

# **Competitive Challenges for Supply Chain Management in Emerging Markets: The Case of Mexico**

**by**

**Walfried Lassar**<sup>1</sup>, Florida International University  
**Jerry Haar**, Florida International University  
**Raúl Montalvo**, Tec de Monterrey (Guadalajara)  
**Leslie Hulser**, Florida International University

**April 2009**

---

<sup>1</sup> Contact author: Walfried Lassar, Ryder Professor and Director, Ryder Center for Supply Chain Management @ Florida International University | UP – RB307C | Miami, Florida, 33199 | T: 305.348.3898 | [lassarw@fiu.edu](mailto:lassarw@fiu.edu)

# **Competitive Challenges for Supply Chain Management in Emerging Markets: The Case of Mexico**

## **Abstract**

Drawing on previous studies in the area, this paper advances international supply chain research using the Resource-Based View (RBV) to evaluate the competitiveness of supply chains, specifically in Mexico. Utilizing RBV as the platform, the firm's use and understanding of knowledge management tools, network systems and green initiatives were evaluated. This study hypothesizes that a firm's competitiveness is determined by the resources it utilizes and that as global competitiveness increases, these factors will determine overall firm performance. Through in-depth interviews with Mexican firms, responses were collected and evaluated to determine the importance and understanding of specific resources within the supply chain, with a specific focus on green initiatives. The results of this research provide insights into the state of supply chain conscience in Mexican *maquiladoras*.

## Introduction

Mexico's offshore manufacturing sector has been shrinking, one of the main reasons being growing competition from Asia (United States General Accounting Office, 2003). Many firms have left the region and many more are struggling to keep their heads above water. Strikingly, a small number of firms are not only doing well but actually thriving. To date, there has been scant reporting on these enterprises.

Unquestionably, the intense competition in the global environment will continue; and as a consequence, firms will need to continuously rethink, reorganize, restructure, and reassess their capabilities and operations—Mexico's *maquiladoras* and their suppliers are no different (Sánchez et al, 2002). Mexican firms will need to integrate efficient management practices into their operations to remain competitive in the current economy (Arroyo et al, 2006). Delivering products and services with efficiency and effectiveness along with ensuring quality throughout the process will prove challenging to most companies. Nevertheless, as Ketchen and Hult (2007) point out, the real competition will not be among companies but among supply chains. Firms must view their entire production system in order to determine their overall comparative advantage and make decisions about activities in their value chain (Haytko and Kent, 2007; Porter, 1990). This is especially true in the case of Mexico where both production sharing operations and strong internal demand for both locally made and imported products are driving supply chains to optimize performance (Ordóñez, 2005; Hausman and Haytko, 2004; Unger, 2003).

Three of the most important major forces that are impacting firms and their suppliers are: (1) the challenge to manage knowledge within the firm, to maximize SCM goals (Klein et al, 2007; Wu et al, 2006; Shore and Venkatachalam, 2003); (2) the need to articulate with and integrate the various “nodes” within the supply chain (e.g., other suppliers, buyers, customers, facilitating organizations) (Wu et al, 2006; Sahin and Robinson, 2002); and (3) the pressure to be “green” or environmentally conscious in word and deed (de Bakker and Nijhof, 2002).

How well suppliers harness these forces or respond to market demands may be assessed through the Resource-based View (RBV) of the firm. While the resource-based view is not empirically superior to others (e.g., transaction cost, principal agent, network-based)<sup>2</sup> in explaining supply chain management (SCM), it nonetheless presents itself as the most *appropriate* of existing theories of SCM for analyzing the capabilities—both manifest and latent—of firms and suppliers in managing knowledge; linking/interacting with other actors in the supply chain, and in responding to external pressures and mandates to be environmentally responsible. Furthermore, the interrelatedness of these capabilities within the supply chain need to be realized by management and coordinated to reach the full potential of their resources (Wu et al, 2006). The RBV provides a sound conceptual framework for analyzing and explaining the synergistic relationship between international management, client/customer relations, and external constituencies.

How well firms and suppliers mobilize and manage resources, including managing knowledge, dealing with internal and external networks, and responding to the challenges of “greenness,” are of no less importance—in fact, perhaps even more so—than government policies, exchange rates, labor laws, and external competition from the Far East (Ford et al, 1998; Soler and Lopez, 2005; Tan et al, 1999; Power, Sohal and Rahman, 2001; Harland, 1996; and Capó-Vicedo, Tomás-Miquel y Expósito-Langa, 2007).

For the last twenty years, the *maquiladora* (offshore production sharing) industry has formed the backbone of Mexico’s manufacturing sector. While removed from endogenous industrial development, it nonetheless has been a significant generator of exports, employment and tax revenue. Investigating firm-level behavior with a resource-based view not only adds to the knowledge base of research on *maquiladoras* in Mexico, but provides guidance and practical advice to supply chain participants, including firms, suppliers, and customers (Barratt and Oke, 2007;

---

<sup>2</sup> While there does not exist a unified theory of SCM, there are nonetheless a number of theories that may be considered complementary. Arni Halldorsson, Herbert Kotzab, Juliana H. Mikkola and Tage Skjøtt-Larsen, “Complementary theories to supply chain management,” *Supply Chain Management*, 12/4, 2007: 284-296.

Krishnan, Parente, and Shulman, 2007).

### **Conceptualization**

The resource-based view is an economics-based, theoretical tool that analyzes, presents and predicts how firms attain a sustainable competitive advantage. It argues that the application of a bundle of resources at the firm's disposition, or within its grasp, can achieve this goal, providing the resources are heterogeneous in nature and not mobile (Barney, 1991; Grant, 1991; Wernerfelt, 1984; Peteraf, 1993). The seminal work of Barney (1991) and Peteraf (1993) on the foundation of RBV yields four principal resources that a firm must possess to achieve a sustainable competitive advantage. The acronym is VRIN: *valuable, rare, imperfectly imitable, and non-substitutable*. As Dierickx and Cool (1989) assert, these resources<sup>3</sup> must be considered/mobilized collectively for the firm to achieve a sustainable competitive advantage.

The RBV applied to supply chains has received limited attention in management research, despite its strong explanatory power in best value supply chains—those that can be inimitable competitive weapons (Ketchen and Hult, 2007; Holcomb and Hitt, 2007; Miles and Snow 2007). Given the interdependencies that exist between suppliers and their customers (Watts and Hahn 1993) and the very nature of supply chain interaction as a form of inter-firm relationships (Carter and Ellram, 1994), the RBV can be utilized to explain, enhance, and preserve the key supplier relationships throughout the chain (firm-supplier-customer) and to evaluate performance and maximize the benefits from the relationship (Rungtusanatham, Salvador, Forza, and Choi, 2003). Capabilities that are rare to come by, not imitable, and not substitutable in supply chains (e.g., Cemex in cement delivery; Amazon in books; Intel in chips) facilitate the management of the flow and quality of input and output, increase operational performance and strengthen the synergistic relationship of the supply chain overall.

The Resource-based view applied to supply chain management is conceptualized here to

---

<sup>3</sup> Resources include organizational systems and processes, information, knowledge, capabilities, partners and alliances, and other assets.

study three critically important forces impacting the competitiveness of firms in supply chains: the management of knowledge, network linkages (among supply chain actors), and environmentalism as a growing external phenomenon. Wu et al. (2006) and Kim et al. (2006) supported earlier research that showed IT investment alone does not create a competitive advantage, rather the coordination and information exchange created through increased IT investment can create the advantage. Building on these results, the components of knowledge management and network linkages will be evaluated to determine their effect on competitiveness to the firm as a whole. By integrating supply chain coordination and network linkages into the RBV framework, we aim to overcome the identified shortcoming of the RBV framework which ignores the “broader system” of organizations that are involved in the supply chain (Holweg and Pil, 2008). As the importance of green activities has continued to grow, both through customer’s demands and increasing regulation, firms are concerned with integrating these initiatives into the supply chain. Vachon and Klassen (2008) investigated the relational view of RBV and the natural view of RBV (NRBV) which proposed that the development of environmental management systems in the supply chain can create capabilities for the firm. Their research built on earlier studies from Klassen and Whybark (1999) and Christmann (2000) that found firms could develop capabilities through environmental management that were difficult for competitors to replicate and that can extend beyond the environmental goals to develop other areas of competitiveness. Therefore, we include green initiatives as resources that firms can develop to increase their competitiveness. These three components combined under the framework of RBV, provide an inclusive look at supply chain activities that could provide a competitive advantage for firms.

### **Force #1 – Managing Knowledge**

Conner and Prahalad (1996) argue that knowledge-based resources are the essence of the RBV, following therefore that the management of knowledge is critical to any organization and its internal as well as external relationships. According to Swan, Scarbrough and Preston (1999),

knowledge management is any process or practice that embodies knowledge creation, acquisition, capture, sharing and use to enhance organizational learning and performance. For supply chains, knowledge acquisition and application will be the key competitive factors and the most valuable strategic resource in a firm's portfolio of assets (Nonaka, 1994; Zack, 1999). However, structures must be created and actions taken to encourage and support the exploitation of existing knowledge and creation of new knowledge (Nonaka and Reinmoeller, 2003). Both tacit and explicit knowledge—organizational memories in particular—have been found to be essential sources of competitive advantage (Hurley and Hult, 1998); however, firms must constantly replenish their stocks of knowledge to ensure that the enterprise's resources remain valuable and do not erode over time (Holsapple and Singh, 2001; Garcia, Calantone, and Levine, 2003). These findings are especially relevant for supply chains. As Hult, Ketchen, and Slater (2004) found, the knowledge development and management processes can explain substantial variance in cycle time. Recognizably, mobilizing and managing all sources of knowledge essential to chain operations is paramount. As chain members comprise many different organizations, knowledge is vital to coordination and central to chain functioning (Hansen, 2002). Part and parcel of knowledge acquisition and application is knowledge sharing, all the more so for actors in the supply chain. Spencer (2003) found that firms that shared knowledge earned higher innovative performance than firms that did not. Cheung and Myers (2008) confirmed this finding, concluding that while there is still a lot of hesitancy on the part of supply chain managers to share critical knowledge, experience reveals that knowledge sharing by buyers and suppliers can benefit both. From the Resource-based perspective, knowledge acquisition and management within and through supply chains clearly impact competitiveness.

## **Force 2 – Linking Networks**

Managing knowledge internally, no matter how judicious and efficient, cannot increase supply chain competitiveness unless that knowledge is integrated into the relationships conducted

and maintained throughout the chain. Firms and their suppliers must cooperate between themselves as well as with their own respective partners. Networks create paths for firms to collect information, fend off competition, and coordinate pricing or policies (Wasserman and Faust, 1994). Reciprocity in such cooperative relationships is vital (Oliver, 1990) and key to the development of new resources (Håkansson and Ford, 2002). These collective efforts can yield positive gains within the supply chain that firms acting on their own might not be able to achieve (Håkansson and Snehota, 1995; Harland and Knight, 2001). A network approach (Thorelli, 1986) is grounded in the communications linkages among various parties in the supply chain---suppliers vis-à-vis their clients and customers as well as within their respective organizations. While various facets of the network relations are standard or pro forma, factors such as trust and “chemistry” move the relationships to customized ones. Dynamic at its core---moving, changing—the links between firms in a network encompass what Johanson and Mattsson (1987) categorize as two types of interaction: exchange processes (such as products, services, information) and adaptation processes (administrative, logistics, technical, personal). Relationships within supply chains may be characterized as strong and weak; tightly coupled firms comprising the former, loosely configured ones the latter (Granovetter, 1973). Best value supply chains, according to Ketchen and Hult (2007) comprise a blend of strong and weak ties to maintain reliability and flexibility and maximize supply chain performance. In essence, though, the resources based in, and harnessed by, suppliers and their customers to ensure mutually satisfying and soundly functioning networks are dependent upon power and trust—particular the latter (Uzzi, 1997).

### **Force 3 – Adopting “Green” Measures**

Green supply chain management (GSCM) integrates environmental awareness and action into the supply chain, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management of the product after its useful life (Srivastara, 2007). Green supply chain management has grown in



importance during the last decade due to both choice and necessity. The pressures and drivers for adoption and boosting environmental performance emanate from stakeholders both within and outside the enterprise—mainly the latter, such as the ISO 14000 and related requirements, all operating at the global level. Even Mexico, which is considered a less mature market for such measures, has seen an increase in this focus due to the involvement of organizations such as the Global Environmental Management Initiative (GEMI) and the Commission for Environmental Cooperation (CEC). Duber-Smith (2005) identifies ten reasons why companies should adopt the green: target marketing, sustainability of resources, lowered costs/increased efficiency, product differentiation and competitive advantage, competitive and supply chain pressures, adapting to regulation and reducing risk, brand reputation, return on investment, employee morale, and the ethical imperative. The academic literature on GSCM is substantial, comprising studies on various dimensions and aspects of green supply chain management and operations as well as syntheses of existing studies (Kleindorfer, Singhal and Van Wassenhove, 2005; Srivastara, 2007; Boks and Stevels, 2007). For example, Simpson, Power, and Samson (2007) assess the relationship between applying GSCM with customer's requirement, and Cheng, Yeh and Tu (2008) examine how trust interacts with factors affecting inter-organizational knowledge sharing in green supply chains. Although logistics managers tend not to place high consideration on environmental issues in their decision-making, planning and operations (Murphy and Poist, 2003), the benefits of GSCM are not insubstantial. For example, Pagell, Yang, Krumwiede, and Sheu (2004) found that investment in environmental management provided increased performance from all companies, regardless of country or size in their study. Environmental management in operations will continue to increase in importance (Corbett and Klassen, 2006). Consequently, conceptual frameworks for assessing responsible chain management (de Bakker and Nijhof, 2002) as well as metrics in evaluating the environmental performance of supply chains (Kainuma and Tawara, 2006; Hervani, Helms, and Sarkis, 2005) will most likely garner increasing attention from academic researchers and

practitioners alike. Presently, there is a paucity of shared supply chain measures at the inter-organizational level to assess the environmental aspects of SCM (Cuthbertson and Piotrowicz, 2008).

The three forces impacting the Resource-based View of supply chains, and the relationship among them, are the subject of our empirical assessment of competitiveness in Mexico's supply chains.

### **Methodology**

The nature of the research problem should drive the choice of research strategy (Creswell, 1998; Denzin and Lincoln, 1998). Consistent with this philosophy and because of the lack of extant knowledge on the phenomenon, we employed grounded theory methodology. Grounded theory is a qualitative research methodology that allows the exploration of concepts, identification of relationships in raw data, and organization of concepts and the relationships into a theoretical scheme (Strauss and Corbin, 1998). Another advantage of grounded theory is the ability to handle complex phenomenon such as resource based supply chain management with its three dimensions investigated in our project because the methodology emphasizes the need for developing multiple concepts and their linkages in order to capture the central phenomenon. Insights from the grounded theory study and existing literature were used to develop the framework investigated in this paper.

We followed a pre-designed interview protocol for our in-depth interviews. First, we provided interviewees with a brief description of our research project, along with definitions of the key constructs. The questioning consisted of broad open ended questions followed by more specific and focused questions. This design was modeled after the data collection used by Kotabe, Parente & Murray (2007).

Selecting participants who can provide meaningful data on multiple incidents is critical for grounded theory. To maximize the variations in the phenomenon, we interviewed managers

involved in making and executing supply chain decisions from a variety of manufacturing companies. A varied group of managers holding different positions from different industries and firms with different sizes were recruited to look for similar supply chain networks across multiple contexts. We included several respondents for each focal firm, usually one general manager, one functional manager and functional supply chain managers for one or two suppliers. See Table 2 in the Appendix for a functional description of our respondents.

Among the various enclaves or clusters of *maquiladora* manufacturing, few have been as key to Mexico's competitiveness as the State of Jalisco and its capital of Guadalajara. The region and municipality are populated by hundreds of firms, from small service providers to multinational companies, with the largest concentration in electronics and information technology. Therefore, the company interviews were conducted in Guadalajara.

Representatives from eight focal companies were interviewed, using multi-level interviews within most of these focal firms to accurately determine the level of knowledge and involvement in supply chain management. The focal firms interviewed included IBM, Hewlett-Packard, Flextronics, Jabil, Foxconn, Sanmina SC, Continental and Fresenius. Additionally, interviews were conducted with eight suppliers related to the focal companies were conducted to determine the level of relationship existent in the supply chain. See Table 3 in the Appendix for the network association of the interviewed firms.

A total of 24 in-depth interviews of 60 minutes each were conducted. The interviews were recorded, unless requested otherwise. All interviews were followed by a tour of the facilities. The interviews were conducted between December 2008 and March 2009 in the state Guadalajara, Mexico.

During the interviews, a pre-scripted instrument was followed that included open-ended questions covering seven areas of supply chain management. Questions were organized to be of increasing focus as the interview progressed. In the event respondents were unable to answer a

question, definitions were provided to allow the interview to continue. Interviews were conducted in English when appropriate and detailed notes were taken of the responses provided by the participants. At the conclusion of the interview, a brief summary was provided by the interviewer to provide a final opportunity for feedback from the subject. For a list of all questions see Table 1 in the Appendix.

## **Analysis and Discussion**

### **How do firms conceptualize and define supply chain management?**

While we found no two responses alike among top managers and functional managers, we did find general agreement that supply chain management entails, at the minimum, a broad range of business functions and services including research and development, production, forecasting, purchasing, logistics, marketing, sales, information, finance and customer service. This understanding encompasses the very model of supply chain management elucidated by Mentzer et al. (2001; See Figure 1)

[Insert Fig 1 about here]

In certain instances, especially with respect to price-sensitive and low-margin related inputs, purchasing and logistics were deemed paramount. In the case of industrial firms in the highly competitive automotive sector, such as Continental, as well as electronics suppliers to a variety of large global firms (the cases of Flextronics and Jabil), just-in-time inventory management and customer service weigh heavily in their supply chain decision making.

While the interviewed firms may have placed varying degrees of importance to the nearly dozen aspects of supply chain management cited above, none discounted the importance of each of those elements. In general, almost all firms conceptualized and defined supply chain management as a coherent set of approaches for efficiently integrating suppliers, manufactures, warehouse and distribution centers and retail establishments for the purpose of producing and distributing merchandise in the right quantities to the right locations and at the right time in order to minimize

system wide cost while meeting service level requirements (Simchi-Levi et al, 2004).

As one manager, Roberto Ayala of Foxconn, indicated: “It is not just about having access to the raw materials at a competitive price. Time, location, information, and getting the product to the final destination while ensuring quality throughout is of critical importance to our firm.”

Another manager asserted that supply chain management has to do with the logistics of information flows, and in general the ability to connect demand with the supply of components including the reaction speed of the whole chain. As an example, he mentioned how important it is to have state-of-the-art information systems for the entire chain. It might take days when a distributor cancels an order in Colombia until a supplier in Taiwan is aware of it. According to Roberto Hernandez of HP: “That kind of dysfunctionality is highly disruptive to the entire supply chain and costly and prejudicial overall to the customer.”

In accordance with this and as mentioned by Julio Acevedo a top manager of HP “Our supply chain management is very complex; we are in 170 countries which means 170 customers and using 400 suppliers. For that reason our supply chain is one of the most complex at a global level.”

From the supplier point of view there was no disagreement on the conceptualization and definition of supply chains. This is not to say there is no normative disagreement in the relationship of supply chain management between buyers and suppliers. As in all commercial relationships between vendors and their customers, perceptions vary widely with respect to operational features such as on-time deliveries, quality, reporting, financial management and overall customer relationships. Recognizably there will be different interpretations in complying with the different matrix of buyer supplier performance.

As Ernesto Donadieu of Ryder a supplier for HP points out: Supply chain management “is the coordination to move materials from a firm to their consumers and the information flow needed for that purpose.” In almost all cases suppliers mention and emphasize the importance of both coordination and an understanding of their buyers’ business in order to fulfill their requirements

on time and according to their standards.

Also in the case of the suppliers it is important for both buyers and sellers to understand at what stage of the supply chain they are since this has different types of implications. As indicated by Alejandro Vazquez of ROHM Semiconductor a supplier of Continental: “Supply Chain Management entails all the activities involved in supplying materials and saving time and cost from requirement to the fulfillment of a given need. It entails all the production chain including suppliers, the manufacturer and its customers. Since we are at the beginning of the chain, we help to plan materials’ supply.

**What kind of processes and systems do supply chain participants utilize in their enterprises?**

The researchers found a rich body of responses to this question. The general sense and approach to processes and systems from the sampled companies is best captured by IBM General Manager Eugenio Goddard who cited the process and system for supply chain as a dynamic one in which continuous improvement and reinvention serve as the centerpiece:

*We make sure at all times that suppliers know what IBM is doing—we work very closely with them. In this way our suppliers can direct and execute their production based upon what IBM produces and plans to produce. This makes the whole process more responsive and adaptable across the board.*

Although there are many similarities in the process and the systems among buyers and suppliers, each industrial sector possesses unique features in this regard. For example, in the electronics component sector, for both original equipment manufacturers (OEM) and contract manufacturers, an Approved Vendor List (AVL) is of utmost importance. In this process all materials have to be approved by the customers from the largest components to the smallest inputs. Buyers demand lowest point pricing and optimal efficiency in delivery to lower the cost and ensure speed--one of the most vital characteristics in the quick cycle of electronic components industry. Suppliers have very little leeway to substitute components or utilize any vendor not pre-

approved by their customer. At the same time, suppliers as well as buyers scan the globe constantly in search of alternative suppliers of inputs who can furnish high quality materials quickly, efficiently, and at the lowest possible price.

Although processes and systems for supply chain are understandably centralized at the top of the organization, with a rigorous system of monitoring, reporting and adjusting, it is also true that companies decentralize selected operational functions as pointed out by Roberto Martinez from HP:

*There is no single process, there are many-- demand planning, administration of the HP net, MRP [material requirements planning] systems, and supply administration systems. There are also informal as well as formal processes managed from consumers to the corporation. There are systems and processes in all the distribution channels, since there are many different ways of selling.*

As for the utilization of networks, the understanding of the concept as well as its implementation, vary widely among general and functional managers and from suppliers. Initially, respondents understood networks to be electronics information systems--purely technical in purpose and function. However, following the broader explanation from the researchers, the interviewees understood networks to be a set of commercial and social relationships.<sup>4</sup>

*A number of firms consider their networks to include suppliers, customers, shareholders, employees, their financial institutions and the community at large. Typical were the comments of one supplier who stated: "Our networks encompass more than customers. The means of designing, managing, and maintaining these communication networks cover the broad spectrum of electronic interconnection including CRM, intranet, and ERPs, through our electronic and interpersonal means*

---

<sup>4</sup> We explained networks and network position as a set of a firm's relationships, including obligations and resource commitments, particularly as they regard buyer-seller interactions. See Turnbull, P., Ford, D. and Cunningham, M. (1996). "Interaction, relationships and networks in business markets: an evolving perspective," *Journal of Business & Industrial Marketing*, 11, 3/4: 44-62.

*of communication, all parties can work to ensure the business objectives are met.*

As for managing the networks, several respondents indicated that their networks are managed in mostly a centralized fashion but with great leeway to adapt their systems. Individual business units often customize their own systems for supply chain management. One firm created two organizations of network management—one for purchasing and one for negotiations with suppliers. Transparency and privacy were cited as two of the most important features of effectively managed networks. Trust, accountability and customer satisfaction were also cited by a number of respondents as a very important aspect of network communications.

A number of firms described their network as a series of sub processes: Acquisitions and procurement, logistics, warehouse management, and VMI (vendor managed inventory). According to Carlos Gomez of Continental:

*Our network process flows from the conceptualization and design of the idea, testing, sourcing, validation, implementation, SOP, controlling, monitoring and end-of-life. For each stage in the network management process there is a clear definition of position and duties. There is no regional or location process--it is global at its core.*

For other firms that rely heavily on their networks, they cite demand planning--which gives a short and a long term forecast--product life cycle monitoring and other process functions, all derived from MRP. The researchers found that in cases where firms offered an extensive portfolio of products and that those products utilized hundreds—even thousands of inputs—but that qualified suppliers were few in number, the greater the likelihood that these multinationals relied on systems, processes, and networks for SCM.

In essence, through the use of a broad range of information technology systems, such as ERP, SAP R3, and personal communications, both buyers and suppliers are able to tie together all aspects of their supply chain management systems and ensure transparency, productivity and efficiency in real time.



### **How committed is senior management to SCM?**

If indeed as Holt (2004) observes, that business competitiveness in the 21<sup>st</sup> century will be based not on competitiveness among firms but among supply chains, senior management in our sample of companies would fully agree. According to our respondents, headquarters senior executives either fully support or do not interfere with the design, planning, implementation and monitoring of supply chain operations. To illustrate in the case of Flextronics, company commitment means that all materials workers are fully integrated in the supply chain management system--each area having their appropriate responsibility to ensure that their contributions to SCM are critical and sustainable. A senior materials vice-president is located in China where most of the firm's suppliers are based in order to ensure that production and output are efficient and every aspect of the China-based supply chain system from sourcing to exporting runs at an optimal level of performance.

In a number of instances, supply chain management is emerging alongside finance and marketing as a path for fast track promotion and advancement to senior leadership positions at the national and global level of the firm. In terms of governance structures the situation varies widely. It is worth citing Fawcett's model for supply chain governance (See Figure 2)

[Insert Fig 2 about here]

While no firm in our sample manifested Fawcett's composite model with separate vice-presidents for R&D, sourcing, operations, logistics and marketing combined with an executive steering for governance counsel to oversee new product development, commodities, process redesign and customer relationship, the researchers did find management systems responsible for end-to-end SCM operations in which governance occurs in both centralized and non centralized managerial systems working closely together.

In several companies, each business unit has its own supply chain manager that reports to the supply chain vice-president at regional or corporate headquarters. One of the most

sophisticated examples, Jabil Corporation, possesses three main divisions each with a SCM vice-president who reports to the division president who in turn reports to the CEO.

The researchers found, however, that formal governance structures among suppliers were absent despite the fact that all suppliers maintained a heavy commitment to supply chain management as a business function.

### **How is knowledge managed by firms in the supply chain?**

Increasingly organizational learning is regarded as indispensable to the planning, operation and performance – and therefore the competitiveness – of enterprises worldwide. Knowledge management has come to be regarded in explicit and tacit forms as the prime variable in effective management of supply chains.

Knowledge management among the firms of our sample all incorporated to varying degrees the development, dissemination and diffusion of knowledge both tacit and explicit throughout their companies and networks. This ranges from both in-company and external training to inter-firm information sharing and informal transfer of tacit knowledge from employee to employee and unit to unit.

In the case of HP for example, knowledge management is incorporated in training and is highly valued. The firm facilitates employees taking courses internationally via the web (e.g. ISO 2009 requirements, other certifications) and links knowledge gained via instruction to employee performance plans. During the last five years, the firm has given high priority to the continuous promotion of knowledge linked to good management practices and technical learning, as well.

All firms in our sample support knowledge management and development in areas such as Six Sigma, Balanced Scorecard, TQM, and corporate university classes.

Understandably, it is technical learning in the knowledge management process that is the highest priority for companies. For example, as a pharmaceutical related firm Fresenius places a high priority on instructing their employees in ISO 9000 and ISO 2000 and provides compulsory

training on best practices for many of the positions in the company.

In the case of one electronics manufacturer, metrics are developed for managing knowledge focused on lean manufacturing. Implemented internally, lean training consists of nine modules of two hours length each; in order to be promoted in the firm employees need to pursue specific studies in courses focusing on the entire range of lean-related subjects.

Once a week from 11 to 12 Kaizen<sup>5</sup> objectives are reviewed. A major priority in knowledge management is for middle level managers and middle level staff to acquire recognized certifications on many aspects of production manufacturing. The sharing of best practices via Intranet is stressed, and inter-company training (among subsidiaries) employs areas of excellence in production and management. For example, a Mexican firm (subsidiary) is advanced in lean manufacturing, so it sends its leading experts to Brazil, weak in that area, for short periods to teach the staff there.

### **Do suppliers have the responsibility for the transfer of knowledge?**

All agreed that in buyer-supplier relationships the mutual exchange of knowledge in a continual and sustained basis is vital to ensure the mutually compatible business objectives of both firms. As Roberto Ayala of Foxconn stated: “When you establish strategies for your companies you lead and transfer the knowledge to execute efficiently and effectively. It is not possible to think and act in this environment without network collaboration.” As a Fresenius supplier asserted: “The agreements our large customers have with suppliers like us work in both directions, to the benefit of all parties. It’s in the contract. Also the company helps suppliers with quality systems.” In the case of IBM, they have a supplier development program, primarily for emerging markets, but for the most part respondents do not believe that suppliers have the responsibility for the transfer of knowledge. Recognizably, however, the inverse is true---many buyers believe that transferring non-proprietary knowledge to their suppliers will help improve supplier performance vis-à-vis buyer

---

<sup>5</sup> Kaizen is a Japanese philosophy that focuses on continuous improvement throughout all aspects of life. When applied to the workplace, Kaizen activities continually improve all functions of a business, from manufacturing to management and from the CEO to the assembly line workers

expectations and demands, benefiting the supplier in knowledge improvement well beyond the specific relationship with the buyer.

The researchers found that many individuals, functions and business units are involved in the process of knowledge management, the principal individual being the head of human resources. As far as networks for knowledge management, firms avail themselves of a variety of these. Flextronics, for example, uses internal vehicles, including Intranet for courses and on-site training. Sanmina has its own university that provides online education for certification as well as a host of other, general business and engineering subjects. Jabil and IBM utilize a network of plants and business units for knowledge-sharing, and in the case of the latter, they send manufacturing people to visit other plants and share best practices, not only in production but other areas such as green practices.

Knowledge management is indeed recognized and valued by firms as an important resource. Size clearly is an important factor though, as some of the smaller suppliers to large firms do not possess formal systems for knowledge transfer and management, save for training manuals inside the company and tacit knowledge as embodied in the firm's administrative heritage.

### **How do firms handle green supply chain management?**

The last decade has witnessed a dramatic increase in corporate and environmental responsibility. Although relatively late to embrace green policies offshore manufacturers and their suppliers are adapting green measures in their production operations and the supply chains of these firms are no exceptions (See Figure 3).

[Insert Fig 3 about here]

In querying the firms in our sample with regard to the importance of green supply chain issues in their organizations, all responded uniformly in the affirmative.

Whether motivated by altruism or external pressures from a variety of constituencies--or a combination thereof--companies in the electronics industry in particular are adapting policies,

programs and operational measures to elevate green supply management as an important business function. As one executive stated: “Environmental issues comprise a core value of our company. From materials sourcing to production, packaging and labeling to sales to our customers and the disposal of scrap and waste in our manufacturing processes, we are vigilant and conscious about the environment. As Ernesto Sanchez of Jabil stated: “Our firm has had a strong commitment to green supply chain management long before it became fashionable and regulations--local and international regulations and standards--where set in place”.

The researchers found that almost all firms achieved or strived for ISO 14000 certification. Of prime importance to these companies was the exclusion of lead in their production processes, reduction in the use of energy, the adoption of recycling throughout their plants, and the employment of green policies in packaging along with the ensurance of sound environmental health conditions in their plants and warehouses.

The researchers also found that foreign multinational firms believe that they and their suppliers--due to the multinationals’ insistence--are more environmentally conscious than local firms. They also acknowledge that European customers are more demanding than their American ones, but that *both* U.S. and European customers are far more demanding than the Latin American ones. As environmentally conscious customers demand compliance with environmental standards that meet or even exceed ISO standards greater and greater pressure will be placed on the suppliers of firms that sell to these customers.

For a firm like Continental that sells 25% of its automotive products into the NAFTA region, and 60% of their sales to Europe, companies that wish to supply this global firm – one that intends to pare down its supplier list by two-thirds – it is of critical importance that those who wish to remain as suppliers to Continental adopt and implement rigorous environmental criteria in their own supply chains.

**What role does performance play in supply chain management?**

Recognizing the increasing competition among global firms and their suppliers, performance issues embody the very core of the firm's survival. Mexican based firms and their supplier networks are no different in how they value, track, measure, and control for financial, production and market variables such as productivity rates, return on assets and investment, market share and other performance metrics.

The researchers posed a number of related questions to general and functional managers as well as their suppliers. We began by querying them on their definition of good performance; in general the respondents cited customer satisfaction and optimal use of resources as most important. Additional factors included in their criteria were worker and shareholder satisfaction, delivery quality and cost along with meeting (but preferably exceeding) all objectives. The balanced scorecard concept was found to be widely used in sending and receiving freight, inventories, cost and delivery times. As Rogelio Mier Bueno of Sanmina SCI stated: "A company that delivers products on time with the optimal requirements while creating and sustaining long term relationships with all parties in the firm's business networks clearly will have achieved excellent performance."

Controlling for performance is vitally important in an enterprise to achieve its objectives. The firms in our sample take a variety of approaches in controlling for their performance. Most employ internal and external controls in which time, cost and relationships with customers are paramount. One organization cited bonus pay and metrics based on Wall Street evaluation inventory turns. Another employs weekly reviews of key metrics on-site and takes preventive and corrective actions. And still others in our sample focus on annual savings targets, quality and deliveries. Quality, including quick identification of problems and swift corrections of rejected merchandise, are vital to the control for performance for all firms in our sample.

How companies value performance varies widely, as well. Most important to the enterprises in our sample are customer and shareholder satisfaction, in which the quality and consistency of

customer service and shareholder satisfaction with the firm's financial performance are most important. Most companies manifest their value of performance through financial rewards to employees and managers. How employees achieve predetermined targets such as productivity goals, cash management, market share and achieving sales targets, result in tangible rewards. In one firm, bonuses are paid to managers with 60% based on financial performance and the remainder on customer satisfaction and cash performance. In the case of Continental the value they place on performance is manifested in the promotion of people to higher level responsibilities along with higher salaries and bonuses. Selecting highly talented individuals for training is also important with such decisions made through collective meetings. As purchasing manager Guillermo Schmidhuber expressed: "Bonuses are paid when all targets are reviewed and met by the employee. Roundtable meetings occur to identify and track talent. High potential individuals are selected and placed on a fast track."

In most cases rewards such as bonuses and raises are based on the negotiations at the beginning of the year. And if the employee and/or business unit can not only meet but exceed the objectives, then the financial benefits are parceled out. As Norberto Leandro of Fresenius stated: "Everything is measured against the budget." In fact with respect to performance metrics all respondents were in agreement that financial and customer measures of performance were the most important.

At IBM performance metrics are decided based upon the position of the employee or the function of the business unit. For example there are metrics for cost maintenance, site availability and utilization, concrete and measurable ideas of management improvement, and control and evaluation of existing processes. In an international firm such as Continental, a global leader in automotive products, savings, quality and subsidiary performance especially in low cost countries are key measures of performance. Freight cost, labor cost, corporate income, out of the box audits, inventory turns, material cost, and control of suppliers' performance are all critically important

measures. According to Roberto Hernandez from Flextronics his view shared by most is that different business units and functions all have different performance goals, but at the corporate level bonus payments are defined according to criteria from Wall Street.

As to how often metrics are used to evaluating performance by business units there is wide variation. Most firms evaluate monthly; others daily, weekly, quarterly and every six months. Sophisticated management information systems allow these enterprises to closely and accurately track performance.

As for performance goals, our respondents cited financial goals, customer satisfaction including quality and time of delivery as the principal performance goals in place. The balanced scorecard is widely used to establish performance goals; and in the case of plant level, production component manufacturers cite defective parts per million, AD cycle time and non-conformance cost (the cost for poor quality from suppliers). For still others EBIT, on-time delivery from suppliers and company delivery time to customers are key performance goals. Finally, a number of firms also employ external criteria for performance goals. In the case of SANMINA, to maintain “A class” status--the highest in the Kaizen program valuation--is of the most importance. In all cases, buyers and suppliers are fully aware of the need for continuous performance improvement and to select, adopt and adapt performance goals, measures and systems to ensure a continuous trajectory of high achievement.

### **What risk management strategies do companies employ?**

Offshore manufacturers in industries with fast cycle times and based in emerging markets where a whole series of risks are present (political, economic, legal, safety) are specially challenged to plan, design and implement strategies to mitigate risk. This is especially important for supply chains. All firms the researchers interviewed have strategies from the mundane to the sophisticated for managing risk. This includes disaster recovery plans, alternative manufacturing sites and redundant suppliers (See Figure 4).



[Insert Fig 4 about here]

One high technology firm asserted that risk management is conducted in their regional headquarters in Miami and includes risks such as material quality, on time delivery to customers, theft and fire.

The use of redundant suppliers was cited by interviewees as essential. Companies demand written commitments from suppliers to correctly manage inventory, materials purchasing, securing customized materials and other related issues. In the case of Hewlett Packard, they utilize worldwide risk assessment systems as well as those at the plant level. As Roberto Martínez of HP asserts:

*A mature prevention process includes among other things a mock system breakdown which could include a bomb explosion that affects SAP or an event that harms or disables key personnel. Business continuity plans are central to HP's risk management process in their supply chain.*

All firms interviewed do have contingency plans in place; some are developed at the corporate level, some at regional headquarters and in all cases at the plant level. Foxconn uses VMI, and the firm carefully tracks supply and demand flows so that suppliers will always have the capacity to meet Foxconn customer demands.

For Continental, their contingency plans include redundant factories, two week inventories, and careful tracking of customer demand and product cycles so as not to be stocked with obsolete inventory. It is common for corporate headquarters or regional headquarters to audit and monitor a subsidiaries contingency plans on a regular basis.

When asked about the challenges associated with these strategies the comment of Roberto Hernandez of Flextronics is representative. "The key challenge is that each actor in the supply chain has to understand that delivery times are compact, and that company-supplier interaction has to be close, constant, efficient and flexible".

Dynamic industries such as electronics and high technology must contend with globalization often moving faster than their abilities to adjust. Life cycles for products are becoming shorter, and companies must be able to react to demand fluctuations more efficiently and responsibly than ever before. Companies must have the capacity to track and purchase inputs. In other words, security, terrorism and black markets could produce devastating impacts to producers and customers. According to Ernesto Sanchez of Jabil, intellectual property is a key determinant of competitiveness. For him and several others, Mexico provides a superior environment than China for intellectual property protection.

For all firms, maintaining a good information base to track, cost and input availability so as not under buy or overbuy is extremely important. As for tools and techniques to manage risks, the respondents have an arsenal that covers the gamut. This includes SAP, ERP for IT, risk management educational programs, business continuative plans, six sigma and as previously mentioned redundant suppliers and on average two weeks inventory of supplies.

As Norberto Leandro of Fresenius emphasized: “Corporate headquarters is ready and willing to work with their subsidiaries in identifying and implementing the most appropriate tool and techniques for risk management that allow both headquarters and the subsidiaries to efficiently and effectively manage a variety of risks.

When asked about the most risk in the global supply chain, all firms cited energy costs, transportation bottlenecks, infrastructure, and security (both local crime and theft as well as global terrorism). The price of raw materials, the shortness of product life cycles and protectionism were deemed of equal importance.

## **Conclusion**

Our qualitative assessment of the sample firms—multinational buyers as well as suppliers—confirms that the Resource-Based View (RBV) of supply chain management, along with the important forces of knowledge management, network systems, and green factors are strong

explanatory factors in the planning, design, and execution of supply chains in Mexico.

Continuous improvement and reinvention of systems and processes in supply chains are commonly shared traits among the companies we evaluated. The kind of resources, amount, and form of application may vary, but the concept of *resources* as a driver of supply chain management and corporate competitiveness is inarguable. Management at headquarters, regional, and subsidiary levels all recognized the vital importance and need to dedicate significant resources to SCM. In fact, along with finance, marketing and production management, SCM is emerging as a “hot ticket” for corporate promotion and advancement to leadership positions throughout the firm.

For the sample firms networks were of vital importance and included not just customers but suppliers, shareholders, services institutions (banks, insurance companies), and civil society. Communication with these different actors was regarded as a business “process” to operate continuously, from design to implementation, monitoring, and feedback activity. Whether centralized or decentralized—and several firms had *both* network management systems operating simultaneously—transparency, privacy, accountability and customer satisfaction were primordial. As for the operational dimension of networks, a central part of the network operations embodied interactive systems for sourcing, controlling, monitoring and end-of-life. All of these, including product life cycle monitoring, were derived from MRP systems.

As for knowledge management, more and more firms regard it as indispensable to their business—planning, executing, monitoring and adjusting their operations. Both buyers and suppliers believe that the development, transfer and spread of organizational learning---tacit and explicit knowledge—throughout their networks can give them a competitive advantage in addition to improving operational efficiency, effectiveness and quality. Six Sigma, Balanced Scorecard, TQM and university and intra-firm “university” courses and programs are vital for their operations. Kaizen, Intranet and ISO-related knowledge management systems and measures are being adopted throughout the firms, from headquarters to overseas subsidiaries. And while buyers and suppliers

transfer knowledge back and forth on a frequent basis, an increasing trend is the proactive movement of firms to fashion a “supplier development program” of non-proprietary knowledge to ensure that their suppliers, that do not have formal knowledge management systems for the most part, can garner learning necessary to improve their performance as suppliers to the larger firms.

Finally, although late to the game, offshore production manufacturers such as those firms in our sample are increasingly adapting green measures and systems throughout their companies—and that includes supply chains. All firms—both buyers and suppliers are integrating “green” in their plans, policies and operations. For some, it is a core value of their company—especially if they are a European or European-related firm (i.e., a supplier to European companies). This may include sourcing, packaging and labeling, minimization of waste in production, and disposal of by-products of the manufacturing process as well as end-of-life goods. ISO 14000 is regarded as the coin of the realm among firms and all were adamant about avoiding lead in their production operations. Interesting, as well, the researchers observed in-plant environmentally responsible systems for energy usage (e.g., light sensors) and receptacles for paper, plastic, and metal in addition to signage encouraging employees to be green.

The competitiveness of supply chains in Mexico is determined by many different factors, and a Resource-Based View of the firm, with attention to networks, knowledge management and the adoption of green policies and measures will loom large in the near- and long-term business environment. Recognizably, this qualitative study involves one country only and a small sample of firms. Future research should extend this pilot research to other countries and industries (beyond electronics and information technology) and utilize a larger sample of firms. Additionally, the qualitative research should be complemented with quantitative assessments using structured survey questionnaires that lend themselves to multivariate analyses.

## References

- Arroyo, P., Gaytan, J. & de Boer, L. "A survey of third party logistics in Mexico and a comparison with reports on Europe and USA." *International Journal of Operations & Production Management*, 2006: 6: 639-667.
- Barney, J.D. "Firm resources sustained competitive advantage." *Journal of Management*, 1991: 99-120.
- Barratt, M. & Oke, A. "Supply chain management in a sustainable environment." *Journal of Operations Management*, 2007: 25,6:1217-1233.
- Boks, C. & Stevels, A. "Essential Perspectives for Design for Environment: Experiences from the Electronics Industry." *International Journal of Production Research*, 2007: 45 [18-19]: 4021-2039.
- Capó-Vicedo, J., Tomás-Miquel, J.V., & Expósito-Langa, M. "La gestión del conocimiento en la cadena de suministro. Análisis de la influencia del contexto organizativo." *Información Tecnológica*, 2007: 18,1:127-135.
- Carter, J.R. & Ellram, L.M. "The impact of interorganizational alliances in improving supplier quality." *International Journal of Physical Distribution & Logistics Management*, 1994: 24,5:15-23.
- Cheng, J., Yeh, C., & Tu, C. "Trust and Knowledge Sharing in Green Supply Chains." *Supply Chain Management*, 2008: 13, 4: 283-295.
- Cheung, M-S. & Myers, M.B. "Managing knowledge sharing networks in global supply chains." *International Journal of Management and Decision Making*, 2008: 9,6:581-599.
- Christmann, P. "Effect of 'best practices' of environmental management on cost advantage: The role of complementary assets." *Academy of Management Journal*, 2000: 43 [4]: 663-680.
- Conner, K.R. & Prahalad, C.K. "A resource-based theory of the firm: Knowledge versus opportunism." *Organization Science*, 1996: 7,5:477-501.
- Corbett, C.J. & Klassen, R.D. "Extending the Horizons: Environmental Excellence as Key to Improving Operations." *Manufacturing & Service Operations Management*, 2006: 8,1: 5-22.
- Corbin, Strauss A. &. "Basics of Qualitative Research: Grounded Theory, Procedures and Techniques." *Sage, Newbury Park, California*, 1990.
- Cresswell, J. W. *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage Publications, 1998.
- Cuthbertson, R. & Piotrowicz. "Supply Chain Best Practices: Identification and Categorisation of Measures and Benefits." *International Journal of Productivity and Performance*, 2008: 57,5: 389-404.
- de Bakker, F. & Nijhof, A. "Responsible Chain Management: A Capability Assessment Framework." *Business Strategy and Environment*, 2002: 11,1: 63-75.
- Denzin, N.K. & Lincoln, Y. *The landscape of qualitative research: Theories and issues*. Thousand Oaks, CA: Sage Publications, 1998.
- Dierickx, I. & Cool, K. "Asset stock accumulation and sustainability of competitive advantage." *Management Science*, 1989: 35, 12:1504-1511.
- Duber-Smith, D.C. "The Green Imperative." *Soap, Perfumery and Cosmetics*, 2005: 78 [8]: 24-26.

- Eisenhardt, K. "Building theories from case study research." *Academy of Management Review*, 1989: 14,4:532-550.
- Fawcett, S.E., Ogden, J.A., Magnan, G.M. and Cooper, M.B. "Organizational commitment and governance for supply chain success." *International Journal of Physical Distribution and Logistics Management*, 2006: 22-35.
- Ford, D., Gadde, L-E., Håkansson, H., Lundgren, A., Snehota, I., Turnbull, P., & Wilson, D. "Managing business relationships." *London: Wiley*, 1998.
- Garcia, R., Catalone, R., & Levine, R. "The role of knowledge resource allocation to exploration versus exploitation in technologically oriented organizations." *Decision Sciences*, 2003: 34,2:323-349.
- Glaser, B.G. *Theoretical Sensitivity*. Mill Valley, Ca: Sociology Press, 1978.
- Granovetter, M.S. "The Strength of Weak Ties." *American Journal of Sociology*, 1973: 78[6]: 1360-1380.
- Grant, R.M. "The resource-based theory of competitive advantage: Implications for strategy formulation." *California Management Review*, 1991: 33,3:114-135.
- Håkansson, H. & Ford, D. "How companies interact in business networks." *Journal of Business Research*, 2002: 55:133-139.
- Håkansson, H. & Snehota, I. "Developing relationships in business networks." *London: Routledge*, 1995.
- Halldorsson, A., Kotzab, H., Mikkola, J.H., & Skjøtt-Larsen, T. "Complementary theories to supply chain management." *Supply Chain Management*, 2007: 12,4: 284-296.
- Hansen, M.T. "Knowledge Networks: Explaining Effective Knowledge Sharing in Multiunit Companies." *Organization Science*, 2002: 13: 232-249.
- Harlan, C.M. "Supply chain management: Relationships, chains and networks." *British Journal of Management*, 1996: 7:63-80.
- Harland, C.M. & Knight, L.A. "Supply network strategy: Role and competence requirements." *International Journal of Operations & Production Management*, 2001: 21,4:476-489.
- Hausman, A. & Haytko, D.L. "Examining key factors of supply chain optimization: The maquiladora example." *Working Paper #2004-20, University of Texas - Pan American*, 2004.
- Haytko, D.L. & Kent, J.L. "Mexican maquiladoras: helping or hurting the US/Mexico cross-border supply chain?" *The International Journal of Logistics Management*, 2007: 18: 347-363.
- Hervani, A.A., Helms, M.M., & Sarkis, J. "Performance Measurement for Green Supply Chain Management." *Benchmarking*, 2005: 12, 4: 330-353.
- Holcomb, T.R. & Hitt, M.A. "Toward a model of strategic outsourcing." *Journal of Operations Management*, 2007: 25,2:464-481.
- Holsapple, C.W. & Singh, M. "The Knowledge Chain Model: Activities for Competitiveness." *Expert Systems and Applications*, 2001: 20, 1: 77-98.
- Holweg, M. & Pil, F.K. "Theoretical perspectives on the coordination of supply chains." *Journal of Operations Management*, 2008: 26 [3]: 389-406.
- Hult, G.T., Ketchen, D.J., & Slater, S.F. "Information processing, knowledge development, and strategic supply chain performance." *Academy of Management Journal*, 2004: 47,2:241-253.

- Hurley, R.R. & Hult, G.T. "Innovation, market orientation and organizational learning: An intergration and empirical examination." *Journal of Marketing*, 1998: 62,3:42-54.
- Johanson, J. & Mattsson, L-G. "Interorganizational relations in industrial systems: A network approach compared with transaction cost approach." *International Studies of Management and Organization*, 1987: 17,1:34-48.
- Kainuma, Y. & Tawara, N. "A Multiple Attribute Utility Theory Approach to Lean and Green Supply Chain Management." *International Journal of Production Economics*, 2006: 101,1: 99-108.
- Ketchen Jr., D.J. & Hult, G.T.M. "Bridging organization theory and supply chain management: The case of best value supply chains." *Journal of Operations Management*, 2007: 25: 573-580.
- Kim, D., Cavusgil, S.T. & Calantone, R.J. "Information systems innovations and supply chain management: Channel relationships and firm performance." *Academy of Marketing Science*, 2006: 40-54.
- Klassen, R.D. & Whybark, C.C. "The impact of environmental technologies on manufacturing performance." *Academy of Management Journal*, 1999: 42 [6]: 599-615.
- Klein, R., Rai, A., & Straub, D.W. "Competitive and Cooperative Positioning in Supply Chain Logistics Relationships." *Decision Sciences*, 2007: 38 [4]: 611-646.
- Kleindorfer, P.R., Singhal, K., & Van Wassenhove, L.N. "Sustainable Operations Management." *Production and Operations Management*, 2005: 14 [4]: 482-492.
- Kotabe, M., Parent, R., & Murray, J.Y. "Antecedents and outcomes of modular production in the Brazilian automobile industry: a grounded theory approach." *Journal of International Business Studies*, 2007: 38 [1]: 84-106.
- Krishnan, M., Parente, E., & Shulman, J.A. "Understanding Latin America's supply chain risks." *McKinsey Quarterly*, 2007: May:1-4.
- Lee, Su-Yol. "Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives." *Supply Chain Management: An International Journal*, 2008: 185-98.
- Manuj, I. & Mentzer, J.T. "Global supply chain risk management." *Journal of Business Logistics*, 2008: 38,3:192-223.
- McCracken, G. *The Long Interview*. Newbury Park, CA: Sage Publications, 1988.
- Mentzer, J.T, DeWitt, W.K., James S., Min, S., et al. "Defining supply chain management." *Journal of Business Logistics*, 2001: 1-25.
- Mentzer, J.T., Flint, D.J. "Validity in logistics research." *Journal of Business Logistics*, 1997: 18,2:199-216.
- Miles, R.E. & Snow, C.C. "Organization theory and supply chain management: An evolving reserach perspective." *Journal of Operations Management*, 2007: 25,2:459-463.
- Morrison, J. "Developing research questions in medical education: The science and the art." *Medical Education*, 2002: 36,7:596–597.
- Murphy, P.R. & Poist, R.F. "Green perspectives and practices: A "Comparative Logistics" study." *Supply Chain Management*, 2003: 8,2:122-131.
- Nonaka, I. & Reinmoeller, P. "Knowledge creation and utilization: Promoting dynamic systems of creative routines in Hitt, M.A., Amit, R., Lucier, C.E. & Nixon, R.D., eds." *Creating value: Winners in the New Business Environment*, 2003.

- Nonaka, I. "A dynamic theory of organizational knowledge creation." *Organization Science*, 1994: 5,1:14-37.
- Ordóñez, S. "Empresas y cadenas de valor en la industria electrónica en México." *EconomíaUnam*, 2005: 2,5: 90-111.
- Pagell, M., Yang, C., Krumwiede, D.W., & Sheu, C. "Does the Competitive Environment Influence the Efficacy of Investments in Environmental Management." *Journal of Supply Chain Management*, 2004: 40: 30-39.
- Peteraf, M.A. "The cornerstones of competitive advantage: A resource-based view." *Strategic Management Journal*, 1993: 14,3:179-191.
- Porter, M. "The Competitive Advantage of Nations." *The Free Press*, 1990.
- Power, D.J., Sohal, A.S., & Rahman, S.U. "Critical success factors in agile supply chain management: An empirical study." *International Journal of Physical Distribution & Logistics Management*, 2001: 31, 4:247-265.
- Rungtusanatham, M., Salvador, F., Forza, C. & Choi, T.Y. "Supply chain linkages and operational performance." *International Journal of Operations & Production Management*, 2003: 23,9:1084-1099.
- Sahin, F., & Robinson, E.P. "Flow coordination and information sharing in supply chains: Review, implications, and directions for future research." *Decision Sciences*, 2002: 33 [4]: 505-536.
- Sánchez, J., Elías, J., & García, H. "Marco Conceptual de la Cadena de Suministro: un nuevo enfoque logístico." *Publicación Técnica*, 2002.
- Shore, B. & Venkatachalam, A.R. "Evaluating the information sharing capabilities of supply chain partners: A fuzzy logic model." *International Journal of Physical Distribution & Logistics Management*, 2003: 33 [9/10]: 804-824.
- Simchi-Levi, D., Kaminsky, P., and Simchi-Levi, E. *Managing the Supply Chain: The Definitive Guide for the Business Professional*. McGraw-Hill Professional, 2004.
- Simpson, D., Power, R., & Samson, D. "Greening the Automotive Supply Chain: A Relationship Perspective." *International Journal of Operations and Production Management*, 2007: 27 [1]: 28-48.
- Soler, V.C. & López, Y.Y. "Nueva filosofía de trabajo entre fabricantes y distribuidores: Colaborando tras la consolidación de ECR." *Investigación y Marketing*, 2005: 90:27-33.
- Spencer, J.W. "Firms' Knowledge-sharing Strategies in the Global Innocation System: Empirical Evidence from the Flat Panel Display Industry." *Strategic Management Journal*, 2003: 24, 3: 217-233.
- Srivastara, S.K. "Green Supply-Chain Management: A State-of-the-Art Literature Review." *International Journal of Management Reviews*, 2007: 9 [1]: 53-80.
- Strauss, A. & Corbin, J. *Basics of Qualitative Research*. Newbury Park, CA: Sage Publications, 1990.
- Strauss, A., & Corbin, J. *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage Publications, 1998.
- Swan, J., Scarbrough, H. & Preston, J. "Knowledge management: A literature review ." *Issues in People Management. Leicester: Institute of Personnel and Development*, 1999.



- Tan, K-C., Kannan, V.R, & Handfield, R.B. "Supply chain management: An empirical study of its impact on performance." *International Journal of Operations & Production Management*, 1999: 19,10:1034-1052.
- Thorelli, H.B. "Networks: Between markets and heirachies." *Strategic Management Journal*, 1986: 7,1:37-51.
- Turnbull, P., Ford, D., & Cunningham, M. "Interaction, relationships and networks in business markets: An evolving perspective." *Journal of Business & Industrial Marketing*, 1996: 11,3/4:44-62.
- Unger, K. "Los clusters industriales en México: Especializaciones regionales y la política industrial." *Santiago: CEPAL*, 2003.
- United States General Accounting Office. *International Trade: Mexico's maquiladora decline affects US - Mexico border communities and trade; Recovery depends in part on Mexico's actions*. Washington, D.C.: GAO Reports, 2003.
- Uzzi, B. "Social Structure and Competition in Interfirm Networks: The Power of Embeddedness." *Administrative Science Quarterly*, 1997: 42: 35-67.
- Vachon, S. & Klassen, R. "Environmental management and manufacturing performance: The role of collaboration in the supply chain." *International Journal of Production Economics*, 2008: 299-315.
- Wasserman, S. & Faust, K. "Social Network Analysis: Methods and Applications." *Cambridge University Press*, 1994.
- Watts, C.A. & Hahn, C.K. "Supplier development programs: An empirical analysis." *Journal of Supply Chain Management*, 1993: 29,2:10-17.
- Wernerfelt, B. "A resource-based view of the firm." *Strategic Management Journal*, 1984: 5:171-180.
- White, D. "Application of systems thinking to risk management." *Management Decisions*, 1995: 33,10:35-45.
- Wu, F., Yenyurt, S., Kim, D., & Cavusgil, S.T. "The impact of information techonology on supply chain capabilities and firm performance: A resource-based view." *Industrial Marketing Management*, 2006: 35 [4]: 493-504.
- Zack, M.H. "Developing knowledge strategy." *California Management Review*, 1999: 41,3:125-145.

## Appendix

**Table 1: Interview Questions**

1.	What do you understand supply chain management entails?
2.	How would you define supply chain management?
3.	What is your process/system for supply chain management?
4.	Do you have a network?
5.	How do you manage your network?
6.	How would you describe your process?
7.	If you don't have a system, what is your particular relationship between your supply chain partners?
8.	What is the managerial commitment to supply chain management?
9.	Is there a governance structure in place?
10.	What specific tools are used to manage knowledge?
11.	Do suppliers have responsibility for the transfer of knowledge?
12.	What organizations/people are involved in the process?
13.	Is there a network for knowledge transfer?
14.	How would you define good performance?
15.	Does your organization control for performance?
16.	How do you value performance?
17.	What metrics are used to measure performance?
18.	How often are these metrics used?
19.	What performance goals are in place?
20.	Are green supply chain issues important to your organization?
21.	Are these criterion pushed up by the downstream suppliers?
22.	Are customers pushing these requirements down?
23.	Are their customers that are more or less likely to be interested in green initiatives?
24.	With the inherent risk associated with global supply chain management, do you employ a risk management strategy?
25.	Do you have contingency plans in place?
26.	What challenges are associated with these strategies?
27.	What tools and techniques do you use to manage risk?
28.	Where do you see the most risk in the global supply chain?

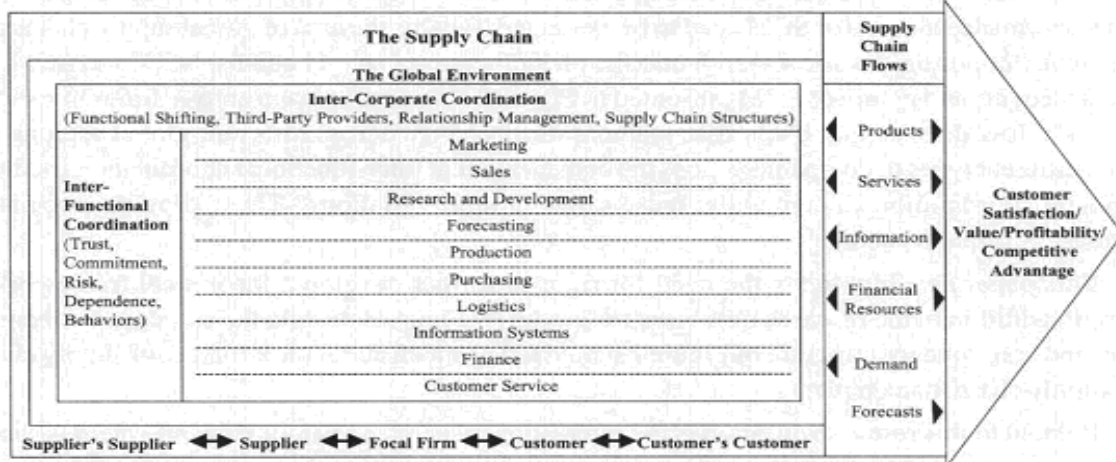
**Table 2: Interviewees**

<b>Firm</b>	<b>Name and Functional Title</b>
IBM	Eugenio Goddard, General Campus Director Edgar Gómez, Global Logistics Manager Rodolfo Casillas, Procurement Management Integrated Supply Chain
Flextronics	Roberto Hernández, Plant Director Warren Salzman , Material Senior Director Ricardo Pérez Barba, Program Management Manager
HP	Julio Acevedo, General Director HP Guadalajara Roberto Martínez, Latin America SC Director
Ryder (Supplier for HP)	Ernesto Donnadieu, Director of Operations/Logistics José Carlos Barrera Sepúlveda Costs Manager
Foxconn	Roberto Ayala Michael Chalk, Business Unit Executive - IBM X series Products
Maquiladora Gráfica Mexicana (Supplier of Foxconn)	Alvaro Reyes
UREBLOCK (Supplier of Foxconn)	????
Sanmina-SCI	Rogelio Mier Bueno , Director of Supply Chain Management, EMS- Mexico
Jabil	Ernesto Sánchez, Senior Director of Business Management, Mexico Alejandro Lárraga, Purchasing Manager
Texas Instruments (Supplier of Jabil)	Mario Ornelas
Fresenius	Norberto Leandro, Supply Chain Director
Smurfit Kappa (Supplier of Fresenius)	Gerardo Ramírez Executive of Special Accounts
Etiquetas Electrónicas	Santiago Sáinz, Senior Advisor
Continental	Carlos Gomez, Purchasing-SQM Director - Purchasing HUB Guillermo Schmidhuber, Category Manager - Connectivity Modules
ROHM Semiconductor (Supplier of Continental)	Alexandro Vázquez, Regional Sales Manager Latin America
FT (Supplier of Continental)	????

**Table 3: Supply Chain Networks**

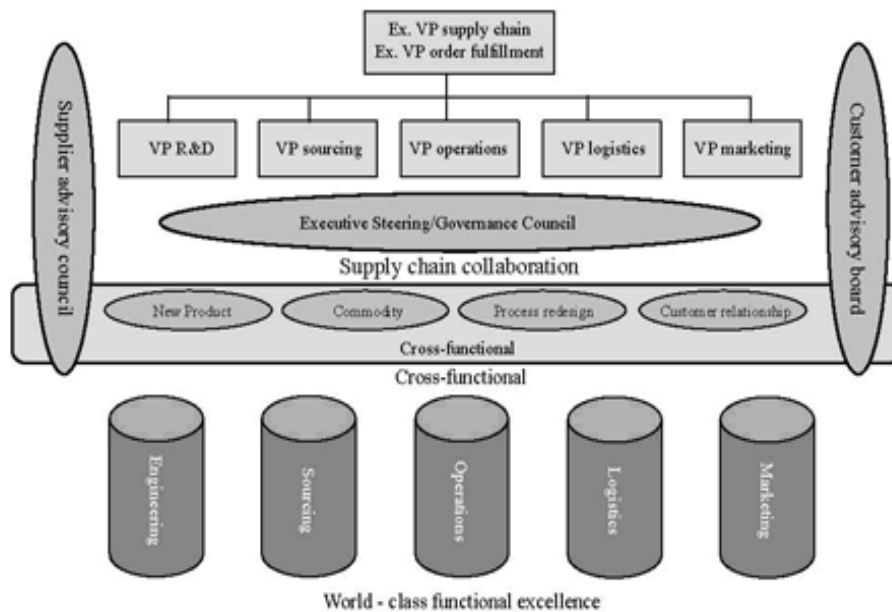
<b>Network Number</b>	<b>Supplier to Focal Company</b>	<b>Focal Company</b>
<b>1</b>	Ryder	IBM
		Flextronics
		Hewlett-Packard
<b>2</b>	Maquiladora Gráfica Mexicana /UREBLOCK	Foxconn
		Sanmina-SCI
<b>3</b>	Texas Instruments	Jabil
<b>4</b>	Smurfit Kappa/Etiquetas Electrónica	Fresenius
<b>5</b>	ROHM Semiconductor/FT	Continental

**Figure 1: Value Chain of Supply Chain Management**



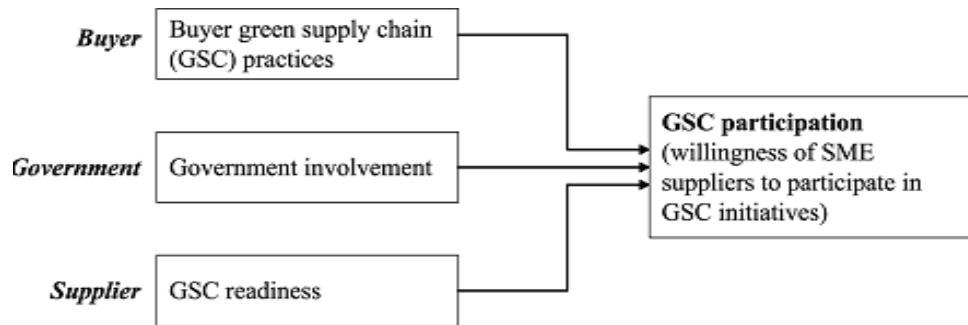
Source: Mentzer, J. T.; DeWitt, W.; Keebler, J.S.; Min, S.; Nix, N.W.; Smith, C.D.; and Zacharia, Z. G., (2001). "Defining Supply Chain Management," *Journal of Business Logistics*, 22, 2: 1-25.

**Figure 2: A Model for Supply Chain Governance**



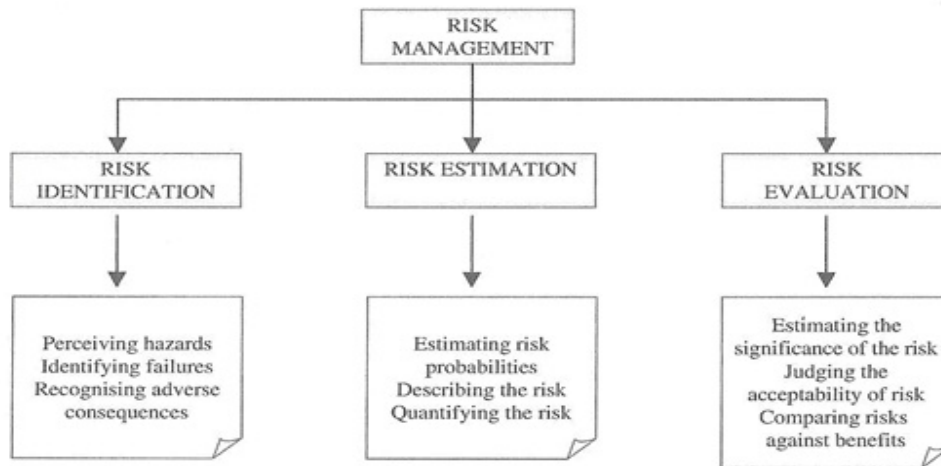
Source: Fawcett, S. E., Ogden, J. A., Magnan, G. M. & Cooper, M. B. (2006). "Organizational commitment and governance for supply chain success," *The International Journal of Physical Distribution & Logistics Management*, 36(1), 22-35.

**Figure 3: Drivers of SME Supplier Participation in GSC Initiatives**



Source: Lee, Su-Yol (2008). "Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives," *Journal of Supply Chain Management*, 13, 3: 185-198.

**Figure 4: Risk Management Systems**



Source: White, D. (1995). "Application of Systems Thinking to Risk Management," *Management Decision*, 33, 10: 35-45.