations, some of the organizations responding to the survey had less than five years of global experience. Even though there is no indication of respondent bias based on global experience, it might have been beneficial if this research could include companies that have higher global experience.

Third, the percentage of respondents was small and was limited to companies located in Malaysia. Had the study contained responses from many more global companies from other geographies in addition to Malaysia, the results of the study might have much better robustness.

7.5 Recommendations for Future Research

Future research should apply multiple methods of analysis. For example, some of respondents in this research have more than ten years of experience, and some of them have less than five years of experience in the global market. Different analysis through cluster method based on the number of years of experience can be done.

The model for this study is large, and future research should divide the model into two types of supply chain design. Statistical analysis using AMOS or LISREL can be used in a smaller model with an adequate number of respondents.

Future research also can conceptualize different cultural dimensions from Hofstede culture theory and analysis on how these dimensions influence the global supply chain. There are many other variables that are important for the design of a global supply chain, such as the impact of information systems and the impact of emerging economy on global challenges. Future research should incorporate information technology as one of the factors that influence the design of a global supply chain.

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Appendix A

Questionnaire for Q-Sort

Appendix A: Questionnaire for Q-Sort
* Items removed in the Q-Sort process.
** Items reworded in the Q-Sort process.
Technology uncertainty (TC)
Technology changes in our industry are frequent.
Technology changes in our industry are unpredictable
Technology changes in our industry are fairly major.
Technology changes in our industry provide big opportunities in our industry*
Technology changes in our industry give us advantage over our competitors.
Market internationalization (IM)
Our competitors are primarily foreign/international companies.
Our competitors sell their products in international market.*
Our products are sold in a international market.*
We have loyal customers in the international market.

We have gained more market share in international market.
We have tougher competition in international market compared to domestic market.*
We have higher risk in the international market.
International property protection (DP)
We have agreements with our suppliers about our data protection
We feel insecure about sharing our information with our suppliers*
We feel safe to share our confidential information with our suppliers.
We can trust our suppliers on issues regarding security.
Our suppliers do not expose our intellectual property to a third party.
Our suppliers ensure that only authorized employees log into confidential databases.
Economic uncertainty (EU)
We are looking forward to having the Free Asian Trade Agreement.
We do not has any problems or issues related to a country's currency fluctuation.
We have strategies in place to respond to changes in the global economy.
Current economic situation have a major impact on our business.
Current economic situation have a minor impact on our business.
Managerial cultural intelligence (MCI)
Our manager is able to understand cultural differences when interacting with business partners from different cultural backgrounds.
Our manager is able to understand the legal and economic systems of other cultures.
Our manager is able to understand cultural values and religious beliefs of other cultures.

Our manager is able to modify their verbal behavior (words, tone, style) when cross cultural communication requires it.
Our manager is able to modify their nonverbal behavior (gestures, time, and space orientation) when a cross-cultural interaction requires it. **
Our manager is able to work with business partners from different cultures.*
Our manager is able to work with suppliers from cultures that are new to them.*
Structural Cultural Intelligence (SCI)
Our manager is able to convey the expectations we have of our international business partners.
Our manager is able to understand the expectations our international business partners have of us.
Our manager is able to develop mutual expectations that are culturally agreeable with our international business partners.*
Our manager is able to develop culturally appropriate norms and standard operating procedures with our international business partners.
Our manager is able to develop knowledge sharing strategies (cultural related) with our international business partners.
Our manager is able to identify how our international business partners‘ expectations differ from our own.*
Our manager is able to build culturally appropriate plans that ensure smooth transitions and limited disruption when activities are moved to offshore partners.
Our manager is able to design culturally appropriate governance mechanisms to ensure high off-shore performance.*
Our manager is able to resolve cultural differences in expectations with our international business partners.
Competitive cultural Intelligence (CCI)
Our firm has the strategy in place to evaluate the competitive risks of off shoring.
Our firm has the reputation of offering attractive culturally appropriate incentives to international business

partners.*
Our firm has the legal mechanisms in place to manage risks associated with proprietary firm knowledge.
Our firm has the resource to assess the cultural compatibility of international business partners.
Our firm has a system for exiting from international contracts with minimal business disruptions.*
Our firm values its public reputation as a good international business partner.*
Our firm acknowledges that in selecting an off shoring partner, factors such as language, cost, and data, security and privacy must be evaluated.*
Product type (TP)
Our firm produces products have long life-cycle.
Our firm produces products have short life-cycle.
Our firm produces standardized products.
Our firm produces innovative/complex products.
Our firm produces products that have stable demand.
Our firm produces products that have unpredictable demand.
Lean supply chain design (LSD)
We eliminate non value product development processes.
We simplify our process development to eliminate waste.
We use the same quality programs (to eliminate double steps processes) as our suppliers.**
We use forecasting method for our production plan. **
We have stable forecasting methods for product demand.*
We work with our suppliers to simplify product development processes.*

We work with our supplier to save cost (in regards ro process or product development) in our current production.**
Responsive supply chain design (RSC)
We increase our level of customization per customer request.*
We increase production capacity per customer request.*
We modify our product per customer request.
We reduce our delivery time per customer request. **
We develop products based on customer requests.*
We pay more attention to quality than our rivals.*
We constantly interact with our customer.
We listen to customer requests through our IS network.*
We constantly commit to improve on product performance. **
Our supply chain activities have less cycle time.**
Our suppliers (in our SCM link) are involved in our product innovation process. **
Our innovation (in our SCM link) activities are highly active (high innovation).**
Our innovation activities are moderately active (low to medium innovation).
Operational collaboration (OC)
Our suppliers communicate with us regarding their current capacity plans.
Our suppliers communicate with us regarding their current quality issues.
Our suppliers communicate with us regarding their current logistics issues.
Our suppliers communicate with us regarding their current production plans.

Our Suppliers share with us their current capacity plan.
Our Suppliers share with us their current quality issues.
Our Suppliers share with us their current logistics issues.
Our Suppliers share with us their current production plans.
Strategic collaboration (SC)
Our Suppliers share with us their future/long-term capacity plan.
Our Suppliers share with us their future/long-term quality issues.
Our Suppliers share with us their future/long-term logistics issues.
Our Suppliers share with us their future/long-term production plans.
Our suppliers communicate with us regarding their future/long-term production plans.
Our suppliers communicate with us regarding their future/long-term quality issues.
Our suppliers communicate with us regarding their future/long-term logistics issues.
Our suppliers communicate with us regarding their future/long-term capacity plans.
Current commitment (CC)
We keep our commitment with our suppliers based on our current productions plans.
We keep our commitment with our suppliers based on our current contract.*
We keep our commitment with our suppliers based on current operational issues.
We keep our commitment with our suppliers based on our agreements regarding our current projects.*
We keep our commitment with our suppliers to maintain current quality standard.
We keep our commitment with our suppliers to maintain current production capacity.
Continuous commitment (FC)

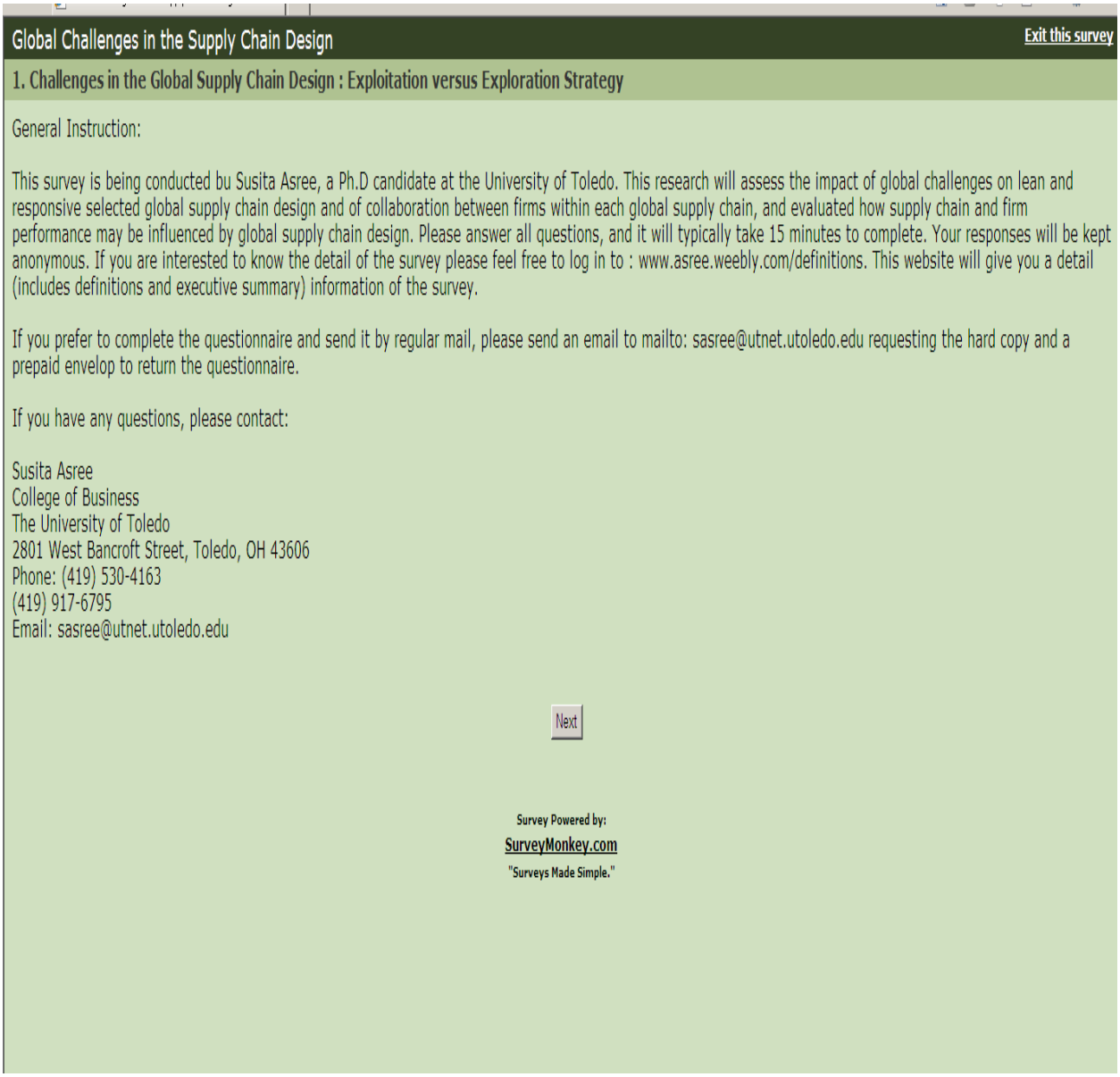
We keep our commitment with our suppliers based on our future productions plans.
We keep our commitment with our suppliers based on our long-term contract.*
We keep our commitment with our suppliers based on future operational issues.
We keep our commitment with our suppliers based on our agreements regarding our future and long term projects.*
We keep our commitment with our suppliers to maintain future production capacity.
We keep our commitment with our suppliers to maintain future/long term quality standard.
Incremental learning (IL)
Our daily/frequent communication with our supplier improves our knowledge regarding our product development.
Our daily/frequent communication with our supplier improves our knowledge regarding our process development.
Our daily/frequent communication with our supplier improves our knowledge regarding our product quality.
Our daily/frequent communication with our supplier increases our knowledge regarding our operational product improvement.
Our daily/frequent communication with our supplier increases our knowledge regarding our operational process improvement.
Our daily/frequent communication with our supplier increases our knowledge regarding our operational quality improvement.
Experiential learning (EL)
We continuously value information (knowledge) from external sources as new knowledge. **
We continuously value information (knowledge) from internal sources as new knowledge. **
We continuously learn (through communication/information sharing) from our suppliers and customers. **

We continuously rely on external information for our innovation activity.
We consider this learning process as an ongoing activity.
Lead time (LT)
We fill customer orders in less lead time.
We have shorter lead time compared to our rivals.
Cost efficiency (CE)
We have low overhead costs.
We have low inventory level.
Innovativeness (INV)
We develop products (more innovative) that are significantly different from our competitors.**
We develop more new innovative products than our competitors.**
Our customers prefer our innovative design over our competitors‘ design.*
Our products have better quality (in regards to innovation) than similar products produced by our competitors.**
Time to market (TM)
Our Products are developed in less time than the industrial average time.
Our Product reaches the market faster than industry average time.
Our Product reaches the market faster than our competitors.
Our Product concept formation (time) takes longer than expected.**
Our Products are the first in the market.
Our Products are commercialized faster than expected.

Operational organizational performance (OCP)
Our firm is perceived to be competitive by our short-term suppliers.
Our firm short term revenue is growing
Our firm has an increasing sales growth.
Our firm has an increasing profit margin on sales.
Our firm is perceived to be competitive by our customers.*
Strategic organizational performance (SOP)
Our firm has a long term market growth.
Our firm has an increasing market share.*
Our firm has an increasing return on investment.
Our firm long term revenue is growing.
Our firm is perceived to be competitive by our long-term suppliers.
Our firm has active innovation activities.*
Our firm is a top player in our industry.*

Appendix B

Online survey



Global Challenges in the Supply Chain Design

Exit this survey

1. Challenges in the Global Supply Chain Design : Exploitation versus Exploration Strategy

General Instruction:

This survey is being conducted bu Susita Asree, a Ph.D candidate at the University of Toledo. This research will assess the impact of global challenges on lean and responsive selected global supply chain design and of collaboration between firms within each global supply chain, and evaluated how supply chain and firm performance may be influenced by global supply chain design. Please answer all questions, and it will typically take 15 minutes to complete. Your responses will be kept anonymous. If you are interested to know the detail of the survey please feel free to log in to : www.asree.weebly.com/definitions. This website will give you a detail (includes definitions and executive summary) information of the survey.

If you prefer to complete the questionnaire and send it by regular mail, please send an email to mailto: sasree@utnet.utoledo.edu requesting the hard copy and a prepaid envelop to return the questionnaire.

If you have any questions, please contact:

Susita Asree
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Next

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Global Challenges in the Supply Chain Design

Exit this survey

2. SURVEY QUESTIONS:

Please rate the extent to which you think the statement is relevent to your firm and supply chain.

1. Technology changes in our industry...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...are frequent.						
ii...are unpredictable.						
iii...are fairly major.						
iv...give us advantage over our competitors.						

2. We have...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...more competitors in international markets.						
ii...loyal customers in the international markets.						
iii...gained more market share in international markets.						
iv...a higher risk in the international markets.						

3. We...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...have agreements with our suppliers about our data protection.						
ii...feel safe to share our confidential information with our suppliers.						
iii...can trust our suppliers on issues regarding security.						

4. Our suppliers...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...do not expose our intellectual property to a third party.						
ii...ensure that only authorized employees log into confidential databases.						

5. We...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...are looking forward to participating in the Free Asian Trade Agreement.						
ii...do not had any problems or issues related to a current country's currency fluctuation.						
iii...have strategies in place to respond to changes in the global economy.						
iv...believe that the current economic situation has a major impact on our business.						
v...believe that the current economic situation has a minor impact on our business.						

6. Our Suppliers share (as partners) with us their...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...future/long-term capacity plan.						
ii...future/long-term quality issues.						
iii...future/long-term logistics issues.						
iv...future/long-term production plans.						
v...current capacity plan.						
vi...current quality issues.						
v...current logistics issues.						
vi...current production plan.						

7. Our suppliers communicate with us regarding their....

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...current capacity plans.						
ii...current quality issues.						
ii...current logistics issues.						
iii...current production plans.						
iv...future/long-term production plans.						
v...future/long-term quality issues.						
vi...future/long-term logistics issues.						
viii...future/long-term capacity plans.						

8. We keep our commitment with our suppliers...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i. based on our current productions plans.						
ii. based on our current operational issues.						
iii. based on our future production plans.						
iv. based on our future operational issues.						
v. to maintain current quality standard.						
vi. to maintain future quality standard.						
vii. to maintain current production capacity.						
viii. to maintain future production capacity.						

9. Our daily/frequent communication with our supplier increases our knowledge regarding...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...our current product development.						
ii...our current process development.						
iii...our current product quality.						
iv...our current product improvement.						
v...our current process improvement.						
vi...our current quality improvement.						

10. We continuously...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...value information (knowledge) from external sources as new knowledge.						
ii...value information (knowledge) from internal sources as new knowledge.						
iii...learn (through communication/information sharing) from our suppliers and customers.						
iv...rely on external information for our innovation (in regards to learning) activity.						
v...consider this learning process as an ongoing activity.						

11. Our firm produces...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...products that have short life-cycles.						
ii...standardized products.						
iii...innovative/complex products.						
iv...products that have stable demand.						
v...products that have unpredictable demand.						

12. We...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...eliminate non value adding processes in our product development processes.						
ii...simplify our processes development to eliminate waste.						
iii...use the same quality programs as our suppliers.						
iv...mainly use forecasting method to project our production resources.						
v...work with our supplier to save cost in our current production.						

13. We...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...modify our products per customer requests.						
ii...increase our level of customization per customer request.						
iii...constantly interact with our customer.						
iv...constantly commit to improve on product performance.						
v...deliver in less cycle time.						
vi...pay attention to our innovation process.						
viii...consider are innovation activity highly active.						
ix...consider our innovation activity are moderately active						

14. Our firm ...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...has an increasing return on investment.						
ii...has an increasing sales growth.						
iii...has an increasing profit margin on sales.						
iv...has a long term market growth.						
v...has short term revenue is growing						
vii...has long term revenue is growing.						
viii...has fills customer orders in less lead time.						
x...has low inventory levels.						
xi...has low overhead costs.						
xiii...has shorter lead time compared to our rivals.						
x...is perceived to be competitive by our short-term suppliers.						
xi...is perceived to be competitive by our long-term suppliers.						

15. Our Products...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...are commercialized faster than expected.						
ii...are the first in the market.						
iii...reach the market faster than industry average time.						
iv...reach the market faster than our competitors.						
v...takes longer time to design than expected.						
vi...are significantly different from our competitors.						
vii...are more innovative than our competitors.						
viii...have better quality than similar products produced by our competitors.						

16. Our managers (operations or supply chain) are able ...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...to understand cultural differences when interacting with culturally different suppliers.						
ii...to understand the legal and economic systems of other cultures.						
iii...to understand cultural values and religious beliefs of other cultures.						
iv...to modify their verbal behavior (words, tone, style) when cross cultural communication requires it.						
v...to modify their nonverbal behavior (gestures, time, and space orientation) when a cross-cultural interaction requires it.						
vi...to conveys the expectations we have of our international business partners.						
viii...to understand the expectations our international business partners have of us.						
ix...to develop culturally appropriate standard operating procedures with our international business partners.						
x...to develop knowledge sharing strategies (cultural related) with our international business partners.						
xi...to build culturally appropriate plans that ensure smooth transitions when activities are moved to offshore partners.						
xii...to resolve cultural differences in expectations with our international business partners.						

17. Our firm has...

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
i...the strategy in place to evaluate the competitive risks of off shoring.						
ii...the legal mechanisms in place to manage risks associated with proprietary firm knowledge.						
iii...the resources to assess the cultural compatibility of international business partners.						

18. Your parent company:

	Malaysia	USA	United Kingdom	China	South America	Japan
is located in						

Other (please specify)

	Malaysia	USA	United Kingdom	China	South America	Japan
is located in						

Other (please specify)

19. Please rank the importance of the following factors (from 1- most important to 5-least important) in selecting your suppliers (use each number only once).

i. Cost

ii. Quality

iii. On time delivery

iv. Process Flexibility

v. Product Flexibility

20. Type of quality program your firm has:

- i. Total Quality Management
- ii. Kaizen
- iii. Six Sigma (active projects)
- iv. ISO standard

Other (please specify)

21. Please specify your firm sales:

	less than 10 million	less than 50 million	50 - 1 billion	more than 1 billion	not available
i. Annual Sales					
ii. Sales at international location.					
iii Sales at domestic location (parent company location)					

22. Number of international locations of your firm:

- none
- two
- three
- more than 5
- more than 10
- more than 50

23. Number of employees:

	less than 100	100 - 500	500 - 1000	more than 1000
i.At your current location				
ii.At parent company location				
iii.Total employess (worldwide) for the company				

24. Most of our suppliers are:

- Local (Malaysian owned company)
- International
- Local and international

25. Type of your firm ownership:

- sole proprietorship
- partnership (with local)
- limited liability company (LLC)
- nonprofit corporation (not-for-profit), and

26. Please indicate your current position:

- [ ] i. CEO
- [ ] ii. Top Management
- [ ] iii Middle Manager
- [ ] iv. Operations Manager
- [ ] v. Purchasing Manager

Other (please specify)

27. The years you have stayed at this organization:

- [ ] i. Under two years
- [ ] ii. 2-5 years
- [ ] iii. 5-10 years
- [ ] iv. over 10 years

28. Type of Industry:

- [ ] i. Food Industry
- [ ] ii. Electronics
- [ ] iii. Textile
- [ ] iv.Chemical
- [ ] v. Heavy Machinery
- [ ] vi. Automotive

Other (please specify)