

Impact of information technology on supply chain of Indian industries

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Abstract—Over the past decade, an important focus of researchers has been on supply chain management (SCM), as many organizations believe that effective SCM is the key to building and sustaining competitive advantage for their products/services. To manage the supply chain, companies need to adopt an SCM strategy (SCMS) and implement appropriate SCM practices. However, different SCM strategies and practices require support from appropriate information technology (IT) applications and their usage. To effectively manage the supply chain, there is therefore a need for aligning these applications and their usage with the supply chain strategy and practices of the firm. While the literature on IT-business alignment has mainly focused on various aspects of the alignment between information systems strategy and business strategy, it is largely deficient in offering an understanding of how specific supply chain strategies should be aligned with relevant IS strategies. Similarly, prior studies on SCM have developed considerable detail on supply chain strategies, without enunciating the implications of these strategies for the use of IT. Additionally, many studies have examined the importance of implementing SCM practices and their impact on supply chain and firm performance without identifying the corresponding Information systems usage that might be required for executing those practices in a more effective manner. Thus, there is need to studies that can explore the relation between SCM and the usage of IT. This study is an attempt to study and understand the phenomenon by which IT has been used for integration purposes in the supply chain context and to examine how Information Systems Integration significantly affect the performance of supply chain management.

Index Terms— Information Technology, Supply chain Management, Indian industries

I. INTRODUCTION

Information Technology (IT) is plays significant role in the success of the supply chain of industries. It is essential to integrate the Information technology with elements of supply chain management. IT is backbone for the success of supply chain of industries. It is impossible to achieve an effective supply chain without IT. it is essential to integrate the activities both inside and outside of an organization for success

of supply chain management. An integrated information system (IS) is required for this which can share the information related to value-adding activities [1]. IT utilization has changed its role in present scenario of competing between supply chains which grows more intense due to high global competition, Firms have started to utilize IT to directly influence the processes of comprising the value chain Increasingly, IT is used to facilitate internal coordination within a firm and enhance external integration with external constituencies (e.g., customers and suppliers) and also to enhance decision making among supply chain members [2]. This phenomenon is evident by the increased usage of information systems for integration purposes; for instance, information systems infrastructure (e.g., data communication tools, network connection, standard data structure, and unified coding standards), information systems software (e.g., enterprise-wide information system such as SAP), and information systems applications (e.g., centralized database management systems, electronic data interchange (EDI), web-based or internet-base information systems). Although the advances in formation technologies are considered a key driver of supply chain integration; what is the best way to deploy these technologies and to coordinate supply chain-wide activities is still under research. The concept of Information Technology can be captured using two main sub-constructs (e.g., internal IT and external IT) and can be conceptualized at three levels (1) Strategic, (2) Operational, and (3) Infrastructural. Studying the effects of IT in these levels can help researchers and executives understand how IT practices at different levels contribute to overall supply chain effectiveness [4]. The implications of such an understanding may bring significant benefits to both operations researchers and practitioners. Such benefits may include making better decisions about which IT to utilize, which information systems (IS) practices to emphasize, and what level of information system to

attain. This study examines the impact of information technology on supply chain functions.

II. PAST STUDIES

Sharing information is important for the functioning of the supply chain. However, sharing quality information between members of the supply chain is important as well. For instance, sharing information within the entire supply chain can create flexibility, but this requires accurate and timely information (Jarrel, 1998). Moberg et al. (2002) argue that accuracy, timeliness, and proper formatting of the information determine the quality of the information. They suggest that supply chain members emphasize the importance of having accurate, timely, and properly formatted information to fully realize the value of information exchange among them. Hence, managers may not even use information coming from their partners if the information has poor quality. Li et al. (2005) emphasize the importance of information sharing to SCM practice. The main principle of SCM is sharing of information within supply chains (Moberg et al., 2002). By sharing information with members of the supply chain, an organization can respond more quickly to the customer's changing needs (Li and Lin, 2006). Information sharing is defined as the extent to which critical and proprietary information is communicated to one's supply chain partner (Li et al., 2005; Li and Lin, 2006; Li et al., 2006; Mohr and Spekman, 1994). Mohr and Spekman (1994) suggest that information sharing and being knowledgeable about each other's business help partners maintain their relationship for a longer time. Thus, it will reduce uncertainties in the market if supply chain members have more information and knowledge about other members (Yu et al., 2001). Furthermore, Frazier et al. (1988) suggest that organizations should share and exchange information with their suppliers regarding production plans, core product, process design, schedules, and product development to create synergies between the organization and its suppliers. This synergy will increase the ability of supply chains to react effectively to sudden changes and uncertainties in the market (Lee, 2000).

Porter and Millar (1985) argue that every value activity in the value chain requires usage of information in some way that differs from other

activities. For example, a logistic activity utilizes IT for scheduling promises, transportation rates, and production plans to ensure timely and cost effective delivery. On the other hand, a company could use IT to enhance its ability to exploit internal activities as well as external activities i.e. coordinate their activities closely with suppliers and customers. In another study, Kyobe (2004) argues that IT resources such as hardware and software can be strategically utilized to achieve competitive advantage. Companies might focus on utilizing IT for internal operations or for external relationships i.e., improving customer services and links with suppliers by sharing useful information and obtaining reductions in cost. Information quality is defined as the extent to which information exchange is accurate, timely, complete, relevant, and credible. Inaccurate and missing data will add costs to the supply chain and can drive poor performance. Chopra and Meindl (2001) argue that information must be accurate, accessible in a timely manner, and valuable when making supply chain decisions. Inaccurate and missing data will make it very difficult for managers to make good decisions as it will not provide the manager with a true picture of the situation of the supply chain. For example, Wal-Mart collects data in real time on what products are being purchased at each store of its stores and send these data back to the manufacturers to determine how much inventory to hold at each store and to decide when to ship new loads of products from the manufacturer. Chopra and Meindl (2001) provide many examples of how inaccurate and missing data results in an increase in materials inventory and adds costs to the supply chain. Furthermore,

III. CASE STUDY

This paper examines the impact of information technology on performance of supply chain of Indian industry. In addition, it also highlights the benefits obtained from introducing the information system in supply chain. A motorcycle manufacturing plant located in north India is considered for case study, whose overall managerial control has been transferred from an Indian company to Japanese company in 2001. The company was started the production of motorcycles with collaboration of a Japanese company in mid 1980, and subsequently entered into a joint venture, based on 50:50 capital investments. In mid 1990, Japanese company decided to face competition independently by parting ways with Indian company,

with which it had a tie-up for over one decade. In 2001, the plant became a 100% Japanese subsidiary after acquiring the 50% stake of Indian company. The Japanese company has now two manufacturing units which employs the 3800 employees. Quality control department has 145 employees and 48 executives. On other hand, purchasing department has 34 employees and 5 executives. 68% parts are purchased from

Table 1: Impact of IT on performance of suppliers of company

Sr. no.	Factors	Less (1) → High (5)				
1	Suppliers deliver what we need.					X
2	Suppliers deliver when we need				X	
3	Suppliers adopt quality practices as per our requirement.				X	
4	Suppliers manage quality as per our requirement.			X		
5	Suppliers inspect product frequently.					X

Table 2: Impact of IT on responsiveness in supply chain of company

Sr. no.	Factors	Less (1) → High (5)				
1	Suppliers respond quickly to			X		

vendors. 75% of purchased parts are received directly on shop floor. To conduct a case study, A questionnaire was prepared to study the impact of information technology on supply chain management. The feedback obtained from this questionnaire indicate that company is significantly benefited though implementation of different information system. These benefits are explained in table 1 to table 15.

	our changing requirements of cost					
2	Suppliers respond quickly to our changing requirements of delivery time			X		
3	Suppliers respond quickly to our changing requirements of cost design			X		
4	Supplier respond effectively to our changing requirements of cost				X	
5	Supplier respond effectively to our changing requirements of delivery time				X	

6	Supplier respond effectively to our changing requirements of design			X		
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Table 3: Impact of IT on ‘Assembles to order strategy’ in supply chain of company

Sr. no.	Factors	Less (1) → High (5)				
1	Suppliers customize our product by adding feature modules as per requirements.			X		
2	Suppliers produce modular products				X	
3	Suppliers respond to customization requirements quickly			X		
4	Suppliers delay the products final assembly until customers make an order				X	

Table 4: Impact of IT on efficiency of supply chain

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems improve the efficiency of operation between our supplier and us				X	
2	Information systems manage material requirement planning of our facility				X	
3	Information systems manage production control between our supplier and us				X	
4	Information systems coordinate (Production and information) efficiently across suppliers and product lines					X

Table 5: Impact of IT on flexibility of supply chain

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to introduce new product and service in our market			X		
2	Information systems help to quickly share information within our firm				X	
3	Information systems help to monitor change in our market condition			X		
4	Information systems help to respond to changes in the market			X		
5	Information systems help to change the design of our product				X	

Table 6: Impact of IT in comprehensiveness decision making

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to provide sufficient information to support careful decision making			X		
2	Information systems help to provide support for decision making		X			
3	Information systems help to adopt a well analyzed view when making major decisions				X	

Table 7: Impact of IT on strengthen partnerships with supplier

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to select supplier based on their quality			X		
2	Information systems help to solve problems jointly with our suppliers				X	
3	Information				X	

	systems help to include our key suppliers in planning and goal setting activities					
4	Information systems help to help our suppliers to improve their product quality				X	

Table 8: Impact of IT on customer relationship practices

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to interact with customers to set reliability, responsiveness, and other standards for us				X	
2	Information systems help to measure and evaluate customer satisfaction			X		
3	Information systems help to determine future customer expectations				X	
4	Information systems help to			X		

	facilitate customers ability to seek assistance from us					
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Table 9: Impact of IT on lean system practices of company

Sr. no.	Factors	Less (1) → High (5)				
1	Information systems help to reduce manufacturing set up time			X		
2	Information systems help to build and maintain continuous quality improvement programs			X		
3	Information systems help to streamline ordering, receiving and other paperwork from supplier			X		
4	Information systems help to push suppliers for			X		

	shorter lead times					
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Table 10: Impact of IT on postponement practices

Sr. no.	Factors	Less (1) → High (5)				
1	The company can delay final product assembly activity until customer order have actually been received				X	
2	The company can delay final product assembly activities until the last possible position in the supply chain				X	
3	The company can store our parts/products at distribution points closer to the customer			X		
4	The company can design products for modular assembly				X	

Table 11: Impact of IT information sharing practices

Sr.	Factors	Less (1) → High			
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no.		(5)				
1	The company can inform our trading partners in advance of our changing needs				X	
2	The company can manually share business knowledge of core business processes with our trading partners				X	
3	The company can mutually share proprietary information with our trading partners				X	

Table 12: Impact of IT on information quality practices

Sr. no.	Factors	Less (1) → High (5)				
1	The company can exchange information with our trading partners in a timely manner					X

2	The company can exchange information with our trading partners in a accurate manner					X
3	The company can exchange information with our trading partners in a complete manner				X	
4	The company can exchange information with our trading partners in reliable manner				X	

Table 13: Impact of IT on Supply chain integration

Sr. no.	Factors	Less (1) → High (5)				
1	There is high level of communication and coordination between all functions in our firm				X	
2	Cross function teams are frequently used for process design and improvement in our firm				X	
3	There is great amount of cross over activities of					X

	our firm and our trading partners.					
4	There is high level of integration of information systems in our firm.				X	

Table 14: Impact of IT on Responsiveness to customer

Sr. no.	Factors	Less (1) → High (5)				
1	Fill customer order on time				X	
2	Has short order to delivery cycle time				X	
3	Has fast customer response time					X

Table 15: Impact of IT on overall performance of company

Sr. no.	Factors	Less (1) → High (5)				
1	Increase in Market share				X	
2	Increase in Return to investment				X	
3	Growth in return on investment				X	
4	Profit margin on sales				X	
5	Improvement in overall competitive position			X		

IV. DISCUSSION

Today companies are often not considered independent entities, but parts of multi-company, multi-echelon networks, i.e. supply chains, delivering goods and services to the final customer. Supply chain management (SCM). Literature proposes that integrated control of these multi-company networks can provide significant benefits. The utilization of information technology (IT), in turn, is considered an imperative requirement for managing these networks, and has been associated with significant supply chain efficiency improvements.

Although the importance of IT for efficient SCM is widely acknowledged, research assessing how IT is in practice used for the purposes of SCM is narrow. More specifically, majority of the prior research has focused either on modeling the benefits of inter-organizational information technologies and information sharing, or on assessing the impact of specific technologies on supply chain efficiency. Consequently, the actual uses of IT in supply chain management as well as the reasons for using IT in a specific way still remain unclear. Due to these identified limitations in the previous literature we address the following research problem: “How and for what purposes do companies use information technology in supply chain management?” This study systemically investigate the complex causal relationships between information systems integration and other related constructs such as information technology utilization, supply chain integration, firm’s operational performance, suppliers’ operational performance, and firm performance. Its objective to discuss the issues like what are the key dimensions of information systems integration?, What are the key dimensions of information technology utilization? , What factors indirectly and directly affect operational performance and firm performance? How are customers and suppliers involved in the process of supply chain integration? What is the highest priority level of integration for firms to gain ultimate benefits from their supply chain? There is no clear definition of constructs and conceptual frameworks on information systems integration in the current literature and study mainly focuses on the physical aspects of information systems integration such as data integration and network connectivity within a merger and acquisition context. The few studies that have attempted to study

the concept of information systems integration are not clearly focused and mainly relate to infrastructural integration. The current study provides a complete set of benefits for information systems integration consisting of strategic integration, operational integration and infrastructural integration. This study provides a theoretical framework that identifies the detailed dimensions of information systems integration, information technology utilization, supply chain integration, firm’s operational performance, suppliers’ operational performance, and firm performance.

This study presents a framework to study the management of information technology enabled supply chains. This paper studies the impacts of information technology and digitization on supply chain and supply chain management. It is found that digitization and information technology have made some changes to how firms operate but the fundamentals of economics are still the same. In a nutshell, improving internal process with the help of the supply chain and by connecting to other supply chain members the business parties can be integrated and connected in a digital manner to form transparent supply chains. This study is exploratory in nature and thus is not without limitations. The results highlight the critical role of customers and suppliers in facilitating supply chain integration. Effective relationships with customers and suppliers will directly lead to a higher level of supply chain integration and in turn lead to a higher level of operational performance for both firms and suppliers. Moreover, relationships with trading partners will directly and indirectly influence firm performance through firm’s and suppliers’ operational performance. This is a very valuable finding since partner relationships have received little attention by top management. This study reveals that the nature of the information systems integration process occurs in a sequential manner. The integration process starts with collaborating activities between departments such as collaborating and developing business plans, identifying new markets, adjusting manufacturing and logistics process, setting up network connectivity, and etc. Once the internal integration is firmly rooted, the process of external information systems integration is begun by involving their trading partners. Therefore, internal integration process is crucial and a pre-requisite for the success of a supply chain. Moreover, the indirect influence of IT use on supply chain

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integration demonstrates that the higher level of IT use alone will not necessarily result in the higher level of supply chain integration if not accompanied by other factors, such as internal information systems integration and external information systems integration.

V. CONCLUSION

This paper studies the impact of IT on supply chain management through case study. This study highlights the importance of integrating both internal and external systems in the supply chain to make the coordination of activities easier. In literature review, some authors illuminated that not all available information needs to be shared but the relevant information as too much confuses people. The authors have demonstrated that although many parties, with their own internal technologies, are involved in the supply chain management the chain can be made information technology enabled if top management support is endowed and technologies for integration are selected carefully. The study provides the inferences made from an instrument that is valid and reliable for the current study's context. The measurement instruments include four constructs: 1) information technology utilization, 2) internal information system integration, 3) external information system integration, and 4) supply chain integration. Finally, in order to better understand the complex phenomenon of supply chain management, the research on the use of IT in SCM should be complemented by research on the other means of supply chain coordination.

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