

Organizational Integration In Supply Chain Management: A Case Study

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ABSTRACT

Increasing competition due to market globalization, product diversity and technological breakthroughs stimulates independent firms to collaborate in a supply chain that allows gaining the mutual benefits. This requires collective coordination framework to synchronize and to integrate the information systems and also organizational activities of the supply chain partners.

However, so far research in supply chain integration (SCI) has paid little attention in identifying and developing a framework to know the present level of coordination among the supply chain partners.

The author's intention in this paper is to review the literature related to SCI and to understand the relationship between integration and performance and also to identify the various elements of integration to develop a framework and a migration path for Organizational and Information Technology Integration. Developed frame work will help the industries to know the present level and provides the roadmap to move to next level of integration with the customers and suppliers for enhancing their performance. Case study was conducted in Auto-Industries to operationalize the developed SCI framework. Present paper will add onto the contribution of authors who have ventured study in the area of SCI.

Key words: Supply Chain Management (SCM), Supply Chain Integration (SCI), Organisational Integration, Information Technology (IT), Original Equipment Manufacturers (OEM)

I. Introduction

Supply chain is described as effective flow of material, money and information to meet the business requirements by linking customers and supplier through their manufacturing and service activities [2], [20]. SCM has evolved as a solution to all scales of industries to improve the productivity of the total supply chain beyond the company's border [10]. The integration of supply chain has been the subject of significance debate and discussion. As organisations seek to develop partnerships and more effective information links with trading partners, internal processes become interlinked and span the traditional boundaries of firms [21]. Supply chain integration means the coordination of core processes across the organisational boundaries through improved communication, partnerships, alliance and cooperation among the supply chain partners. The conventional wisdom in most SCM literature is that "the more integration-the better the performance of the supply chains [3]. When supply chain members integrate and act as a homogeneous entity, there is an improvement in the flow of goods, services, finances and information creating improved performance [10].

So far, research in supply chain integration has paid little attention in identifying and developing a framework to know the present level of coordination among the supply chain partners [7]. In the current study, we examine the relationship between supply chain integration and its performance. The purpose of the paper is to increase the knowledge on the factors that explains the information and organisation integration among the supply chain partners. In the paper, literature related to Supply Chain Integration is reviewed to develop a framework and a migration path for Organizational and Information Technology Integration. Both upstream and downstream of supply chain and triadic scope of integration is

operationalize to know the level of supply chain integration in the Indian Automobile industries. Developed frame work may help the industries to know the present level of supply chain integration and provides the roadmap to move to next level of integration with the customers and suppliers for enhancing their performance. Also paper will add onto the contribution of authors who have ventured research in the area of supply chain integration.

The reminder of the paper is organized as follows: First section provides general information about supply chain; second section provides a comprehensive understanding of supply chain integration followed by identification of elements for the development of supply chain integration framework. Last section provides methodology and case study to validate the developed framework, followed by conclusions and references.

II. Review of Literature

In following section, an attempt is made to review the literature on Supply Chain Integration and its performance, and the stages of Supply Chain Integration.

A. Supply Chain Management and Supply Chain Integration

Purpose of the supply chain management is to remove the communication barriers, eliminate boundaries and coordinating among the supply chain partners. The emergence of the integration concept has made supply chain to operate as a corporate entity. Supply chain spans a virtual enterprise through electronic media without limiting the company boundaries.

Reference [26] originally identified four stages of integration: base line integration, functional integration, internal integration and external integration. Since then, integration has moved towards broader channel or network perspective. The focus of integration has shifted from functional integration towards integration of various partners in the supply chain [6]. That is from internal integration towards external integration. Reference [16] views the supply chain integration as the synchronization of various flows in a supply chain. Reference [17] outlines three dimensions of supply chain integration viz; information, coordination and organizational linkage. Information integration refers to the sharing of information and knowledge among the members in the supply chain [16]. The term coordination refers to the realignment of decisions and responsibility in the supply chain [23]. The essence of organizational linkages include communication channels between the members in the supply chain, performance measurement, and sharing of common visions and objectives [17]. References [3], [4] view the supply chain integration through informational and organizational. Reference [16] proposes three scopes of supply chain integration: dyadic integration, triadic integration or an extended integration. A dyadic integration involves focal company and their customers or suppliers. A triadic integration involves focal company, their customers and suppliers. An extended integration refers to integration of more than three parties along the supply chain and can involve focal company, customer, supplier and customers' customer and suppliers' supplier etc.

B. Supply chain Integration and Performance

The main drivers for the supply chain integration are information revolution, increased levels of global competition, demanding customers, demand driven markets and emergence of new inter-organizational relationship. In the literature it can be documented three elements of integration: Information integration, Organization integration and Technology integration. In the literature, basis of integration are characterized by cooperation, collaboration, information sharing, trust among the supply chain partners and shared technology.

There is a fundamental shift from managing the individual functional management to managing the supply chain relationship among the trading partners [12]. Literature focuses on the importance of aligning goals across functions through cooperation and collaboration. Literature also cites the traditionally poor alignment of goals between manufacturing, distribution and sales function [28]. This cooperative theme across the supply chain partners is supported by supply chain integration is possible when: customers and suppliers establish right partnership with the objectives of reduced inventory, shorter lead-times and better service to customers. Effective utilization of information technology tool to the integration of supply chain activities has greater effect of reducing the levels of complexity. Reference [17] the critical point in minimizing excessive inventories is access to its management of information system. The key element to attain necessary flexibility to improve logistics processes is proper coordination among the independent firms, such as raw material suppliers, manufacturers, distributors, third party logistics providers and retailers. The proper coordination among them also avoid higher inventory costs, longer delivery time, higher transportation costs and higher levels of loss and damage [29].

To optimize the effectiveness, executives should strategically segment their suppliers in to strategic partners [11]. Integration of supply chain processes can provide an effective means by which costs

can be reduced and improved customer service levels [21]. The formula for integration, however, is not a simple one. Organization that aims to become part of an extended supply network can also expect that it will require an infrastructure, enabling effective information flows and streamlined logistics. A key component of this Supply Chain Integration will be robust and durable mechanism for the collaborative arrangements among the supply chain partners. The most effective of these will be mix of collaborative and information technology elements for supply chain integration. Review of existing literature reveals that there is no comprehensive frame work for understanding the migration path in the integration of supply chains. Therefore, next section deals with the identification of elements and developing a migration path for the Organizational Integration and Information Technology integration

III. Developing a migration path for the supply chain Integration

A. Organizational Integration

Organizational linkages essentially include communication channels between the members in the supply chain, performance measurement. It also includes sharing of resources, common visions and objectives [3], [17]. Organizational integration between the supply chain members encourages suppliers and customers to become more entrenched members of the network and instills a sense of belongingness to the supply chain [2]. It is observed that the trust among the partners is at higher level in an integrated supply chain. Organizational integration reduces the need for safety stocks by promoting collaboration and decision delegation among supply chain members. It also reduces irrational behavior and “second guessing” among supply chain members thereby reducing the need for safety stocks [2], [23]. The aim of organizational integration is not merely to resolve conflicts should they arise, but rather to recognize and avoid potential conflicts and/or divergence of interest in advance and devise governance structure to forestall or avoid it. Sharing ideas, skills and common culture are the true characters of organizational integration which helps the supply chain members to behave more like a unified entity[2], [23]. The absence of organizational integration among supply chain partners may curtail the growth of supply chain integration [2], [23]. The basic requirement of Supply chain management is that various members at all levels of hierarchy in multiple organizations must work together for achieving common goals. Managing coordination among the supply chain partners therefore assumes significant importance. Reference [2] shown through empirical study that a positive correlation exists between performance and collaboration in the areas covering supply chain design and inventory management among the supply chain members. Integration can begin with the product design, involvement of customer and suppliers in the various activities of enterprises like: Research and Development, Production Planning and all other steps leading marketing of the product [9]. From the literature, it can be documented that involvement of customers and suppliers, communication channels, joint training programs to train manpower and sharing of technical knowledge, joint cultural programs to achieve bonding, trust among the organizations, vendor managed inventory as detailed in the table 1 are the key elements for the coordination among the both upstream and downstream members of the supply chain. In the literature three concepts namely *direction*, *scope* and *level* are widely used to describe supply chain integration and its extent. The *direction* of integration refers whether the integration is directed downstream, upstream or both in a supply chain. Scope describes dimensions of integration. The *level* refers to what extent the activities are integrated with in the direction and dimension. Table 1 explains the elements, measuring scale and migration path for the Organizational integration.

Table 1: Elements and measuring scale for Organizational integration

Elements of Integration	Variables of Integration	Level of Integration(Up- stream) with suppliers		
		Low (1-2)	Medium(2-4)	High(5)
Involvement of customers and	Research and Development	Five point Likert scales(1extremely low frequency –5		

suppliers	Product Design	extremely high frequency)		
	Production Planning			
	Marketing			
	Supply chain design and implementation			
	Quality improvement			
	Performance measurement			
Communication channels		Only at top management	Top management and Managerial levels	At all levels
Joint training programs to train manpower and sharing of technical knowledge	Low , medium and high frequency	Five point Likert scales(1extremely low frequency –5 extremely high frequency)		
Trust among the organizations		All Material from suppliers are inspected and then sent to production	Majority of materials from suppliers are inspected and then sent to production	Few of materials from suppliers are inspected and then sent to production
Inventory As managed by vendor		Not used	Few suppliers during experimental stage	With majority of suppliers

B. Information Technology Integration

SCI in general and specifically information sharing is facilitated by recent advances in information technology (IT) like internet and other communication devices [30],[15], [1],[19]. With the emergence of the personal computers, optical fiber networks, explosion of the internet and the World Wide Web, cost and the availability of information resources allows easy linkages and eliminates information related time delays in any supply chain networks [22]. Integrated Supply Chain is not a new one, but it has only become feasible as companies access to information that is accurate, timely and affordable. Information is the only element within the supply chains that has become less expensive over the time. An example of this trend is the use of IT tools and emails for communication and for sharing of design data, spreadsheets, trading documents, invoices and online transfer of money among the supply chain partners.

Much of the literature available suggests that IT tools are the main drivers for integration [22], [9]. Internet and World Wide Web helped the industries to integrate their supply chains in real time for coordinating the various flows in a supply chain [13], [1]. A reliable information and communication technology paves the way for timely and efficient information exchange among partners. For example, using electronic data interchange (EDI) technology/Internet and Extranet supply chain members can share minute information about their production needs by giving vendors access to the production planning and control system. Using EDI the vendors can also arrange deliveries without the need of any paper transactions. Similarly, timely payments can be arranged using internet banking. Thus the cost of doing business reduces significantly due to the reduction in information sharing lead time and payment delays. This makes the supply chain more efficient and gives the user competitive advantage over the others. The integration of many IT enabled e-commerce tools – bar coding, electronic messaging, electronic data interchange, global network management and Internet – is allowing supply chain partners to attain significant productivity gains. The advantages of information technology integration are reduced cycle time from order to delivery, increased visibility of transactions, better tracing and tracking, reduced transaction costs, and enhanced customer service which all these offer greater competitive advantage for all supply chain partners. In spite of all these classical goodness of information Technology (IT), many firms continue to face the problems in achieving seamless supply chain management. Information and communication technology tools consist of both hardware and software which can be used for integrating the supply chains. IT tools helps to gather, store, share and analyze the information and makes the information available to right person at a right time. In the literature, researchers have defined three levels of IT integration [25]. Level 1: refers to low level IT integration where small amount of information is shared electronically. Level

2: Moderate integration in which moderate amount of information is shared electronically among the supply chain members but ability to change the shared data and documents is limited to few members in a supply chain. Level 3: is defined as a high level of IT integration which total information is shared electronically and all members in supply chain can change and manipulate the shared information. Table 2 explains the elements, measuring scale and migration path for the IT integration.

Table 2: Elements and measuring scale for IT integration

Elements of Integration	Level of Integration(Up- stream) with suppliers		
	Low	Medium	High
Use of IT tools for sharing the information	Majority of information sharing is paper based/Fax or informally	Partly shared electronically and partly by informally and paper based	Fully shared electronically
IT coverage	Some data and information is in the files/folders and much data is in the hard copies	Most data and information needed is in the systems and not accessible to all.	All data and information needed is in the systems and can be accessed by all.
Communication tools	Phone/Fax/email	LAN/Electronic links with selected suppliers	Dedicated server and extensive use of EDI/Internet/XML links with supply chain members
Automation	Software are used on functional basis related suppliers and SRM activities	Software are used for connecting key suppliers	Software are used for connecting all suppliers

IV. A Case Study

A. Methodology and Operationalization of Supply Chain Integration

Operationalization of the developed frame work and migration path in the above Table 1 and 2 is explained, the details of which are presented below:

1. Scope of Integration: Both upstream and downstream of supply chain. In the current study the triadic scope of integration that is involvement of focal company, auto industry, their suppliers and customers are considered. Figure 1 shows the scope of integration in the proposed study.
2. Dimension of Integration: Organizational and IT integration
Extent of Integrations: Low, Medium and High level
3. Elements of Organizational integration: Elements of organizational integration: Involvement of customers and suppliers, Communication channels, Joint training programs to train manpower and sharing of technical knowledge, Joint cultural programs to achieve bonding, Trust among the organizations, Vendor managed inventory. Table 1 explains the elements and measuring scale adopted to identify the level of organizational linkage in the case industry.
4. Elements of Informational Technology Integration: Use of IT tools for sharing the information, IT coverage, communication tools and automation. Table 2 explains the elements and measuring scale adopted to identify the level of IT integration in the case industry.

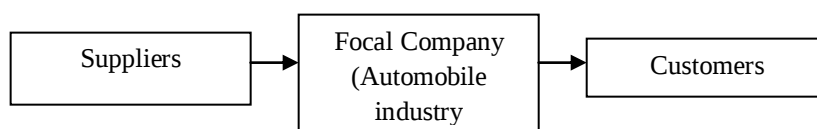


Figure 1: Composition of Triad

B. Case Illustration

An Indian automobile industry is selected to study the current practices supply chain integration. Automobile industry is seen as a flagship bearer, frequently regarded as a barometer measuring the current wealth of a nation's economy [27]. The extreme complexities and long lead-times of automobile manufacturing make it an ideal case for the study of SCM. The case study is conducted in an Indian Automobile industry which is located in the western region of India. The company is having around 2200 workers and management staff and officers around 500. The company is having an approximate market share of 48% and customers are usually wholesalers and distributors and government agencies. The

company is having substantial number of suppliers, retailers, distributors in their supply chain. Typical supply chain of automobile industry is shown in the Figure 2. The case company is certified with ISO9001 and 9002. The company is practicing supply chain management concept since 2001 and the company is having a separate supply chain department. The main enablers for the company to implement supply chain management concept are:

1. Delivery performance improvement
2. Inventory level reduction
3. Reduction of inbound and outbound logistics cost
4. Supplier base reduction

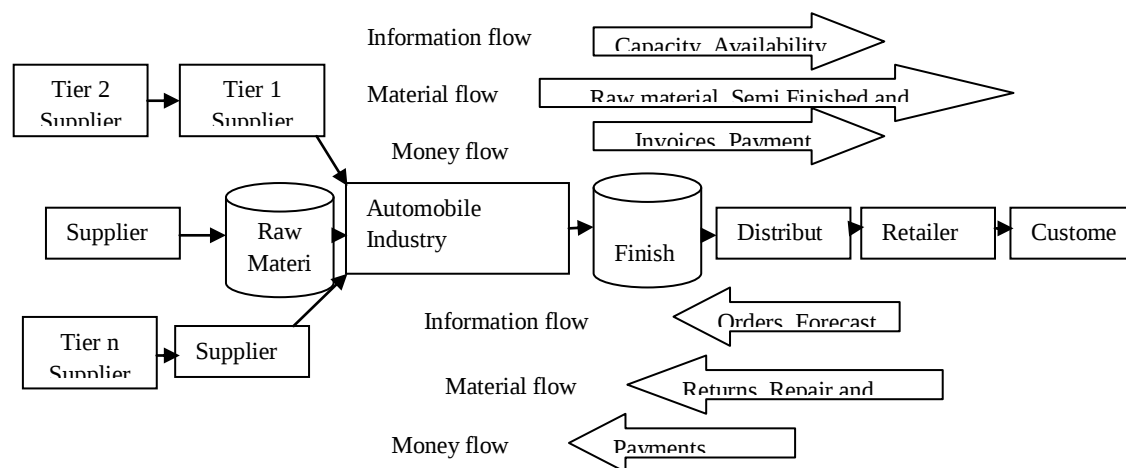
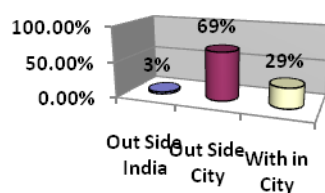


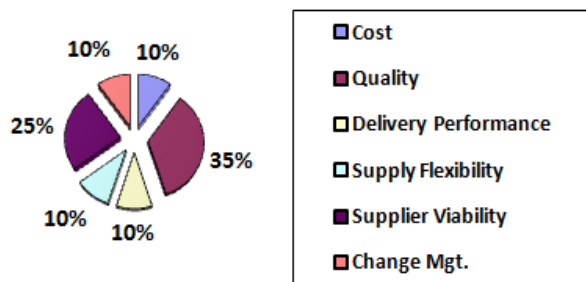
Figure 2: Supply chain and its flows of case automobile industry

C. Supplier relationship management by case industry

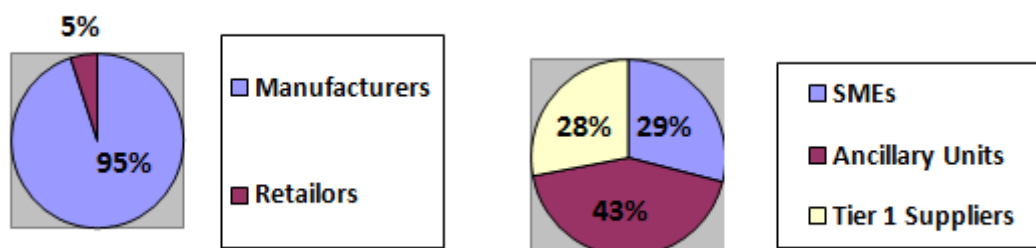
Company under consideration is a pioneer in automobile industry, recognized for heavy duty auto products. Company has almost 350 suppliers out of which 200 are located in an industrial estate within the city, 140 are located outside the city and 10 outside the India. Out 350 suppliers 100 are small and medium scale enterprises. 50 % of suppliers are original equipment manufacturers and ancillary units supplying only to the case industry. Graph 1 & 3 explains details of suppliers. The company is very well connected with the suppliers through internet. It has initiated close partnerships with many key suppliers for several years with significant mutual benefits. Company has developed a supplier evaluation model and vendor rating system. Suppliers are chosen by considering various factors like their delivery performance, their willingness for part development, technology adoption and cultural diversity. Details of vendor rating elements are given in the Graph 2. While the core competency areas which contributes to 10 % of the material content in each automobile are all within direct control of the automobile manufacturer (Case Industry) and almost 90 % of the material content in each automobile is procured from these 350 suppliers and other upstream suppliers. Case industry is in the process of reducing the supplier base drastically and created tiers of suppliers.



Graph 1: Suppliers Profile



Graph 2: Elements of Vendor Rating



Graph 3: Details of Suppliers

Tier 1 suppliers were considered closest to the case company. Suppliers are grouped into Tier 2 and 3 (and beyond) suppliers. Tier-1 suppliers work closely with a group of tier-2 suppliers who constitute the physical supply side of the chain. The partitioning of suppliers in this manner enabled the case industry to manage their supply chain better due to fewer points of contact. It is observed in the case study that communication across the supply chain often got blurred and vital information did not reach to tier 2 suppliers. However, this can be overcome by using information and communications technology which enables distant suppliers and customers to be in touch with other supply chain members. Added information visibility brought on by the Internet and Web based supply chain planning systems helps to partially compensate for the loss of direct contacts. Most of the suppliers are connected through electronically with the industry. The company has developed an integrated production manufacturing systems to connect various departments within the company. Most of the departments within the company are connected in real time and data flows electronically. Case company shares the production, the quality and the inventory information with suppliers quite often through electronically. Constant interaction with suppliers at all levels is quite common. Extensive cooperation takes place with suppliers at the product design stage. Cost reduction, performance improvements, new strategic initiatives, process development and production planning and control teams are the few characteristics of the case industry. Tier-1 suppliers deliver using self-selected logistics providers arranged by the case company and are following “circuit delivery (milk runs) from the company” and “milk runs from the centralized distribution center”. These trucks pick raw materials from the suppliers and take them to case industry. This arrangement is done for the suppliers who are within the city and usually trucks are loaded to full capacity. The case company contributes significantly to the improvement and upgrading the skills of their suppliers by organizing periodic training programs and sharing technical expertise.

Table 3: Status of organizational and IT Integration in the Supply Chain

Dimensions of Supply Chain integration	Elements of Integration	Variables of Integration	Level of Integration(Up- stream) with suppliers		
			Low(1-2)	Medium(2-4)	High(5)
Organizational integration	Involvement of customers and suppliers	Research and Development		Very often involvement of key	

				suppliers	
		Product Design		Frequent involvement of key suppliers	
		Production Planning		Frequent involvement of key suppliers	
		Marketing	Rare involvement of key suppliers		
		Supply chain design and implementation		Frequent involvement of key suppliers	
		Quality improvement	Rare involvement of key suppliers		
		Performance measurement	Rare involvement of key suppliers		
	Communication channels			Frequent involvement of key suppliers	
	Joint training programs to train manpower and sharing of technical knowledge	Low , medium and high frequency			Technical and technological expertise is shared with suppliers
	Trust among the organizations				All the raw materials from the suppliers are sent directly to shop floor
	Vendor managed inventory			Both with 50 % ratio	
Informational Technology Integration	Use of IT tools for sharing the information			Fully shared electronically through Internet	
	IT coverage		Most data and information needed is in the systems and not accessible to all.		
	Communication tools		Computers are connected through LAN	SAP and Integrated production Management systems are used	
	Automation		All functions		

			are fully computerized and Software is used for connecting key supply chain members		
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The company maintains raw material inventory for 7 days, work in process inventory for 3 days and finished inventory for 5 days. It is having cash to cash time 37 days, procurement time 2 days, production time 4 days, delivery lead time 8 days and total cycle time 14 days. The company is maintaining 10 parts per million (PPM) quality standards. The status of organizational and IT integration in the supply chain are shown in the Table 3.

V. Managerial Implications and Conclusion

The current study contributes to the theory and study of supply chain integration. First and foremost, studied the Organizational and Information Technology Integration and identified frame work and migration path. It also study contributes to the understanding of relationship between levels of Supply Chain Integration and performance. The study has shown that supply chain managers of auto industries have embraced information technology to facilitate supply chain integration. The process has been accelerated to a great extent due to enhanced affordability of hardware, software and user friendliness of the Internet.

VI. Limitations of the Study and Scope for Future Research

In the present paper an effort has been made to provide migration path for the supply chain integration. Many researchers may question its generalization. So, developed framework should be operationalizing for different types of industries like: Original Equipment Manufacturers, Auto Component Manufacturers etc. Authors believe that a larger study need to be carried out and compared with present work to obtain better understanding of migration of SCI.

Acknowledgment: The authors would like to extend appreciation to case industries for providing the opportunity to study the SCI practices in their industry.

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