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Supply Chain Management Practices and Challenges: Case Studies of Four Supply Chains

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This study aims to present the supply chain management (SCM) practices of four supply chains, three of which are located in the Philippines (petroleum, semiconductor, and automotive) while one (toy manufacturing) is based in Malaysia.[1] These companies were compared in terms of their supply chain management strategies as well as their differences in the areas of supply management, demand management, and logistics management. Their strategies pertaining to supply chain collaboration, supply chain operation, and coordination mechanisms were also compared. The extent of adoption of collaboration strategies and information technology in their supply chain operations was also investigated. Respondent firms were then compared using an SCM positioning grid. The supply chain challenges encountered by these companies and the strategies they employ to address them were also investigated.

Results show that despite the differences in industry context, the four supply chains generally face similar challenges and problems in demand, supply, and logistics management. Despite the respondent firms' different positioning in the SCM grid, the four supply chains implemented almost the same measures to address their supply chain challenges.

Keywords: Supply chain management, supply chain collaboration, supply chain operations, coordination mechanisms

1 Introduction

Supply chain management (SCM) is a business process that deals with the planning, implementation, and control of the movement and storage of goods, services, and information to meet the requirements of the customers effectively and efficiently (Council of Supply Chain Management Professionals, 2013). Implied in this definition are key principles of SCM: (1) SCM is a management function, (2) SCM involves key stakeholders (e.g., the suppliers, the manufacturers/service providers, and the customers), (3) SCM seeks to meet the requirements of its customers, and (4) SCM involves the relationship between the different supply chain partners to achieve customer satisfaction. SCM is also a discipline founded on the management of relationships between corporate functions and across companies (Cooper & Ellram, 1993). Internal integration of corporate functions and external integration with suppliers and customers are important. Langley and Holcomb (1992) emphasized that SCM seeks to synchronize the supply chain activities to create customer value. Firms that pursue strategic coordination of the different business functions within a company and across companies within the chain are primarily motivated by the need for long-term survival (Mentzer et al., 2001). Supply chain integration is, therefore, not just a tactical decision but should be part of the company's corporate strategy (Vieira, Paiva, Finger, & Teixeira, 2013; Valmohammadi, 2013).

Supply chain integration requires supply chain partners to collaborate and integrate their activities and operations. The degree of integration, however, depends on the complexity of the supply chain. Mentzer et al. (2001) identified three degrees of supply chain complexity: (1) a direct supply chain (i.e., the company, its suppliers, and its customers involved in the upstream and downstream supply chain activities), (2) the extended supply chain (i.e., the company, its suppliers' suppliers, and its customers' customers), and (3) the ultimate supply chain (i.e., the company, its extended supply chain, and all the other organizations involved in the company's operations). Effective supply chain integration happens when partnership based on trust exists between the members of the supply chain,

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[1] The petroleum company is a 100 percent Filipino-owned corporation while the toy manufacturing company is a US firm based in Malaysia. The semiconductor company is a joint venture between a Philippine company and a French-Italian firm. The automotive firm based in the Philippines is a joint venture of a Philippine company and a Japanese automotive firm.

which is then translated into mutual sharing of information, risks, and rewards (Cooper & Ellram, 1993; Ganesan, 1994; Izquierdo & Cillian, 2004; Chu & Fang, 2006; Rascovic & Morec, 2013). Theoretically, SCM is able to achieve strategic integration because SCM enables a company to identify the business or business process in which it has core competency, although actual practice is not able to attain what SCM hopes to achieve (Fawcett & Magnan, 2002). Based on Fawcett and Magnan's (2002) analysis of the best supply chains, only a few companies adopt integrative practices in managing the entire spectrum of the supply chain. Fugate, Sahin, and Mentzer (2006) explained that establishing organizational relationships can be a challenging task because it requires identifying the benefits, costs, and investments needed among supply chain members to attain integration.

This study was conducted to study the supply chain practices of four supply chains in the following pillars of SCM: demand management, supply management, and logistics management. Their strategies related to supply chain collaboration, supply chain operations, and coordination mechanisms were also discussed. Their adoption of collaborative strategies and information technology was also investigated. Lastly, the efforts of these supply chains to attain supply chain integration with their customers and suppliers as well as the challenges they are facing in their respective supply chains were presented in the study.

The next section presents a literature review of the supply chain management practices and challenges in different industries, the research gaps, and what this study seeks to contribute to literature. The research design is then discussed. The last section presents the results and analysis, the summary and conclusions, and the areas for further study.

2 Literature review

Table 1 shows a summary of the literature on SCM practices in different industries. Based on these studies on the petroleum, semiconductor/electronics, automotive, toy, food processing, healthcare, and other industries, the following common themes in supply chain can be identified:

1. Effective SCM implementation requires shared goals setting, collaborative planning, shared risk and reward sharing, and information sharing (McLaren, Head, & Yuan, 2004; Collin & Lorenzin, 2006; Fredriksson, 2006; Varma, Wadhwa, & Deshmuch, 2008; Sundram, Ibrahim, & Gavindaraju, 2011; Hwang & Lu, 2013).
2. Supply chain integration is important and needs to be achieved beyond the first-tier supply chain network to include the suppliers' supplier network and the customers' customer network (Briscoe, Lee, & Fawcett, 2004; Gimenez & Ventura, 2005; Danese, Romano, & Vinelli, 2006; Pires & Neto, 2008; Govindan, Kannan, & Haq, 2010; and Xia & Tang, 2011).
3. Supply chains should be responsive to customer requirements and flexible to demand-and-supply challenges (Collin & Lorenzin, 2006; Pires & Neto, 2008; Adebanjo, 2009).
4. Efficiency of the supply chains should be improved to reduce supply chain costs (Kumar, Ozdamar, & Zhang, 2008; Pires & Neto, 2008; Mustaffa & Potter, 2009; Agwunobi & London, 2009; Hwang & Lu, 2013).
5. Supply chains face demand and supply risks; thus, supply chain risk management is critical (Johnson, 2001; Enyinda, Briggs, Obuah, & Mbah, 2011).
6. Supply chain performance measurement is critical to assessing supply chain effectiveness and responsiveness (Varma et al., 2008; Charan 2012).
7. Supply chains need to have a sustainable supply chain (Francis, Simons, & Bourlakis, 2008; Adebanjo, 2009; Shukla, Deshmuck, & Kanda, 2009).

The supply chain management practices in different supply chains are described as follows. The petroleum industry faces several supply chain risks related to raw materials sourcing, operations, marketing, pricing and regulation. Enyinda et al. (2011) noted the importance of having supply chain operations risk management in this sector, while Varma et al. (2008) emphasized the need for a holistic supply chain performance measurement system.

The automotive industry also faces its own set of supply chain challenges. The industry is characterized by strong global competition and pressure to reduce costs (Pires & Neto, 2008). There

is also a need to overcome demand distortion and supply game playing (Miemczyk & Howard, 2008). To speed up the delivery and time-to-market distribution of new automotive in Brazil, for example, a supply chain configuration called the industrial condominium configuration was proposed. In this mechanism, the key supply chain partners in the automobile industry are located in an area similar to a condominium. Fredriksson (2006) noted that efficiency of a modular system in an automotive company in Sweden was found to be dependent on the use of several coordination mechanisms. Charan (2012) emphasized the value of supply chain performance measurement in the industry while Xia and Tang (2011) reported that outsourcing of the US automobile industry to low-cost countries is an irresponsible strategy and suggested a triple-C strategy to address the problems of the industry.

With regard to the semiconductor industry, strategies to address the long cycle time and the need for product development in this mature industry, the following were identified as critical success factors in the industry: (1) top management commitment, goal setting, and business process reengineering (Sundram et al., 2011; Hwang & Lu, 2013); (2) risk, reward, and information sharing (Mclaren et al., 2004; Sundram et al., 2011); and (3) supply chain integration (Briscoe et al., 2004). On the other hand, the toy industry is characterized by short product life cycle, volatile demand, and capacity risks, making licensing and outsourcing strategies viable supply chain options (Johnson, 2001; Wong, Arlbjorn, & Johansen, 2005).

Collin and Lorenzin (2006) presented the efforts of Nokia Networks to improve its demand and project-planning activities and emphasized that supply chains need to be agile to respond to the changing requirements of the customers. In another industry, Adebanjo (2009) described the strategies of an intermediary food trading organization in the United Kingdom to improve its demand management strategies, given the demand and supply requirements of the industry. In the healthcare industry, reengineering the supply chain and using purchasing volume were done to reduce total supply chain costs (Agwunobi & London, 2009; Kumar et al., 2008). In Malaysia, Mustaffa and Potter (2009) investigated the inventory management system of a healthcare company, and they suggested strategies related to vendor-managed inventory to improve the efficiency of the supply chain. Based on the study of four supply networks in the pharmaceutical industry in Italy, Danese et al. (2006) identified integration and understanding of forecast performance trade-offs as present in this industry.

While several articles may have been written about supply chain challenges in different industries, only a few articles have been written to highlight the same in Asia, more so in the Philippines. Most articles also used the survey method depicting an aggregate perspective in presenting the supply chain operations of different supply chains. This study utilized the case study methodology and provides the literature with an in-depth discussion on the actual experiences of four companies managing their respective supply chain challenges. The study focuses on the following supply chains: (1) petroleum, (2) semiconductor and electronics, (3) automotive, and (4) toy supply chains.

Table 1. SCM Practices in Different Supply Chains

	Authors	Company/ Industry	Methodology	Findings
PETROLEUM				
1	Enyinda et al., 2011	Multinational oil firm in Nigeria	Case study	The industry faces several risks: operations, oil resource, marketing, technological, country, price, costs, and government actions. Supply chain operations risk management must be an integral part of the company's overall risk management strategy.
2	Varma et al., 2008	Petroleum supply chain in India	Interview of 24 SMEs in India petroleum supply chain	Using the balanced scorecard (BSC) and the analytical hierarchy process (AHP), supply chain performance measures in this supply chain should consider a comprehensive set of performance measures.

	Authors	Company/ Industry	Methodology	Findings
SEMICONDUCTOR AND ELECTRONICS				
3	Hwang and Lu, 2013	Semiconductor industry	Research surveys and interview of two leading semiconductor companies in Taiwan	The key success factors for e-SCM project implementation in this industry are top management commitment, clear project goals and requirements, and business process reengineering.
4	Sundram et al., 2011	Electronics industry	Survey of 125 electronics companies in Malaysia	The following SCM practices have significant effect on supply chain performance: agreement on supply chain vision and goals, risk and reward sharing, and information sharing.
5	Mclaren et al., 2004	Electronics industry	Case studies of selected electronics manufacturers	Organizational capabilities supported by an SCM information system can help achieve operational efficiency and flexibility as well as internal and external planning and analysis.
6	Briscoe et al., 2004	Semiconductor industry	Triangulation approach (in-depth interviews, survey of 111 lower-tier suppliers, telephone interviews of three suppliers)	Analysis of a quality initiative in the semiconductor industry shows that supply chain integration needs to be achieved beyond the first-tier and reach the lower-tier suppliers.
AUTOMOTIVE				
7	Charan, 2012	Automobile company	Case study of an automobile company	Supply chain performance measurement system is needed to assess vendor performance and in connecting dealer's point-of-sale information to vendors.
8	Xia and Tang, 2011	Automotive industry	Conceptual paper	Outsourcing to low-cost countries in the US automotive industry is not sustainable and an irresponsible supply chain strategy. They proposed a triple C (cease-control-combine) strategy.
9	Govindan et al., 2010	Automobile industry	Framework development	Actions of one firm in the supply chain can influence the overall supply chain efficiency, responsiveness, and profitability.
10	Shukla et al., 2009	Automobile industry in India	Personal interviews of 30 organizations	Automobile companies in India are still in the early adoption of environmentally responsive supply chains.
11	Fredriksson, 2006	Automotive company in Sweden	Fifteen semi-structured interviews conducted with representatives from different functions related to pre- and final assembly activities	Efficiency of a modular system was found to be dependent on the use of several coordination mechanisms.

	Authors	Company/ Industry	Methodology	Findings
12	Miemczyk and Howard, 2008	Automobile	Research paper involving a two-day workshop with 50 managers of a build-to-order car manufacturer	Company addressed the corporate and industry factors to improve its supply chain responsiveness.
13	Pires and Neto, 2008	Automobile industry in Brazil	Case study of an automobile manufacturer and its four suppliers	Confirmed the need for a supply chain configuration, specifically the industrial condominium configuration.
14	Ramcharran, 2001	Automobile industry	Survey of auto parts suppliers and auto manufacturers	Risk assessment through the utilization of information is needed to better demand management in this industry.
TOY				
15	Wong, et al., 2005	Toy supply chain	Longitudinal and in-depth case study involving qualitative semi-structured interviews and questionnaire involving 11 main European toy retailers	Traditional mass production or push models are dominant SCM practice in the toy supply chain. SCM know-how in this industry is not able to manage volatility and seasonality in the chain.
16	Chan, Chin, and Lam, 2007	Hong Kong toy industry	Survey of 205 Hong Kong toy companies	Identified five core values and 14 key success factors in the toy industry related to sourcing performance.
17	Johnson, 2001	Toy supply chain	Conceptual research	Reduce seasonality and new product adoption risk through licensing and distribution channel strategies and reduce capacity risks through outsourcing and flexible supply networks.
FOOD				
18	Adebanjo, 2009	Intermediary food trading organization in the United Kingdom	Single case study involving semi-structured interviews with different departments	Examined the demand management practices of a trading organization.
19	Francis et al., 2008	Beef food service company in the United Kingdom	Case study involving selected livestock producers, meat processor, meat importer, and food service distributor	Identified specific supply chain waste elimination opportunities at both the producer and processor levels.

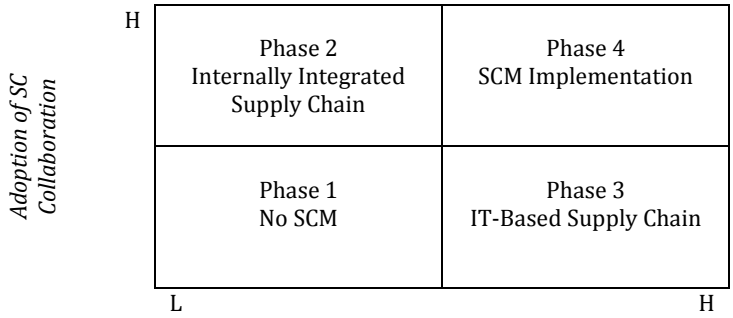
	Authors	Company/ Industry	Methodology	Findings
20	Gimenez and Ventura, 2005	Food industry in Spain	Used the survey method	Companies in the food industry business may be found in various integration stages: (1) no integration, (2) medium to high level of integration in the logistics-production interface, and (3) high levels of integration in both internal interfaces and in some of their supply chain relationships.
HEALTHCARE				
21	Agwunobi and London, 2009	Healthcare	Analysis of cases and secondary data	Identified ways to streamline layers in the supply chain and to use purchasing volume to reduce prices.
22	Danese et al., 2006	Pharmaceutical company in Italy	Case study involving four supply networks	Identified that external fit and the state of supply network configuration and integration are important; also noted the need to forecast performance trade-offs associated with SCM.
OTHER INDUSTRIES				
23	Kumar et al., 2008	Healthcare	A case study of a healthcare group that has more than 10 hospitals in Asia and Europe	Reengineered its SCM operations, particularly the supply system and materials management, to reduce costs.
24	Mustaffa and Potter, 2009	Healthcare industry in Malaysia	Single case study using two echelons with data collected through process mapping	Evaluated the inventory management in the private healthcare sector in Malaysia and suggested strategies related to vendor-managed inventory to address the urgent orders and stock availability for the distribution of medicines from the wholesalers to the clinic.
25	Collin and Lorenzin, 2006	Mobile infrastructure industry	Case study of Nokia Networks	Emphasized demand planning and project planning to increase agility of the supply chains.
26	Danese, 2007	Various industries in Italy	Case study of seven supply networks whose central firms operate in different sectors	Different firms implement collaborative planning, forecasting and replenishment (CPFR) differently depending on their goals, characteristics of the products and markets in which they are sold, supply networks' physical and relational structure, and CPFR developmental stage.
27	Romano and Vinelli, 2001	Textile and apparel in Italy	Case study on Marzotto, an Italian textile and apparel company	Compared a traditional customer-supplier approach and a coordinated perspective in improving the supply network; found that a joint management of quality practices and procedures can improve the supply chain network.
28	Vieira et al., 2009	Supermarket retail chain	Research paper using a structured questionnaire applied to 125 representatives of suppliers of large supermarket chains	Interpersonal integration important for collaboration more than integration factors, such as gain or cost sharing or even strategic integration.

3 Research design

The case study was used to describe the supply chain operations of four companies from the following industries: (1) petroleum (Company A), (2) semiconductor (Company B), (3) automobile (Company C), and (4) toy (Company D). The petroleum company is a 100 percent Filipino-owned corporation, while the toy manufacturing company is a US firm based in Malaysia. The semiconductor company is a joint venture between a Philippine company and a French-Italian firm. Meanwhile, the automotive firm based in the Philippines is a joint venture of a Philippine company and a Japanese automotive firm. Selection of the company respondents was done in coordination with the Production Management Association of the Philippines (PROMAP) and the UP Manufacturing Linkage Program, some of whose member firms were tapped to participate in this in-depth study. These associations actively participated in the 2005 and 2011 SCM surveys conducted by the researcher. A manufacturing colleague from Malaysia was requested for the participation of the Malaysian-based US toy manufacturing company (Company D) in the study to present the SCM practices of a supply chain located in another country.

The manager in charge of supply chain operations for each company served as the respondent in the study. Questionnaires were sent to the respondent managers. In-depth telephone interviews were then conducted upon receipt and review of the filled-up questionnaires. The respondents were asked to describe their strategies on their demand, supply, and logistics management functions; the problems they faced in these areas; and the corresponding strategies they are implementing to address these problems. Their extent of adoption of supply chain collaboration, supply chain operation and coordination mechanisms were also investigated. Based on their adoption of collaboration strategies and information technology in the supply chain, the respondent firms were categorized using an SCM positioning grid consisting of four quadrants: (1) Phase I (No SCM), Phase 2 (internally integrated supply chain), Phase 3 (IT-based supply chain), and Phase 4 (SCM implementation) (Talavera, 2008) Please refer to **Figure 1.**

Figure 1. SCM Positioning Grid



Source: Talavera (2008)

4 Results and Analysis

4.1 Profile of Respondent Firms

The respondent firms are described in Table 2. Employee size ranges from 1,300 to 3,000. Total assets range from about USD 50 million to USD 13 billion. The bulk of operations of these firms are in manufacturing, except for the oil refining and marketing company (Company A). Except for Company A, the other three respondent firms have foreign ownership.

Table 2. Profile of Respondent Firms

	Company A	Company B	Company C	Company D
Industry category	Petroleum	Semiconductor / electronics	Automobile	Toy
Employee size	1,348	About 2,000	1,319	3,000
% of employees in manufacturing	34%	80%	75%	100%
Total assets	PHP 113.2 B (USD 2.44B)	USD 13.1 B (as of 3/27/10)*	PHP 15.6 B (USD 0.34 B)	USD 50M
Ownership structure	100% Phils.	Joint venture between Phils. and Italy-France	Joint venture between Phils. and Japan	100% US
Location	Philippines	Philippines	Philippines	Malaysia

Source: Company interviews.

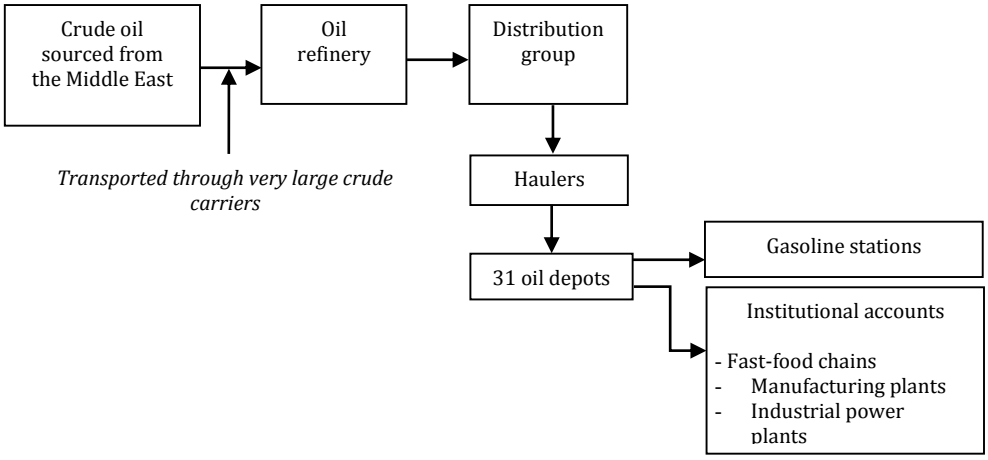
Notes:
1. The interviews were held in the first quarter of 2010 and the total assets declared by the respondent firms (except for Company B) were for CY 2009.
2. The total assets of the Malaysian-based US toy manufacturing company were declared in US dollar as of end of 2009.
3. The total assets of Company A and C were declared in Philippine peso and were converted to US dollar using this exchange rate:
   USD 1 = PHP 46.421 (December 2009, from http://www.nscb.gov.ph/stats/pesodollar.asp).

Details about the company respondents and their respective value chains are presented below.

Company A is the largest oil refining and marketing company in the Philippines and is currently supplying 40% of the country's total fuel requirements. It has an ISO 14001-certified refinery that produces a full range of petroleum products, including liquefied petroleum gas (LPG), gasoline, diesel, jet fuel, kerosene, and fuel oil. The products from the refinery are transported mainly by sea to their depots and terminals all over the country for distribution to their service stations. They also serve industrial clients, including various companies in the power and manufacturing sectors and international and domestic carriers. The company is majority-owned by one of the biggest food conglomerates in the country.

Company A follows the supply chain described in **Figure 2**. The crude oil from the Middle East or Asia is transported to the oil refinery through crude carriers. From the refinery, the output is distributed by the company's own distribution group in coordination with the haulers (e.g., vessel owners, tankers, and barges) for distribution to the company's oil depots. The products are delivered to or picked up by the customers. Although the diagram appears simple, in reality, the supply chain is complicated by the dynamism in the oil industry. Petroleum is considered a commodity because demand for such by the gasoline stations is generally stable and predictable. However, that cannot be said with respect to the demand from institutional accounts, whose petroleum requirements would sometimes fluctuate depending on economic activity and power supply stability.

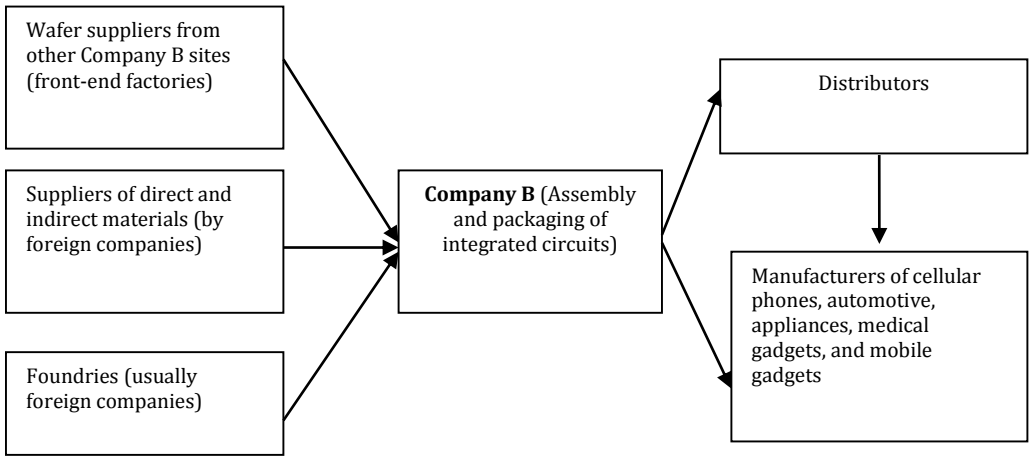
Figure 2. Value Chain (Company A – *Petroleum Industry*)



Company B belongs to the top-ten semiconductor firms in the world. It started operations in 1999 and after a decade of operations, its production plant expanded its portfolio of technology and research & development in the assembly and testing of standards and advanced packages. In 2008, the company entered into a joint venture with another semiconductor company and eventually bought the company. Company B has a high-technology facility for assembly and testing of integrated circuits in Southern Tagalog, Philippines. The plant operates 24 hours a day, seven days a week.

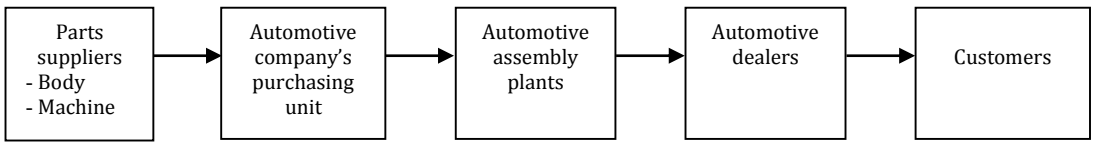
Company B also belongs to an industry that faces both uncertainty and risks in both the demand and supply side. On the demand side, the industry is faced with short product life cycles, increasing demand from customers for variety and customization (Sodhi & Lee, 2007), and stiff competition especially in the world market. On the supply side, it faces risks brought about by fast-changing technology, highly vertically integrated and even complex supply chain that leads to supplier-related delays. Its value chain is depicted in **Figure 3**.

Figure 3. Value Chain (Company B – *Semiconductor / Electronics Industry*)



Company C is a local automotive manufacturing company recognized in the region for its excellent quality products and high production efficiency. In 2010, it was given an Excellent Quality Company Award by its mother company, Company CHQ. In 2008 and 2009, **Company C** was recognized as one of the top-five manufacturing plants in the world. Its plant, located in Southern Tagalog, Philippines, was established in 1988. Its product lines include completely knocked down (CKD) and completely built up (CBU) lines. About 51% of the company is owned by a local commercial bank, 15% by a foreign investor in Japan, and 34% by Company CHQ. Company CHQ is one of the biggest automotive companies in the world selling around 7.5 million models per year. **Company C's** value chain presents the interplay of the key players in the value chain—namely, the parts supplier, the automotive manufacturer/assembler, and the distributors (refer to **Figure 4**).

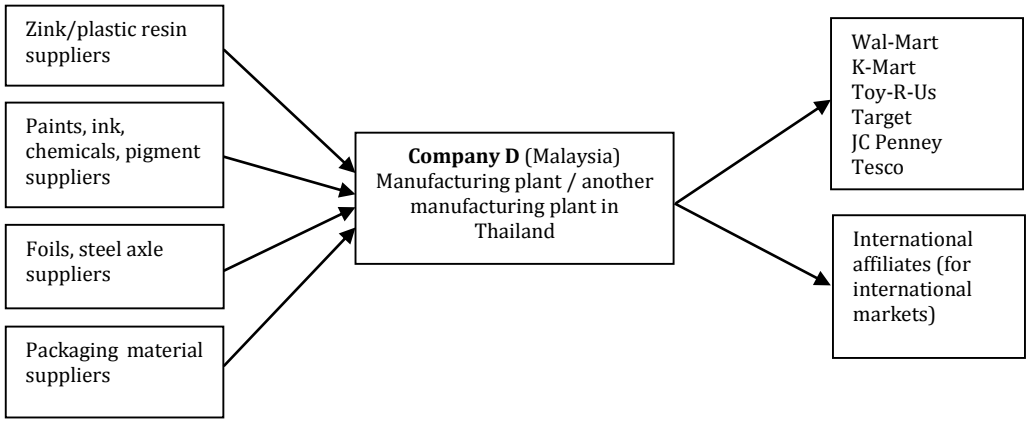
Figure 4. Value Chain (Company C – *Automobile Industry*)



Company D, a subsidiary of a toy manufacturing company in the USA, is involved in the design, manufacture, and marketing of toys and other entertainment products. It is based in Malaysia. Its value chain activities include the following processes: product development, tooling, and manufacturing. The manufacturing process is vertically integrated with all the manufacturing processes installed in-house. Company D and another sister company in Thailand produce die-cast cards and play sets. Other products like dolls and girl toys are produced in its manufacturing plants in Indonesia and China, while

infant and preschool toys are produced mainly in China. Its major customers are Wal-Mart, K-Mart, Target, Toy-R-Us, and JC Penny in the USA and Tesco & Carrefour in the international market. The toy industry faces global supply chain risks as it is heavily dependent on petrochemical (plastics) for its raw material. Its value chain is presented in **Figure 5.**

Figure 5. Value Chain (Company D – *Toy Industry*) (Die-Cast Cards and Play Sets)



4.2 Supply Chain Structure

Table 3 shows that for all respondent firms, supply chain operations are handled by different organizational units. Supply management is handled either by the supply, logistics, production control, or materials department. Demand management is also handled by different units like marketing services, logistics department, sales planning group, and even by the material department. All company respondent firms reported having departments that handle logistics functions. Findings show that an SCM department or its equivalent in the organization that coordinates the supply chain operations is not present in all the respondent firms.

Supply chain management involves process coordination, management of supply chain relationships, and tight integration of functional areas as well as linkage with the chain's supplier and customer networks (Christopher, 1998; Wisner, Leong, & Tan, 2009; Schroeder, Goldstein & Rungtusanatham, 2013; Bozarth & Handfield, 2013). Supply chain integration involves changes in structure through the formation of cross-functional teams (Wisner et al., 2009) and internal integration of key processes using the materials management concept (purchasing, operations, and logistics management) (Burt, Dobler, & Starling, 2003). To achieve an integrated supply chain and excellence in supply chain performance, Bowersox, Closs and Cooper (2010) also emphasized the need for a process view geared towards the improvement of these supply chain integrative processes (e.g., demand planning, customer relationship collaboration, order fulfillment, product / service development, manufacturing customization, supplier relationship collaboration, life cycle support and reverse logistics). Given the need to look at supply chain management from a process and systems perspective (Chopra & Meindl, 2010), it is important, therefore that there is a unit in the organization that will coordinate and manage these changes in supply chain structure and processes.

Table 3. Units Handling Supply Chain Operations

Area	Company A (Petroleum)	Company B (Semiconductor)	Company C (Automotive)	Company D (Toy)
Supply Management	Supply Optimization (5)	Logistics Department (3)	Production Control Department (23)	Material Department – Production Planning and Control Unit (1)
Demand Management	Marketing Services (1 analyst)	- Product Division Group - Central planning in Europe and Singapore - Sales and Market International (3)	Sales and Product Planning Department (4) Sales Distribution Department (11)	Material Department – Master Planning Unit (6)
Logistics Management	- Distribution (Domestic) (21) - Commercial Services (International) (10) - Warehousing Department ▪ Refinery – Oil Movement and Storage ▪ Depot Operations	Logistics Department (50)	Material Handling Operations (176)	Material Department – Shipping & Warehouse Unit (8)

Source: Company interviews.

Note: The numbers enclosed indicate the manpower complement for the unit.

4.3 Supply Management

With respect to the supply management function, Table 4 shows that the four company respondents generally employ multiple sourcing for their critical raw materials. **Company C**, however, uses single sourcing strategy for its local parts. Purchasing in these four different industries is also centralized. In the case of **Company B**, all its purchases are handled by a global purchasing team except for local purchases like office supplies and some minor maintenance repairs. The respondent firms reported employing different types of relationships depending on the importance of the raw materials being procured.

Table 4. Supply Management

Supply management	Company A (Petroleum)	Company B (Semiconductor)	Company C (Automotive)	Company D (Toy)
Supplier size policy for critical raw materials	Multiple sourcing	Multiple sourcing	Single sourcing for local parts (direct); multiple sourcing for indirect materials	Single, limited, and multiple sourcing
Procurement	Centralized	Centralized and decentralized	Centralized under Procurement Department	Centralized and decentralized
Nature of relationship with supplier	Cooperative for term contracts; competitive for spot purchases	Collaborative if development is required; cooperative for supply-managed inventory; transactional for one-time and common items	Employs different types of relationship (collaborative, cooperative, transactional, and competitive) depending on material	Collaborative

Source: Company Interviews.

4.4 Demand Management

Table 5 presents a summary of the demand management strategies of the respondent firms. In general, the respondent firms use a combination of methods in demand forecasting. Historical methods are used for old and stable product lines. All respondents also reported using demand forecast models using statistical packages and resource planning systems. **Company A** uses a demand planning system, while **Company B** has a sales and operations planning team that handles demand planning. **Company C** considers various internal and external factors in its demand projection, while **Company D** even conducts toy fair twice a year to obtain inputs from customers for new product development.

In terms of relationship with customers, both **Company A** and **Company B** employ a collaborative relationship with their customers. In the case of **Company A**, the marketing services department generates demand projections from their salesmen, who in turn get this information from the field/grassroots. The projected sales information is subjected to their demand planning software. The company's marketing analyst, who needs to be proficient with Microsoft software and Systems Applications and Products (SAP) in data processing, develops the rolling three-month demand forecast, which is used as basis in developing the production program, crude purchases, and delivery program. The output of this system is then processed by the marketing services department for release to the different stakeholders such as the supply chain optimization group, accounting, and critical customers. The suppliers of crude oil are not involved in this process.

Company A reported that their firm is a market-driven company. **Company B** actively collaborates with its customers on order cancellation window and claims on raw material preparation. The company has key customers who agree to take financial responsibilities on raw materials that are solely dedicated to the products whenever there is demand drop or huge shift in demand.

Table 5. Demand Management

Demand management	Company A (Petroleum)	Company B (Semiconductor)	Company C (Automotive)	Company D (Toy)
Methods used for demand forecasting	Historical, grassroots forecasting, demand planner	Historical, statistical trends, linkage with customer's MRP	Sales trend (including fleet sales), reservations trend, seasonality index, run-out and new model introduction, political and economic factors; simple average, regression, ratio	Historical method for old product line, market trend analysis and toy fair (twice a year) to obtain customer input for new products
Nature of relationship with customer	Collaborative	Depending on market and customer, either collaborative, cooperative, or transactional	Case by case basis; all types of relationship exist	Collaborative
Strategies to manage demand fluctuations	Time fencing; adjustment of production and inventory levels; promotional activities	Safety stock; production line dedication; subcontracting; collaboration with customers	Adjustment of production levels and production takt time	Adjustment of production levels, work hours, and workforce levels; joint promotional activities with retailer during lean months

Source: Company Interviews.

4.5 Logistics Management

Table 6 presents the strategies of the four companies in the area of logistics management. The table shows that all respondent firms have their own logistics group. **Companies B, C, and D**, however, also utilize the services of other entities to handle this function. These companies employ different types of relationship with their logistics partners. The type of relationship depends on the item being

distributed by their partners. In terms of the utilization of various logistics tools and techniques, **Companies B, C, D** reported utilizing just-in-time (JIT) deliveries while **Company D** reported getting the services of a third-party logistics provider for its operations.

Table 6. Logistics Management

Logistics and warehouse management	Company A (Petroleum)	Company B (Semiconductor)	Company C (Automotive)	Company D (Toy)
Performance of logistics function	In-house	In-house and implants from forwarders	In-house; outsourced	In-house container loading, unloading, and haulage
Nature of relationship with logistics provider (if applicable)	Not applicable	Collaborative , cooperative, and transactional	Collaborative, cooperative, and transactional	Collaborative
Logistics management strategies employed	Not applicable	Bar coding, radio frequency identification (RFID), electronic data interchange (EDI), Just-in-time (JIT), local hub	JIT – container; Kanban – manually operated monitoring board	JIT deliveries; 3rd-party logistics provider (3PL); consolidation center or hub in China

Source: Company interviews.

4.6 Supply Chain Challenges and Strategies to Address Them

Table 7 summarizes the supply chain challenges faced by the four companies. The table also shows previous literature on supply chain challenges faced by the petroleum, semiconductor, automotive, and toy industries.

Crude oil is the major raw material of **Company A**, which is heavily affected by price fluctuations from the world market. The industry faces supply volatility, long and complex supply chain, high risk of product contamination, and a difficulty in supply chain integration (Varma et al., 2008). To address these challenges, Company A has a Supply Optimization Group responsible for the (1) acquisition of the most economical crude/feed inventory package to satisfy market requirements; (2) adoption of the optimum operating strategy; (3) minimization of the working inventories; (4) mitigation of the impact of unplanned events, such as shutdowns, fluctuating demand, delayed arrival of crude/feed; and (5) end-to-end integration of supply chain planning, execution, networking, and coordination. It also reported using linear programming models for this purpose. The Supply Optimization Group also provides direction to the value chain function and progressively integrates the supply chain of the company. Procedures are defined to execute plans and programs, and creative approaches in pursuing market opportunities are adopted. Logistical challenges also pose a major problem for the petroleum industry, thus the company continues to invest in infrastructure needed to move the finished products from the refinery to reach the consumers. The company also coordinates with local government units for zoning ordinance issues and also employs security measures to address the issues of theft and pilferage.

The semiconductor industry is characterized by having an unpredictable and fluctuating demand, long manufacturing cycle times, short product life cycle, and high product variety (Brown, Lee & Petrakian, 2000; Briscoe et al., 2004). Briscoe et al. (2004) emphasized the need for standardized quality assessment beyond the first-tier suppliers, new product development, and cycle time reduction. **Company B** similarly faces volatility of demand, which often results in stock-outs or obsolescence of products. Since customer specifications in this industry are stringent, the company needs to ensure that materials meet the quality requirements of the customers. The company addresses the issue of demand volatility by building enough safety stock for consumers with whom the company has a long-term relationship. The company also applies postponement strategy so that the company will only be producing the modular parts. Differentiation is done later only upon the order of the customer. **Company B** also has a sales and operations planning team that addresses this issue,

and the company is also employing a time-fencing strategy. To address the issues on the receipt of nonstandard materials from suppliers, the company involves its second- and third-tier suppliers in product development.

The automotive industry is a very competitive industry facing cyclical changes, plunging demand, industry volatility, and foreign competition (Ramcharran, 2001; Xia & Tang, 2011). There is also a competitive pressure to source parts in low-wage countries (Ramcharran, 2001) and achieve quality despite having an outsourcing strategy (Xia & Tang, 2011), and a need for an environmentally responsive automobile supply chain (Shukla et al., 2009). Supply chain planning, performance measurement, and information technology adoption are important (Ramcharran, 2001; Charan, 2012). In the case of **Company C**, it reported the need to have a stable supply base and competitive price. Ferdows (1997) observed that an important development in the automobile industry is transnational manufacturing, wherein the other activities of the supply chain, other than the original manufacturing of the product, are done in other countries. Supply strategies also shift from firm-level competitiveness to a responsive supply chain to compete in this global environment. This is the same environment that **Company C** is into. It experiences the following supply chain problems: availability of delivery information, forecasting/planning accuracy, long delivery lead time, and aging stock. To address the first two issues, the company strictly implements its firm order system and employs forecasting tools and flexibility tools that allow for correction and adjustment.

Company B belongs to the top-ten semiconductor firms in the world. It started operations in 1999; and after a decade of operations, its production plant expanded its portfolio of technology and R&D in the assembly and testing of standards and advanced packages. In 2008, the company entered into a joint venture with another semiconductor company and eventually bought the company. Company B has a high-technology facility for assembly and testing of integrated circuits in Southern Tagalog, Philippines. The plant operates 24 hours a day, seven days a week.

However, Miemczyk and Howard (2008) presented the observations of various authors about the cost implication when firms attempt to meet the customer requirements for product variety and operational efficiency. It is important, therefore, to understand that the flexibility of the supply chain has significant cost implication and would sometimes involve inventory increases (McCutcheon, Raturi, & Meredith, 1994). To ensure that **Company C** produces automobiles with faster turnover, thereby minimizing the occurrence of aging stock, the company generates accurate data from its dealer management system to improve model and color mix. In the area of logistics management, the company tries to maximize existing space and continues to find ways to improve productivity despite the utilization of labor-intensive tools.

The toy industry experiences high demand seasonality/cyclicality, slow demand growth, short product life cycle, and intense competition in innovation and pricing (Johnson, 2001; Wong et al., 2005). The toy industry faces long manufacturing lead time and low supplier reliability (Johnson, 2001; Wong et al., 2005). **Company D** reported encountering the same supply problems, particularly on how to reduce supplier lead time and improve compliance of suppliers to quality and delivery requirements. The company collaborates with its major and key suppliers and shares to them their know-how about lean production system. The company also organizes Kaizen events in the vendor premises to help them improve their process flow and throughput time reduction so as to reduce overall vendor lead time. The company also sets up a supplier certification program to improve incoming material quality. Likewise the company collaborates with its key suppliers and provides them with six-month demand forecast upfront (i.e., three months fixed with no change and three months soft with impending change).

With regard to demand management, **Company D** reported having the following problems: lack of point-of-sale data for all retailers, inaccuracy of sales forecast, and difficulty in integrating the sales forecast into manufacturing and capacity planning. The company closely coordinates with key customers/retailers (Wal-Mart, Toy-R-Us, and K-Mart in the United States) to obtain point-of-sale data. The company still has to do the same in the other international markets. The company observed that the "bullwhip effect" happens in the trendy toy category. To moderate this effect, the company employs the "keep the market hungry" strategy, which sometimes affects the company through lost sales. The company is still in the process of integrating its data throughout the whole supply chain. **Company D** admits that this process is tedious and costly.

Table 7. Supply Chain Challenges

Industry	Supply Chain Operation	Supply Chain Challenges of Case Company	Previous Researches on Supply Chain Challenges
Petroleum (Company A)	Supply management	Price volatility of major raw material (crude)	Limited choice of raw material suppliers, volatile supply situation; difficulty in integrating with suppliers (Varma et al., 2008)
	Demand management	Swing in demand	High risk of product contamination, difficulty in integrating with customers (Varma et al., 2008)
	Logistics management	Logistical challenges on product transfer; silt and tide condition at major thoroughfare; zoning ordinances from the local government units; pilferage	Long and complex supply chain; high transportation costs (Varma et al., 2008)
Semiconductor (Company B)	Supply management	Nonstandard materials requiring customer certification; high stockouts/obsolescence due to volatility of demand; multiple supply source qualification	Long production lead time, large inventories (Brown et al., 2000) Need for standardized supplier quality assessment for implementation beyond the first-tier suppliers; issues on process redesign and cycle time reduction (Briscoe et al., 2004)
	Demand management	Fluctuations in demand because of the nature of business, the number of suppliers, the timeliness of product introduction	Unpredictable and fluctuating demand (Brown et al., 2000) New product development is important (Briscoe et al., 2004)
	Logistics management	None; the company reported that it has the best warehouse and logistics practices in its industry	
Automotive Industry (Company C)	Supply management	For local parts: – Cost competitiveness – Supply base capability	Competitive pressures to source parts in low-wage countries (Ramcharran, 2001) Need for environmentally responsive supply chains (Shukla et al., 2009) Quality issues related to low-cost outsourcing strategy; need for core supplier group (Xia & Tang, 2011) Need to measure supply chain orientation of vendors (Charan, 2012)
	Demand management	Availability of delivery information; long delivery lead time and aging stock; forecasting/planning accuracy	Cyclical changes, industry volatility, foreign competition (Ramcharran, 2001) Plunging demand, fierce global competition (Xia & Tang, 2011) Need for a dealer management system (Charan, 2012)

Industry	Supply Chain Operation	Supply Chain Challenges of Case Company	Previous Researches on Supply Chain Challenges
	Logistics management	Storage space limitation; labor-intensive management tools	Need for better supply chain planning and information technology (Ramcharran, 2001) Need for supply chain performance measurement system (Charan, 2012)
Toy Industry (Company D)	Supply management	Supplier lead time reduction; quality compliance; delivery adherence	Long lead time (Johnson, 2001) Low supplier reliability, long manufacturing lead times (Wong et al., 2005)
	Demand management	Lack of point-of-sale data for all retailers; sales force accuracy; integration of sales forecast to manufacturing capacity planning to shipping and distribution to retailer	Fad-driven demand, rapid change and uncertainty, short product life cycles, slow demand growth (Johnson, 2001) High demand seasonality/cyclicality, short product life cycle, intense competition in innovation and pricing (Wong et al., 2005)
	Logistics management	Space requirement during peak season; coordination with logistics service provider; shipping vessel schedule in relation to manufacturing center shipping port location	Problems on logistics capacity (Johnson, 2001) Need for supply chain initiatives on collaborative planning, forecasting and replenishment (CPFR), cross-docking, vendor-managed inventory (Wong et al., 2005)

4.7 Adoption of Supply Chain Management

In 2008, Talavera observed from a survey of 79 companies that there were three distinct supply chain management (SCM) constructs—consisting of 18 components—that would signify the presence of SCM in organizations in the Philippines. These constructs include supply chain collaboration, supply chain operations, and coordination mechanisms. The four company respondents were compared in terms of their adoption of these SCM constructs (see Table 8). The respondent firms were asked to rate their adoption of each of the six SCM strategies associated with each of these three SCM construct categories. A Likert scale was used for this purpose. The scores of the four companies for each SCM strategy were added. The total score was then divided by the total maximum score of 30 for the six SCM strategies per SCM construct category to get the SCM adoption index.

Results show the companies' extensive adoption of coordination mechanisms (73%) and moderate adoption of traditional supply chain operations (55%). To a lesser degree, they also adopted supply chain collaboration strategies (53%). In terms of specific supply chain strategies, the four respondent firms coordinate to a large extent with their suppliers through the regular communication systems and web-based tools. Coordination with customers is done mostly through the web, while monitoring and capturing demand is done through partial computerization. Demand forecast in collaboration with customers, and materials and production planning in collaboration with suppliers are adopted moderately. Sharing of databases with stakeholders (suppliers and customers) was adopted only to a limited extent.

Table 8. Adoption of Supply Chain Management

Factor		Description	Co. A (Petroleum)	Co. B (Semiconductor)	Co. C (Automotive)	Co. D (Toy)	Ave.	Adoption Index
Factor 1	1.	Materials and production planning done in collaboration with customers	2	5	0	3	2.50	
Supply chain coordination	2.	Demand forecast done in collaboration with suppliers	0	3	0	0	0.75	
	3.	Demand forecast done in collaboration with customers	3	5	0	5	3.25	**53%**
	4.	Shared databases with suppliers	3	3	3	2	2.75	
	5.	Shared databases with customers	5	5	1	2	3.25	
	6.	Materials and production planning done in collaboration with suppliers	5	4	0	5	3.50	
Factor 2	7.	Monitoring and capturing demand through manual system	0	0	0	0	0	
Supply Chain Operations	8.	Managing materials requirements through manual system	0	0	0	5	1.25	
	9.	Procurement through traditional and paper-based systems	2	0	5	5	3.00	
	10.	Ordering through traditional ordering systems (paper-based)	5	0	5	5	3.75	**55%**
	11.	Coordination with customers through regular communication systems (telephone calls, letters)	5	3	4	5	4.25	
	12.	Coordination with suppliers through regular communication systems (telephone calls, letters)	2	5	5	5	4.25	
Factor 3	13.	Collaborative demand forecasting using multifunctional team	5	5	5	0	3.75	
Coordination Mechanisms	14.	Collaborative materials and production planning using multifunctional team	5	5	3	0	3.25	
	15.	Coordination with suppliers through web-based tools (electronic data interchange and mail-enabled transactions)	5	5	5	3	4.50	
	16.	Coordination with customers through web-based tools (electronic data interchange and mail-enabled transactions)	5	5	2	4	4.00	**73%**
	17.	Monitoring and capturing demand through partial computerization	5	3	0	5	3.25	
	18.	Online ordering	5	5	0	3	3.25	

Source: Company interviews.

Notes:

1. Likert scale: 1 – Limited extent of implementation; 5 – Large extent of implementation; 0 means "not implementing"
2. SCC – Supply Chain Collaboration; SCO – Supply Chain Operations; CM – Coordination Mechanisms

In 2008, Talavera proposed an SCM positioning grid that classifies a manufacturing or service company in terms of its stage of SCM adoption. Based on the respondent firm's extent of adoption of supply chain collaboration (with customer s and suppliers) and of information technology tools used in the supply and demand functions, the firms could fall in any of the four quadrants, as follows (refer to Table 9):

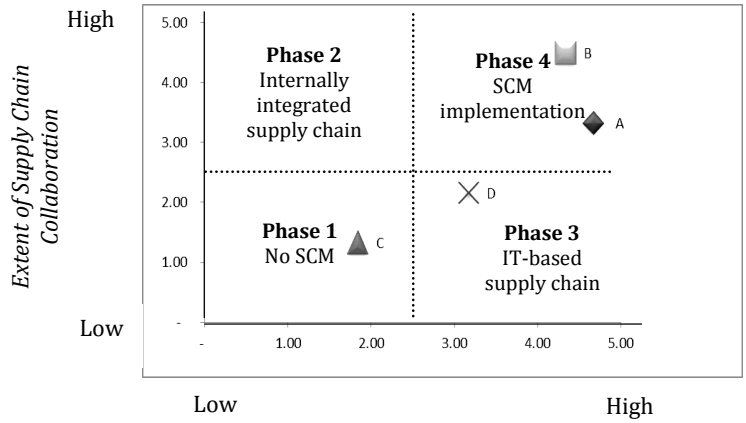
Table 9. SCM Positioning Grid Categories

Quadrant	Extent of supply chain collaboration	Extent of IT in the supply chain	Phase of SCM adoption
I	Low	Low	No SCM
II	High	Low	Internally integrated supply chain
III	Low	High	IT-based supply chain
IV	High	High	SCM implementation

The position of the respondent firms vis-à-vis this grid is shown in **Figure 6**.

Results show that **Company A**, the oil refining and marketing company, and **Company B**, the semiconductor company, are both in Quadrant 4, depicting extensive adoption of SCM-based strategies. Under Quadrant 3 (IT-based supply chain strategy) is **Company D**, a children's toy manufacturing company. These industries reported having responsive supply chain strategies, especially in handling supply and demand management issues. It is surprising that **Company C**, a reputable automobile company known in the region for its quality management system and lean operations strategies, was found in Quadrant 1. Results show that **Company C** did not adopt some aspects of SCM, particularly in the areas of external collaboration.

Figure 6. Position of the Respondent Firms in the SCM Positioning Grid



Sambharya and Banerji (2006) in their analysis of the Japanese automobile industry explained the keiretsu system that exists in this industry, wherein a dominant automobile manufacturer coordinates with a selected set of automotive parts suppliers to have tighter control of the supply side. **Company C** typifies this setup as far as supplier relationship is concerned. However, in the area of external collaboration with customers (automotive dealers), a different finding was observed. **Company C** reported not collaborating with customers in demand forecasting and having limited information sharing with customers. A possible explanation on the low external collaboration of **Company C**, a dominant Japanese automotive company located in the Philippines, can be found in the article of Lee (2011). In Lee's analysis of the Japanese and Korean automobile industries, he highlighted the concept of bounded trust that is prevalent in Japanese automobile industry. Bounded trust means that while

the dominant automotive manufacturer coordinates with the key players in the keiretsu, this is limited to its family circle and very few trusted partners.

Despite this finding, **Company C** is able to achieve a responsive supply chain through its internal integration and tight control of operations. Vargas, Cardenas, and Matarranz (2000) in their analysis of Spanish assembly manufacturing firms emphasized that internal integration of these activities (e.g., production, storage, transfer, procurement, and distribution) is indeed important for a firm's long-term survival.

In light of these findings, there is a need to revisit the nomenclature in the SCM positioning grid (refer back to Figure 1) to have a more accurate description of the supply chain category of firms and their corresponding strategies. In particular, it is proposed that Phase 1 be revised from being a "No SCM" category to being a "fragmented supply chain" category instead. The other changes include the following: Phase 2 (internally integrated supply chain), Phase 3 (IT-driven supply chain), and Phase 4 (internally and externally integrated supply chain).

5 Summary and Conclusion

This study presented the experiences of four supply chains in the areas of supply management, demand management, and logistics management. Utilizing the case study method, it looked into the supply chain challenges encountered by these four companies and their strategies to address these challenges. Results show that despite the differences in the industry contexts and SCM practices employed, they appear to share a commonality in the supply chain challenges faced. The general problems in demand, supply, and logistics management in the four industries also appeared to be the same. In the four industries, there is a need to respond to customer requirements in terms of the right quantity and quality. Demand accuracy is therefore important. Supplier reliability and production flexibility were also observed as critical in all industries. Logistics management issues may be addressed internally or through coordination with third-party logistics service providers.

The findings of the study raise important issues about SCM in theory and in practice:

a) The SCM literature emphasizes the need for interfaces between the manufacturers and its stakeholders and suppliers through internal and external coordination. SCM is a discipline founded on the management of relationships both between corporate functions and across companies (Cooper & Ellram, 1993). However, it is possible that for some organizations, such as Company C, having control in the operations is a more important consideration. This means that a firm may not necessarily adopt collaboration strategies, but this does not mean that such a firm is not practicing the critical dimensions of SCM such as systems orientation, cross-functional coordination, and customer focus, as noted by Mentzer et al. (2001).
b) In their study of six supply chains (composed of 72 companies), Storey, Emberson, Godsell, and Harrison (2006) found SCM to be emergent both in theory and practice. The difficulty in appreciating and consequently adopting the critical dimensions of SCM lies in the perception that SCM as a philosophy is idealistic and fragmented. Having globally dispersed supply chains also poses another issue.
c) The SCM positioning grid classifies respondent firms based on two parameters: adoption of collaboration strategies and IT-based strategies. SCM is a multidimensional construct that involves various aspects that have not been captured by the grid. A company's positioning in the grid also is not indicative of the degree of responsiveness of its supply chain. Future researches should look into the impact of a firm's collaboration strategies on the supply chain's ability to be responsive and agile.

6 Limitations and Areas for Further Study

The findings of the case study present valuable insights especially into how different companies address their unique supply chain management challenges. However, since the study is exploratory in nature and involves only four case studies, one cannot make a generalization that such supply chain practices and challenges exist in the said industries. For a better understanding of industry practices, future studies should focus on a comparative study of the SCM practices of the key players (preferably competing) of a particular industry. Future researches should also consider other industries with more complex supply chain structures and facing volatile conditions, like the pharmaceutical industry, the utilities sector, and the banking industry, among others.

Researchers should also consider other research methodologies to generate responses about supply chain strategies of companies. A triangulation method consisting of several methodologies are recommended to achieve deeper research insights. An immersion in the company's premises is recommended so that the researcher can experience the dynamics of the firm's supply chain challenges on a more realistic basis. In this way, substantive learning can be derived from the experience and the researcher will have better basis as to the congruence of SCM theories in actual practice.

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