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SUPPLY CHAIN OPERATIONS IN THE PHILIPPINES: A SURVEY

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This study was conducted to determine the extent of adoption of supply chain operations by selected Philippine manufacturing and service organizations, particularly in the areas of demand and supply management. It looked into the motivations of organizations for adopting them. This paper also identified areas where companies can establish links with two important stakeholders in the value chain—the suppliers and the customers. Seventy-nine companies—representing the food processing, pharmaceutical, garments, publishing, semiconductor/electronics, food service, and other industries—participated in the study. Descriptive analyses and regression analyses were conducted to test the study's hypotheses.

Results show that supply chain operations, particularly demand management and supply management, are still conducted in the traditional and conventional way. Very few industries also reported adopting supply chain operations that use information technology (IT). Philippine companies have yet to fully adopt and fully explore a lot of supply chain operations based on supply chain management (SCM) principles. The Philippine manufacturing and service industries still need to be exposed to the strategic value of these SCM-based supply chain operations.

I. INTRODUCTION

Supply chain management (SCM) is an operations management function concerned with getting products and services where and when they are needed. SCM includes the design and management of systems to control the flow of materials, work-in-process, and finished inventories to support business strategy. It is directed toward the achievement of an integrated supply chain process that allows firms to source the materials from any part of the world and deliver these to customers also in any part of the world. Anderson et al. (1997) described SCM as a collection of the following principles: customer segmentation, customized logistics, demand planning, strategic sourcing, supply chain strategy, and supply chain performance measurement. The Council of Supply Chain Management Professionals (CSCMP) defined SCM as "the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. SCM, thus, involves the adoption of supply chain operations that include critical business processes such as supply management and demand management. More importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers" (quoted in Kotzab et al., 2006).

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But SCM does not merely involve the internal integration of business functions; it is also a well-established discipline that involves the coordination of an organization's internal planning, manufacturing, and procurement efforts with its external partners such as suppliers and customers (Mclaren et al., 2002; Lambert et al., 2005). To ensure that products and services are available where and when they are needed, there is a need for integration across organizations (internal or intraorganizational integration) and throughout the supply chain (external or interorganizational integration) (Gimenez & Ventura, 2005; Cooper et al., 1997; Cooper & Ellram, 1993). To properly manage the supply chain, Lambert and Cooper (2000) emphasized the need for firms to identify the key members of the supply chain network with whom the firm can link its business processes and determine the level of integration and management needed to ensure the effective link. Sahay and Mohan (2003) suggested that supply chain strategy must be aligned with the business strategy and that processes must be streamlined prior to supply chain integration. It is important, therefore, for the supply chain partners (the suppliers, the manufacturing or service companies, and the customers) to collaborate.

II. REVIEW OF LITERATURE

The following literature presents the extent of adoption of SCM-based supply chain operations in different countries, particularly on internal and external collaboration. McMullan (1996) made a comprehensive examination of the state of supply chain management practices in the Asia Pacific region in the early 1990s. The study looked into four key areas: 1) management issues; 2) roles, responsibilities, and logistics-reporting structures in organizations; 3) competitive strategies to improve the competitive performance of the supply chain management process; and 4) performance management to assess the impact of SCM efforts. Majority of the respondents reported that the logistics function was under the supervision of middle or senior management levels in their organization and that SCM was not seen as a strategic function in the respondent organizations. Results show also that less than 60 percent of the respondents reported having formal policies on specific SCM operations. Information technology (IT) was identified as a key supply chain concern.

Sahay and Mohan (2003) reported that fostering trust and collaboration with suppliers, customers, and service providers is a new thing for Indian companies. In their study of 156 Indian companies belonging to several industries (agricultural products, automotive, chemicals/fertilizers, computers, consumer durables, engineering, fast-moving consumer goods, oil/gas, pharmaceuticals, retail, telecommunications, textile, and transportation), they noted that Indian organizations were more focused on customer orientation as opposed to American firms, which focus their SCM efforts toward cost reduction, streamlining of operations, and demand-supply alignment.

The same can be observed for Saudi manufacturing companies (Falal et al., 2003), which had been facing stiff competition due to the imposition of low tariffs on its imports and rationalized subsidies. Based on their study of 107 respondent firms, Saudi manufacturers reported low adoption of suppliers' database, electronic link with suppliers, reduction in number of suppliers, and inventory-reduction strategies. Saudi manufacturing companies with joint-venture

arrangements were also found to have better potential in terms of supply chain integration than local manufacturers.

Danese et al. (2006) investigated four supply networks whose central firms are leading pharmaceutical companies. They observed that industry factors such as highly unsaturated markets and patent protection have driven the prosperity of this industry. However, the dramatic price moderations demanded by public health systems and marketing organizations, the competitive forces from generic drug makers, and the reduction of the effective patent protection period have changed the name of the game in the pharmaceutical industry. There is a pressure now to reduce costs. This resulted in change in operations strategy.

In response to cost reduction pressure, some companies embarked on production scale economies and sought research and development (R&D) synergies with other firms (mergers and acquisitions). Other firms outsourced traditional internal activities, by relocating their production plants and searching new ways of cooperating with customers. The same can be observed in the textile and apparel supply chains. Teng et al. (2005) noted an increasing trend toward outsourcing and adoption of both multiple and strategic sourcing. There is also a need for textile/apparel companies to make right decisions at different stages of the supply chain operations and reduce the overall costs of the supply chain.

In the case of German manufacturing organizations belonging to the electronics, engineering, and process industries, Szwejczewski et al. (2005) noted diversity in the understanding of their relationship with their suppliers. Majority of the respondents reported having a "partnership-like" relationship with suppliers, and majority of them were engaged in multiple sourcing strategies. In 2006, Dorling et al. looked into the factors that affect the successful adoption of vendor-managed inventory relationships in New Zealand. They noted that the oligopolistic structure of the food retailers in New Zealand makes buyers dominate the supply companies, thereby restricting the extent of partnership agreements (cited in Sankaran et al., 2004). Sohal and Perry (2006) presented other factors that motivate firms to improve their supply chain. In their study of the Australian cereal products supply chain, business-environment factors—such as globalization, industry complexity, and buyer and seller power relationships, among others—were found to affect cereal crop yields.

In a three-year study of six supply chains composed of 72 companies in Europe, Storey et al. (2006) observed that SCM was still emergent both in theory and practice. As a body of knowledge, the authors still consider SCM as characterized by idealism and fragmentation, given its multidisciplinary orientation. They noted the presence of logistics directors (not SCM directors) and observed a significant reduction on in-house manufacturing facilities, similar to the findings of McMullan (1996). The concept of collaboration, particularly in relation to their suppliers, was present to a limited extent. While internal integration may be present in some companies, there was a lack of holistic SCM, particularly with globally dispersed supply chains. Several authors (e.g., Hewitt, 1994; Cooper et al., 1997; Lambert & Cooper, 2000) maintain that implementation of supply chain management is only likely to be successful if it is recognized as a multidimensional change process.

The above literature shows the differences in the extent of adoption of supply chain operations of firms belonging to different industries and countries. Industry differences, on the other hand, may be a function of other factors such as degree of competition in an industry, the nature of relationship that exists between buyers and sellers, and the overall industry complexity and profitability. It is, thus, hypothesized that:

H1: There is a significant difference in the extent of adoption of supply chain operations by industry affiliation.

The decision of companies to embrace SCM strategies can be motivated by several factors, foremost of which is the increasing competition that affects the supply chain networks (Corbett et al., 1999; Christopher, 2000). However, according to Bovet and Sheffi (1998), other business and economic forces will most impact future supply chain management. These forces include 1) consumer demands; 2) globalization; 3) information/communications; 4) competition; and 5) environmental concerns. Consumer needs and wants are becoming more sophisticated. They will demand good quality products at affordable price as well as want these products to be readily available to them. There is the challenge, therefore, to balance low costs with high-level customer service. There has also been a significant shift in demand-and-supply situation from local to the global arena. A lot of companies in the United States and Europe, for example, had discovered the attractiveness of parts and product sourcing from China, Mexico, and other emerging economies. Similarly, manufacturing firms previously based in the Philippines have also found it more attractive to locate in other countries like Thailand and Vietnam due to cost and market considerations. Since the global markets are becoming more turbulent and dynamic, it is important for supply chains to become flexible and lean to adjust to demand and supply fluctuations.

Information technology is an important driver in the development of SCM. It has affected customer ordering, procurement, pricing, and customer satisfaction as well as how corporate performance is measured. The Internet has significantly affected the way firms do business. Through the Internet, consumers and buyers are able to buy products on-line. Business transactions have also been facilitated through effective flow of information and materials/goods. Alliances between firms in the supply chain have also been made easier through IT. Because of the advances in industrial technology, increased globalization, and improvements in information availability, competition in almost all types of industries has become intense. Companies need to be more innovative and creative to survive in their respective industries, and they need to change their mind-set about their current demand management and supply management practices. Kopczak and Johnson (2003) emphasized the concept of the "supply chain management effect," which shifts the business focus from cross-functional to cross-enterprise orientation. This shift helps firms increase their competitiveness or organizational effectiveness relative to competitors by lowering costs and increasing profits and customer satisfaction (Elmuti, 2002; Tan, 2002; Wisner, 2003). There are several motivations for adopting SCM-based supply chain operations. Following hypothesis 1, it is hypothesized that companies belonging to different industries will have different motivations or reasons for adopting SCM-based strategies. Companies in one industry may be motivated to adopt SCM strategies to reduce production costs, while other companies in another industry may adopt SCM strategies that are more responsive to their customers' needs. The second hypothesis is thus stated as follows:

H2: There is a significant difference in the motivations to adopt supply chain management strategies by industry affiliation.

III. RESEARCH OBJECTIVES

The literature review shows a difference in the extent of adoption of supply chain operations in several industries and countries. However, the literature dealt mostly with the experience of American, European, and other Asian companies; there was none on the Philippine experience. This study was conducted to determine the extent of adoption of supply chain operations in the Philippines, with focus on demand and supply management. The study also looked into the motivations of organizations for adopting various supply chain operations. Lastly, this paper identified the various supply chain operations where Philippine manufacturing and service companies can establish links with two important stakeholders in the value chain: the suppliers and the customers. The study contributes in SCM literature both in theory and practice as it presents the extent to which selected Philippine companies have adopted SCM-based supply chain operations in different industries and types of operations. It also looked into the various motivations that affected the decisions of companies to adopt specific supply chain strategies.

IV. RESEARCH DESIGN

A literature review was conducted to determine the supply chain operations associated with SCM. Industry experts were then consulted in the finalization of this list. The expert panel included operations managers from the University of the Philippines Manufacturing Linkage Program (UP-MLP) and the Production Management Association of the Philippines (PROMAP). From the literature, nine SCM supply chain operations were identified consisting of 31 strategies. The strategies are shown in Table 1.

A survey method was conducted. Member firms of the UP-MLP and the Production Management Association of the Philippines (PMDP) were contacted to participate in the study. From the targeted 100 firms, 79 firms participated in the study. Descriptive analyses and regression analyses were conducted to test the study's hypotheses.

Table 1
Supply Chain Operations

Supply Chain Operation	Code	Strategy
A. Demand forecasting	DF1	1. Demand forecasting done by marketing department only
	DF2	2. Collaborative demand forecasting using multifunctional team
	DF3	3. Demand forecast done in collaboration with customers
	DF4	4. Demand forecast done in collaboration with suppliers
B. Customer coordination	CC1	5. Coordination with customers through traditional communication systems (telephone calls, letters)
	CC2	6. Coordination with customers through Web-based tools (electronic data interchange and mail-enabled transactions)
	CC3	7. Shared databases with customers
C. Customer order taking	CRD1	8. Ordering through traditional ordering systems (paper-based)
	CRD2	9. On-line ordering
	CRD3	10. Efficient customer response through point-of-sale system
D. Customer demand monitoring	CM1	11. Monitoring and capturing demand through manual system
	CM2	12. Monitoring and capturing demand through partial computerization
	CM3	13. Monitoring and capturing demand through computer software
E. Management of demand fluctuations	MDF1	14. Adjustments in production levels
	MDF2	15. Constant production levels with adjustment in inventory levels
	MDF3	16. Constant production levels with variable work hours
	MDF4	17. Adjustment in workforce levels
	MDF5	18. Subcontracting / outsourcing
	MDF6	19. Use of marketing promotions
F. Materials and production planning	MP1	20. Materials and production planning done by production department only
	MP2	21. Collaborative materials and production planning using multifunctional team
	MP3	22. Materials and production planning done in collaboration with customers
	MP4	23. Materials and production planning done in collaboration with suppliers
G. Supplier coordination	SC1	24. Coordination with suppliers through traditional communication systems (telephone calls, letters)
	SC2	25. Coordination with suppliers through Web-based tools (electronic data interchange and mail-enabled transactions)
	SC3	26. Shared databases with suppliers
H. Procurement	PR1	27. Procurement through traditional and paper-based systems
	PR2	28. On-line purchasing (e-procurement)
I. Materials requirements planning	MM	29. Managing materials requirements through manual system
	MM	30. Managing materials requirements using partial computerization
	MM	31. Managing materials requirements through computer software

V. FINDINGS

A total of 79 companies participated in the study. Sixty-three percent (63%) of them were from the manufacturing industry while 37% were from the service sector. The three major manufacturing industries that participated were the pharmaceutical (16.5%), garments (17.7%), and food processing (12.6%) industries (see Table 2). The service sector respondents consisted mostly of companies in the food service sector. Majority (77.2%) of the respondent firms had employee size of less than 500. The companies were owned mostly by Filipinos (70.9%).

Table 2
Profile of Respondent Firms

Description	Categories	Frequency	% to Total
Industry	Food processing	10	12.6
	Pharmaceutical	13	16.5
	Garments / accessories	14	17.7
	Semiconductor / electronics	4	5.1
	Publishing	6	7.6
	Food service / restaurant	20	25.3
	Other companies	12	15.2
	Total	**79**	**100.0**
Employee size	< 500	61	77.2
	500-1000	6	7.6
	1001-1500	6	7.6
	1501-2000	1	1.3
	>2000	5	6.3
	Total	**79**	**100.0**
Extent of foreign ownership	100% Filipino-owned	56	70.9
	100% Foreign-owned	10	12.7
	With foreign ownership	13	16.5
	Total	**79**	**100.0**

Notes:
1. Other manufacturing industries include manufacturers of toys, aluminum, food container, etc.
2. Service companies involve elevator repair and maintenance, restaurants, retail shops, etc.

Table 3 presents the extent of adoption of the supply chain operations in selected Philippine companies. Items A to E in Table 3 refer to supply chain operations related to demand management while Items F to I refer to supply management strategies.

In the area of demand management, the respondent firms rated moderate to high the following:

1. Coordination with customers through traditional communication systems
2. Customer order taking through traditional ordering systems (paper-based)
3. Customer demand monitoring using manual systems

Results show that demand management in selected Philippine companies is still traditional in nature. However, there are efforts to adopt an SCM strategy called collaborative forecasting as shown by the

moderate adoption of multifunctional teams in demand forecasting. Very limited adoption was observed for demand management strategies involving the use of information technology, especially in the following areas:

1. Coordination with customers through shared databases
2. Customer order taking through on-line ordering
3. Use of efficient customer response through the point-of-sale system

To address demand fluctuations, the respondent firms reported adjusting their production levels, inventory levels, and workforce. Variable work hours, subcontracting/outsourcing, and marketing activities to manage the fluctuations were utilized to a limited extent.

Table 3
Supply Chain Operations in the Philippines

Supply Chain Operation	Code	Strategy	Means	Std. Dev
A. Demand forecasting	DF1	1. Demand forecasting done by marketing department only	2.95	1.986
	DF2	2. Collaborative demand forecasting using multifunctional team	3.34	2.018
	DF3	3. Demand forecast done in collaboration with customers	2.48	1.907
	DF4	4. Demand forecast done in collaboration with suppliers	2.09	1.869
B. Customer coordination	CC1	5. Coordination with customers through regular communication systems (telephone calls, letters)	4.32	1.256
	CC2	6. Coordination with customers through Web-based tools (electronic data interchange and mail-enabled transactions)	2.57	2.049
	CC3	7. Shared databases with customers	**1.30**	1.778
C. Customer order taking	CRD1	8. Ordering through traditional ordering systems (paper-based)	3.89	1.790
	CRD2	9. On-line ordering	**1.47**	1.738
	CRD3	10. Efficient customer response through point-of-sale system	**1.85**	2.125
D. Customer demand Monitoring	CM1	11. Monitoring and capturing demand through manual system	3.06	2.084
	CM2	12. Monitoring and capturing demand through partial computerization	2.58	1.910
	CM3	13. Monitoring and capturing demand through computer software	2.36	2.176
E. Management of demand fluctuations	MDF1	14. Adjustments in production levels	3.11	2.038
	MDF2	15. Constant production levels with adjustment in inventory levels	2.09	2.027
	MDF3	16. Constant production levels with variable work hours	**1.22**	1.662
	MDF4	17. Adjustment in workforce levels	2.08	2.065
	MDF5	18. Subcontracting / outsourcing	**1.71**	2.026
	MDF6	19. Use of marketing promotions	**1.62**	1.917

Supply Chain Operation	Code	Strategy	Means	Std. Dev
F. Materials and production planning	MP1	20. Materials and production planning done my production department only	3.38	1.983
	MP2	21. Collaborative materials and production planning using multifunctional team	2.95	2.050
	MP3	22. Materials and production planning done in collaboration with customers	2.23	1.915
	MP4	23. Materials and production planning done in collaboration with suppliers	2.42	1.932
G. Supplier coordination	SC1	24. Coordination with suppliers through regular communication systems (telephone calls, letters)	4.30	1.930
	SC2	25. Coordination with suppliers through Web-based tools (electronic data interchange and mail-enabled transactions)	2.91	1.943
	SC3	26. Shared databases with suppliers	**1.18**	1.678
H. Procurement	PR1	27. Procurement through traditional and paper-based systems	4.13	1.556
	PR2	28. On-line purchasing (e-procurement)	**1.92**	1.979
I. Materials requirements planning	MM1	29. Managing materials requirements through manual system	3.41	1.990
	MM2	30. Managing materials requirements using partial computerization	2.51	1.894
	MM3	31. Managing materials requirements through computer software	**1.40**	2.021

In the area of supply management, the following supply chain operations were rated moderate to high, as follows:

1. Coordination with suppliers through traditional communication systems
2. Procurement through traditional and paper-based systems
3. Managing materials requirements through manual systems
4. Materials and production planning through the production department only

The findings show that supply management in the sample companies is also traditional in nature. Collaboration with suppliers in materials and production planning was adopted to a limited extent. Very limited adoption was also observed for supply management strategies involving the use of information technology, especially in the following areas:

1. Coordination with suppliers through shared databases
2. Procurement through e-procurement
3. Managing materials requirements through computer software

Appendix A shows that in the Philippines, the adoption of supply chain operations is different by industry affiliation. In the area of demand management, demand forecasts are still primarily generated by the marketing department in the garments, semiconductor/electronics, and the publishing industries. The food processing, pharmaceutical, and the food service industries show a relatively higher degree of adoption of collaborative forecasting using multifunctional teams, while a strong degree of collaboration with customers in the area of forecasting was noted for the garments and publishing industries.

All industry respondents reported coordinating with customers through regular

or traditional means of communication. Only the semiconductor/electronics industry reported coordinating with customers through web-based tools. A limited extent of adoption was noted in terms of sharing of databases with customers among industries. This can be attributed to two factors: a) the lack of trust between firms and their customers; and b) the lack of infrastructure that will allow sharing of databases. In the area of customer order taking, the same situation can be observed. All industries reported taking customer orders through traditional ordering systems (paper-based transactions), with on-line ordering and the use of efficient customer response (ECR) being implemented to a limited extent. Only the semiconductor/electronics industry reported adopting on-line ordering.

With regard to monitoring and capturing demand, the garments, publishing, and food service industries reported doing these operations through manual systems. The food processing, pharmaceutical, and semiconductor/electronic industries are already adopting more sophisticated systems through the use of computer software to monitor and capture demand. The industry respondents also reported doing a combination of manual and computerized systems. Except for the garments industry, all the other industry respondents reported adjusting production levels to manage demand fluctuations. The garments industry reported adopting to a large extent subcontracting arrangements. Demand fluctuations in this industry are also addressed through adjustments in inventory levels.

In terms of materials and production planning, for most of the industries (pharmaceutical, garments, semiconductor, and publishing), this supply chain operation is still traditionally performed by the production department. Multifunctional teams, however, are strongly adopted in the food processing and food service industries. While there are efforts to collaborate with suppliers in materials planning, in general, the rate of adoption is relatively lower. Collaboration with suppliers in various industries is generally done through traditional communication systems. Only the semiconductor/electronics industry reported coordinating with their suppliers through web-based tools. Sharing of databases with suppliers is adopted to a very limited extent in all industries. The same case was observed on sharing of databases with customers. Given the limited adoption of information technology in coordinating with customers and suppliers, it is not surprising that procurement is still done through traditional and paper-based systems. Once again, only the semiconductor industry reported adopting e-procurement. Managing materials requirements in selected Philippine companies is generally done through the manual systems. The semiconductor/ electronics industry and the food processing industry reflected high and moderate adoption of computer software, respectively.

VI. DISCUSSION AND ANALYSIS

The literature review indicates that firms belonging to different industries adopt SCM-based supply chain operations differently. Sahay and Mohan (2003) noted that 156 Indian companies belonging to 16 industries implemented to a large extent SCM strategies that are customer-oriented instead of those that are directed toward cost reduction and demand and supply alignment. Szwejczewski et al. (2005) likewise observed that supplier relationships differed in industries belonging to electronic, engineering, and process industries. Thus, to test whether a significant difference exists in the adoption of supply

chain operations by industry affiliation, an ANOVA analysis was conducted. Table 5 shows that significant industry differences were observed in the following supply chain operations supporting hypothesis 1.

Table 5
Supply Chain Operations with Significant Difference by Industry (ANOVA Analysis) (Hypothesis 1)

Supply Chain Operation	Code		Strategy	F	Sig.
Demand forecasting	DF2	1.	Collaborative demand forecasting using multifunctional team	3.258	0.007
Customer order taking	CRD2	2.	On-line ordering	2.776	0.017
Customer demand monitoring	CM3	3.	Monitoring and capturing demand through computer software	3.078	0.010
Managing demand fluctuations	MDF2	4.	Constant production levels with adjustment in inventory levels	2.272	0.046
	MDF5	5.	Subcontracting / outsourcing	3.997	0.002
Procurement	PR1	6.	Procurement through traditional and paper-based systems	2.254	0.048
	PR2	7.	On-line purchasing (e-procurement)	2.200	0.053
Materials requirements planning	MM1	8.	Managing materials requirements through manual system	3.240	0.007
	MM3	9.	Managing materials requirements through computer software	4.447	0.001

To determine which of the nine demand management and supply management strategies have a significant association with industry category, regression analyses were conducted. Results of the regression analysis are shown in Table 6. About 8-10% of the variation of each of the three strategies listed in Table 6 can be attributed to the industry affiliation of the respondent firms.

Table 6
Supply Chain Operations Significantly Associated with Industry Affiliation (Hypothesis 1)

Code	Strategy	r^2	F	Sig.
df2	Collaborative demand forecasting using multifunctional team	0.102	8.722	0.004
Mm1	Managing materials requirements through manual system	0.090	7.570	0.007
Mm3	Managing materials requirements through computer software	0.075	6.252	0.015

It should be noted that the semiconductor/electronic and pharmaceutical industries are mature industries that have been implementing quality management

strategies and lean systems in their repetitive process types of operations. These industries thus extensively adopt SCM-based supply chain operations like collaborative forecasting and materials requirements planning. The food service, garments, and publication industries, on the other hand, employ make-to-order processes with high degree of customization. These industries represent different levels of preparedness for adopting SCM-based operations.

As for the motivations of Philippine companies to adopt supply chain operations, Table 7 shows that the top two reasons why Philippine companies adopt SCM-based supply chain operations are the changing consumer demands and cost reduction. This shows that Philippine companies are conscious of the need to balance responding to customer demands and doing so cost-effectively.

Table 7
Motivations for Employing Supply Chain Operations

	Rank (1 – highest)							
Motivation	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**PHILS**
Consumer demands	3	1	3	1	1.5	1	2	1
Globalization	7	2	4.5	7	5.5	7	6	6
IT development	5	5	4.5	6	5.5	6	5	4
Competition	2	2.5	2	4.5	3	3	3	3
Cost reduction	1	2.5	1	2	1.5	2	1	2
Environmental concerns	4	7	7	3	5.5	4	7	7
Risk management	6	6	6	4.5	7	5	4	5

Industry Code: A-Food processing, B-Pharmaceutical, C-Garments, D-Semiconductor / Electronics, E-Publishing, F-Food service, and G-Miscellaneous industries

It is worth noting that the pharmaceutical, publishing, food service, and semiconductor industries ranked changing consumer demands as the primary motivator for adopting SCM-related strategies. This is understandable considering the high degree of customization and service responsiveness needed in these industries. The food processing and garments industries ranked cost reduction as the primary motivator since firms represented in these industries have mass production process types, which are highly resource-based. The other motivators considered important by the respondents were competition (3^{rd}), IT development (4^{th}), risk management (5^{th}), globalization (6^{th}), and environmental concerns (7^{th}). To test hypothesis 2, the responses were subjected to ANOVA analysis to determine whether a significant difference in motivations exists among industries. The findings show that regardless of industry affiliation, the respondent firms have generally the same motivations for adopting SCM-based supply chain operations, except for the globalization factor in which a significant difference exists.

Table 8
Comparison of Ranking of Motivations by Industry (ANOVA Analysis) (*Hypothesis 2*)

		Sum of squares	Df	Mean Square	F	Sig
Consumer demands	Between Groups	1.992	7	.285	.975	.457
	Within Groups	19.555	67	.292		
	Total	21.547	74			
Globalization	Between Groups	21.936	7	3.134	3.396	.005
	Within Groups	46.133	50	.923		
	Total	68.069	57			
IT development	Between Groups	9.325	7	1.332	1.170	.334
	Within Groups	64.890	57	1.138		
	Total	74.215	64			
Competition	Between Groups	4.610	7	.659	.865	.539
	Within Groups	50.255	66	.761		
	Total	54.865	73			
Cost reduction	Between Groups	5.034	7	.719	1.166	.334
	Within Groups	41.953	68	.617		
	Total	46.987	75			
Environmental concerns	Between Groups	15.859	6	2.643	1.720	.133
	Within Groups	86.078	56	1.537		
	Total	101.937	62			
Risk management	Between Groups	3.029	7	.433	.325	.939
	Within Groups	66.488	50	1.330		
	Total	69.517	57			

VII. CONCLUSION AND AREAS FOR FUTURE RESEARCH

The study shows that supply chain operations, particularly in demand management and supply management, are still conducted in the traditional and conventional way, especially in the areas of communication systems, ordering and procurement, materials and production planning, and customer demand monitoring. The respondent firms from the different industries also reported adopting to a limited extent supply chain operations that require full information sharing with stakeholders like suppliers and customers. Results also show that the respondent firms have not fully explored the various SCM-based supply chain operations, which will allow their companies to have effective relationship with their suppliers and customers, thereby reducing total supply chain costs and achieving a more responsive and flexible supply chain.

The low adoption of SCM-based supply chain operations by Philippine companies may be attributed to the nature of relationship of suppliers, manufacturers, and customers, which could still be at arms' length or transactional type of relationship in which internal and external integration with customers and suppliers is still nonexistent. According to Chin et al. (2004), a good trustworthy relationship between buyers and sellers is important to achieve supply chain

collaboration. Limited adoption of IT-based supply chain operations, like the sharing of databases with customers and/or suppliers, may also be related to security risks associated with these types of engagements. Information technology infrastructure may also not be available for the supply chain players in an industry. Future studies should therefore describe in more detail the nature of relationship that exists between manufacturers, buyers, and customers in Philippine industries. An assessment of readiness to embrace IT-based strategies could also be initially conducted.

The respondent companies in the study belonged to different manufacturing and service industries, which in turn have different production processes and supply chain maturities and complexities. The semiconductor and electronics industry, for example, had been a pioneer in quality management and lean operations; it is therefore more open to adopting effective supply chain operations. However, the pharmaceutical industry, despite its sophistication, still reflected limited adoption of supply chain operations, particularly the sharing of information with customers and suppliers. This shows that other reasons could have prevented the respondent companies from openly adopting supply chain management strategies, which were not fully uncovered by this study. Future studies should focus on a particular industry to be able to explain more clearly the dynamics that occur in such industry.

Future researches on supply chain management should also look into other variables that could explain the differences in adoption of demand and supply management strategies other than industry category. Some variables to look into will be the extent of foreign ownership, technology level, company resources, and other resource-based variables. It would also be better to show the link of adoption of supply chain operations with respect to supply chain performance to show if SCM has, indeed, an impact on corporate performance. It is also suggested to conduct a case study of selected companies that reflected relatively higher adoption of SCM-based supply chain operations. This is important to describe how these companies implemented such operations and how they derived competitive advantage from these operations.

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Appendix A
Extent of Adoption of Supply Chain Operations by Industry

Supply Chain Operation	Code	Strategies	FP (n=10)	PHAR (n=13)	GAR (n=14)	SEM (n=4)	PUBL (n=6)	FS (n=20)	MISC (n=12)	PHILS. (n=79)	F	Sig.
Demand forecasting	DF1	1. Demand forecasting done by marketing department only	2.50	2.69	3.36	4.25	3.67	2.85	2.50	2.95	0.731	.626
	DF2	2. Collaborative demand forecasting using multifunctional team	4.80	4.31	2.50	3.50	3.33	3.40	1.92	3.34	3.258	**.007**
	DF3	3. Demand forecast done in collaboration with customers	2.50	2.15	3.50	2.00	3.17	2.35	1.67	2.48	1.313	.263
	DF4	4. Demand forecast done in collaboration with suppliers	1.60	1.62	3.07	1.75	2.33	2.15	1.75	2.09	1.007	.428
Customer coordination	CC1	5. Coordination with customers through regular communication systems (telephone calls, letters)	3.80	4.62	4.07	5.00	4.83	4.00	4.75	4.32	1.344	.249
	CC2	6. Coordination with customers through Web-based tools (electronic data interchange and mail-enabled transactions)	2.30	2.62	2.86	4.50	2.33	2.55	1.92	2.57	0.876	.517
	CC3	7. Shared databases with customers	1.10	1.00	1.71	2.50	2.00	1.35	0.50	1.30	1.082	.382
Customer order taking	CRD1	8. Ordering through traditional ordering systems (paper-based)	3.70	3.69	4.07	2.25	4.83	3.85	4.17	3.89	0.952	.464
	CRD2	9. On-line ordering	2.20	1.62	0.57	3.75	1.67	0.95	1.75	1.47	2.776	**.017**
	CRD3	10. Efficient customer response through point of sale system	1.80	2.23	1.14	2.50	1.67	2.45	1.17	1.85	0.862	.527
Customer demand monitoring	CM1	11. Monitoring and capturing demand through manual system	1.80	2.38	3.64	2.25	4.67	3.55	2.83	3.06	2.083	.066
	CM2	12. Monitoring and capturing demand through partial computerization	2.50	2.46	1.93	3.33	3.17	2.75	2.75	2.58	0.477	.824
	CM3	13. Monitoring and capturing demand through computer software	3.20	2.69	2.04	4.00	0.67	3.05	0.83	2.36	3.078	**.010**
Management of demand fluctuations	MDF1	14. Adjustments in production levels	3.50	3.62	2.07	4.50	3.83	3.25	2.42	3.11	1.546	.176
	MDF2	15. Constant production levels with adjustment in inventory levels	1.10	1.08	3.21	1.75	2.83	2.55	1.67	2.09	2.272	**.046**
	MDF3	16. Constant production levels with variable work hours	0.50	0.85	1.50	2.00	1.00	1.25	1.67	1.22	0.786	.584
	MDF4	17. Adjustment in workforce levels	1.40	0.62	2.36	1.75	1.50	2.20	2.08	1.77	1.306	2.66
	MDF5	18. Subcontracting / outsourcing	1.00	1.08	3.71	2.25	1.17	1.00	1.92	1.71	3.997	**.002**
	MDF6	19. Promotional activities	1.40	1.77	1.21	0.00	1.67	2.25	1.58	1.62	.925	.448

Appendix A (cont'd)

Supply Chain Operation	Code	Strategies	FP (n=10)	PHAR (n=13)	GAR (n=14)	SEM (n=4)	PUBL (n=6)	FS (n=20)	MISC (n=12)	PHILS. (n=79)	F	Sig.
Materials and production planning	MP1	20. Materials and production planning done by production department only	3.10	3.38	4.29	3.75	3.67	2.80	3.25	3.38	0.848	.537
	MP2	21. Collaborative materials and production planning using multifunctional team	3.70	2.62	2.79	3.50	2.67	3.20	2.42	2.95	0.528	.785
	MP3	22. Materials and production planning done in collaboration with customers	1.80	1.92	3.07	1.75	3.17	2.30	1.50	2.23	1.183	.325
	MP4	23. Materials and production planning done in collaboration with suppliers	2.60	2.62	3.07	1.75	2.50	2.65	1.08	2.42	1.434	.213
Supplier coordination	SC1	24. Coordination with suppliers through regular communication systems (telephone calls, letters)	4.60	4.31	4.00	4.50	4.67	4.45	3.92	4.30	0.441	.849
	SC2	25. Coordination with suppliers through Web-based tools (electronic data interchange and mail-enabled transactions)	3.00	3.46	2.93	4.75	2.67	2.80	1.92	2.21	1.363	.241
	SC3	26. Shared databases with suppliers	1.00	1.31	1.07	2.00	1.50	1.35	0.58	1.18	0.504	0.803
Procurement	PR1	27. Procurement through traditional and paper-based systems	2.90	4.23	4.43	2.75	4.83	4.50	4.17	4.13	2.254	.048
	PR2	28. On-line purchasing (e-procurement)	2.20	2.23	0.79	4.50	1.83	1.80	2.08	1.92	2.200	.053
Materials requirements planning	MM1	29. Managing materials requirements through manual system	2.40	2.31	3.86	1.50	4.67	4.20	3.58	3.41	3.240	.007
	MM2	30. Managing materials requirements using partial computerization	2.60	2.92	1.29	2.50	3.00	2.90	2.50	2.51	1.322	.258
	MM3	31. Managing materials requirements through computer software	2.65	2.08	0.71	4.50	0.00	0.90	0.92	1.40	4.447	.001