Utilizing IT as an Enabler for Leveraging the Agility of SCM

Mehdi Fasanghari and S. K. Chaharsooghi

Iran Telecommunication Research Center (ITRC) & Tarbiat Modares University (TMU)

Iran

1. Introduction

Supply chain management (SCM) is the 21st century operations strategy for achieving organizational competitiveness. Companies are attempting to find ways to improve their flexibility, responsiveness, and competitiveness by changing their operations strategy, methods, and technologies that include the implementation of SCM paradigm and Information Technology (IT).

The use of IT is considered as a prerequisite for the effective control of today's complex supply chains. Indeed, a recent study is increasingly dependent on the benefits brought about by IT to: improve supply chain agility, reduce cycle time, achieve higher efficiency, and deliver products to customers in a timely manner (Radjou, 2003).

However, IT investment in the supply chain process does not guarantee a stronger organizational performance. The debate on the "IT-productivity" paradox and other anecdotal evidence suggests that the impact of IT on firm performance remains unclear (Lucas & Spitler, 1999). In fact, the adoption of a particular technology is easily duplicated by other firms, and it often does not provide a sustained competitive advantage for the adopting firms (Powell & Dent-Micallef, 1997).

The implementation of IT in the SCM can enable a firm to develop and accumulate knowledge stores about its customers, suppliers, and market demands, which in turn influences firm performance (Tippins & Sohi, 2003).

The main objective of this paper is to provide a framework that enhances the agility of SCM with IT.

The rest of this article is organized as follows. IT systems and Supply Chain Management will be described in the next sections. Therefore we begin with a brief review of the IT and SCM. Definitions for agility—as key subjects in this article—are ambiguous. Then, leveraging the agility of SCM is argued and the framework is represented. This is ended by conclusion.

2. IT systems

As for IT systems, when discussing the use of IT in SCM, we refer to the use of interorganizational systems that are used for information sharing and/or processing across organizational boundaries. Thus, besides internal IT systems such as Enterprise Resource Planning systems we also consider identification technologies such as RFID from the scope of this study (Auramo et al., 2005).

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3. Supply chain management

A business network is defined as a set of two or more connected business relationships in which exchange in one relationship is contingent on (non-) exchange in another (Campbell & Wilson, 1996). Stevens (1989) defines SCM as 'a series of interconnected activities which are concerned with planning, coordinating and controlling materials, parts, and finished goods from supplier to customer. A supply chain typically consists of the geographically distributed facilities and transportation links connecting these facilities. In manufacturing industry this supply chain is the linkage which defines the physical movement of raw materials (from suppliers), processing by the manufacturing units, and their storage and final delivery as finished goods for the customers. In services such as retail stores or a delivery service like UPS or Federal Express, the supply chain reduces to problem of distribution logistics, where the start point is the finished product that has to be delivered to the client in a timely, manner. For a pure service operation, such as a financial services firm or a consulting operation, the supply chain is principally the information flow (Bowersox & Closs, 1996).

SCM and logistics definitions entail a supply chain perspective from first supplier to end-user and a process approach, but the main difference between them is that Logistics is a subset of SCM. Companies have realized that all business processes along with logistics process cut across supply chains (Lambert & Cooper, 1998). According to that, SCM ideally embraces all business processes cutting across all organizations within the supply chain, from initial point of supply to the ultimate point of consumption (Lambert & Cooper, 1998). For, SCM embraces the business processes identified by the International Center for Competitive Excellence (see Fig. 1).

4. IT and supply chain management

Recently with development of information technologies that include electronic data interchange (EDI), the Internet and World Wide Web (WWW), the concepts of supply chain design and management have become a popular operations paradigm. The complexity of SCM has also forced companies to go for online communication systems. For example, the Internet increases the richness of communications through greater interactivity between the firm and the customer (Walton & Gupta, 1999). Armstrong & Hagel (1996) argue that there is beginning of an evolution in supply chain towards online business communities.

Supply chain management emphasizes the long-term benefit of all parties on the chain through cooperation and information sharing. This signifies the importance of communication and the application of IT in SCM. This is largely caused by variability of ordering (Yu et al., 2001).

There have been an increasing number of studies of IT's effect on supply chain and interorganizational relationships (Grover et al., 2002). In this article, IT appears to be an important factor for collaborative relationships. A popular belief is that IT can increase the information processing capabilities of a relationship, thereby enabling or supporting greater interfirm cooperation in addition to reducing uncertainty (Subramani, 2004). IT decreases transaction costs between buyers and suppliers and creates a more relational/cooperative governance structure, leads to closer buyer-supplier relationships (Bakos & Brynjolfsson, 1993), may decrease trust-based interorganizational partnerships and removes a human element in buyer-supplier interaction, while trust is built on human interaction (Carr &

Smeltzer, 2002). A new challenge of marketing is occurred with combination of e-business and SCM. IT allows suppliers to interact with customers and receive enormous volumes of information for data mining and knowledge extraction; this knowledge help suppliers for better relationship with their customers (Zhang, 2007). Network Integration in e-business environment increase the flexibility and link the suppliers and customers electronically based on three basic components (Poirier & Bauer, 2000): e-network (for satisfying the customer demands through a seamless supply chain), responses (for integrating inter-enterprise solutions and responses and customer based supply chain strategy), and technology (for supporting the goals of the supply chain).

Fig. 1. Supply Chain Management (Lambert & Cooper, 1998)

As late description, in next section a main framework will be represented to illustrate the impact of IT on SCM.

5. Definition of agility

Agility is a business-wide capability that embraces organizational structures, information systems, logistics processes, and, in particular, mindsets. A key characteristic of an agile organization is flexibility.

Initially, it was thought that the route to manufacturing flexibility was through automation to enable rapid change (i.e., reduced set-up times) and, thus, a greater responsiveness to changes in product mix or volume. Later, this idea of manufacturing flexibility was extended into the wider business context (Powell & Dent-Micallef, 1997) and the concept of agility as an organizational orientation was born.

Agility should not be confused with leanness. Lean is about doing more with less. The term is often used in connection with lean manufacturing (Womack et al., 1990) to imply a “zero inventory” just-in-time approach. Paradoxically, many companies that have adopted lean manufacturing as a business practice are anything but agile in their supply chain. The car industry, in many ways, illustrates this conundrum. The origins of lean manufacturing can be traced to the Toyota Production System (TPS) (Ohno, 1988), with its focus on the reduction and elimination of waste.

Provided that reaction of supply chain increased for responding the real demands, the agility of SCM grows. Emersion of IT and its application in SCM cause to virtual SCM emerges which is more information-based than inventory-based. So, collaboration along buyers, suppliers, and the firm enhances the agility of SCM.

6. The framework of leveraging the agility of SCM by embedding it

The research revealed that the most impact of IT on SCM is on procurement, logistic, firm, vendor relationship management and CRM described in follows and illustrated in Fig. 2.

The final and perhaps most important prerequisite is the need for a high level of “connectivity” between the firm and its strategic suppliers and customers. This implies not just the exchange of information on demand and inventory levels, but multiple, collaborative working relationships across the organizations at all levels. It is increasingly common today for companies to create supplier development teams that are cross-functional and, as such, are intended to interface with the equivalent customer’s management team within the supplying organization (Lewis, 1995). Through using of IT in the supplier and customer area of SCM, the agility of SCM could be leveraged (Fasanghari et al., 2007, Fasanghari et al., 2008).

6.1 IT & procurement

The use of the IT in managing purchasing in the supply chains has developed rapidly over the last 10 years. The research demonstrates that the IT is utilized in a variety of procurement applications including the communication with vendors, checking vendor price quotes, and making purchases from vendor catalogs. Vendor negotiation has also been streamlined through the use of the IT. Face-to-face negotiations are not used as frequently because the negotiations can be conducted through the IT. This includes the bargaining, renegotiation, price, and term agreements (Olsen & Ellram, 1997). The receipt of queries from vendors, providing vendors with information, and the processing of returns and damaged goods were all handled by the IT.

The other more popular use of the IT in supply chains is in order processing applications. The most frequent use of the IT here is in order placement and order status. Over half of the firms use the IT for this purpose. This has dramatically reduced the costs of order processing. The use of the IT in order processing has reduced the error rate involved in order processing. Errors now can be detected more easily and corrected more quickly.

Fig. 2. Framework for impact of IT on SCM

6.2 IT & operation

1) One of the most costly aspects of supply chains is the management of inventory. The research has shown that the most popular use of the IT in this area is the communication of stock outs by customers to vendors, or the notification of stock outs by companies to their customers. The IT has enabled companies to more quickly institute EDI information programs with their customers. The IT has affected inventory management most dramatically in the ability of firms to be proactive in the management of inventory systems. This is demonstrated in the ability of firms to notify customers of order shipping delays and inventory emergencies, in order to decrease the delivery lead time and inventory.

2) Production scheduling has traditionally been the most difficult aspect of SCM. The IT has enabled firms to minimize the difficulty in their production scheduling by improving the communication between vendors, firms, and customers. The research showed that some of

the firms in the study use the IT to coordinate their JIT programs with vendors. In addition, some of the firms are beginning to use the IT to coordinate their production schedules with their vendors.

6.3 IT & firm

1) To keep costs down, an organization must have a high level of discipline based on the size of the firm: each person knows what needs to be done, knows how to do it, and does it quickly and efficiently. To do this requires a discipline of change which encourages innovation, and yet retains the stability of existing procedures until innovations are ready for wide-spread adoption. IT could overcome this problem.

2) The need for continued learning is acute in today's competitive environment. As new teams are formed, individuals must be able to learn rapidly what is needed to deal with a new set of issues. As new knowledge is developed, it must be made available to other members of the team and to individuals in other parts of the larger organization, that IT has the main impact on improving this process.

3) An organization must be "tight" at the same time that it is "loose". By tight, we mean the need to have a lean, disciplined operation, in which there is a strong and ceaseless attention to keeping costs down and providing quality service at the same time. By loose, we mean the need to be innovative, to be responsive to customers' needs, to be flexible and adaptive to changing conditions and changing customer needs in each local situation. This flexibility is the other area that IT has critical impact on firm in the SCM.

6.4 IT & logistic

1) The research showed that the monitoring of pickups at regional distribution centers by carriers is the most popular application of the IT in this area. This is particularly important for a company, since tracking shipments to regional depots provides the firm with data on the reliability performance of the carriers it is using. This enables transportation managers to make sure that the motor carriers they use are meeting their promised arrival times.

2) In production and logistics, many parties are involved in coordinating all the processes that are involved in fulfilling a customer's order: manufacturer, suppliers of parts and subassemblies, material managers, logistics managers, transportation carriers, customer service representatives, quality assurance staffs, and others. The goals are to reduce the cycle time to fill a customer's order, reduce the inventory of parts, work in process, and finished goods in the pipeline, increase the accuracy and completeness of filling a customer's order and of billing him for it, and accelerate the payment for the delivered items to put cash in the bank as soon as possible. To achieve this degree of Order Cycle Integration, manufacturers, merchandisers, and their trading partners are using IT.

6.5 IT & customer relationships

Many management experts argue that, by focusing on total customer satisfaction, a company can improve its processes to deliver better service at a lower cost. Customer-satisfaction driven is often described as the next step beyond TQM, total quality management: the objective is not simply to deliver some abstract definition of quality, but to deliver total satisfaction to the customer, of which the delivery of quality is only a part.

Meanwhile, in the past, customer information could not be fully utilized in setting processes of firms' conditions. With recent increase in the speed of the IT, it has provided firms with the ability to offer their customers another way to contact the firm regarding service issues and integrate customer information and firm information to bring great benefits to both customer and firm. The research shows that some of the companies use the IT to receive customer complaints, while the other utilizes it for emergency notifications.

6.6 IT & vendor relationships

1) For IT in general, Auramo et al. (2005) propose that IT deployment in supply chains leads to closer buyer-supplier relationships. Stump & Sriram (1997) provide empirical evidence that the use of IT is associated with the overall closeness of buyer-supplier relationships. Subramani (2004) reports a positive relationship between an IT-based supply chain and organizational benefits. Lewis (1995) suggest that the decision to use IT within the dyad could encourage the commitment to establishing relational behavior. Their results show that IT decreases transaction costs between buyers and suppliers and creates a more relational /cooperative governance structure.

2) Trust plays a key role in any organizational relationship that IT facilitates it. Trust exists when a party believes that its partner is reliable and benevolent (Heikkilä, 2002). There has been a noticeable increase in the importance of trust in different forms of interorganizational relationships in management literature. The need for trust between partners has been identified as an essential element of buyer-supplier relationships.

3) Studies recognize long-term orientation commitment as a predictor for successful interorganizational relationships (Bensaou & Anderson, 1999). Long-term orientation refers to parties' willingness to exert effort in developing long-term relationships. Such willingness is frequently demonstrated by committing resources to the relationship, which may occur in the form of an organization's time, money, facilities, etc. Productivity gains in the supply chains are possible when firms are willing to make transaction or relation-specific investments, an important indication of commitment that was increased by IT.

4) Several studies suggest that successful buyer-supplier relationships are associated with high levels of information sharing. Information sharing (quality and quantity) refers to the extent to which critical and proprietary information is communicated to one's supply chain partner. IT caused to open and collaborative information sharing lead to positive effects on interfirm relationship.

7. Conclusion

In this article, at first was presented the definition of IT and SCM and afterward the impact of IT on SCM was illustrated in a framework. It is important that, the impact of IT on SCM is much larger as it facilitates inter-organizational communication and in turn reduces cycle times and develops collaborative work. IT provides opportunities for an organization to expand their markets worldwide. IT opens up the communication and enlarges the networking opportunities. IT supports seamless integration of partnering firms. This facilitates an increase in agility and a reduction in cost. Also, IT enhanced teamwork and CRM for designing new products and receiving feedback from customers and being proactive on responding to change market requirements. Considering the recent trend in IT,

more and more companies are attempting to use IT in producing and selling their products/services. Reduction of manual work and costs, improvement of information quality, speeding up of information transfer, and volume of transactions were found to be the drivers for the transaction processing role of IT in SCM.

One set of strategies for gaining competitive advantage is based on a simple principle: use IT to enhance the ways in which people work. To improve the communication between customers and suppliers, IT would be useful in exchanging the information about products and services. Many companies lack knowledge and skills about IT. This could be due to lack of understanding of the implications of IT and lack of fund for IT investment. These require education and training and also government support to facilitate easy access to the Internet service and development of web site for use of IT in SCM. As a main deduction, IT is a major source to enhance the competitive advantages of the SCM.

The implementation of IT in the SCM can enable a firm to develop and accumulate knowledge stores about its customers, suppliers, and market demands, which in turn influences firm performance. The key to survival in this changed condition is through agility in particular by the use of IT in the important segment of SCM. Moreover, the investment of IT for leveraging the agility of SCM can be optimized as the proposed framework for the affected dimensions of the SCM through IT support organizations for use of IT in SCM according to their goal and resources.

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With the ever-increasing levels of volatility in demand and more and more turbulent market conditions, there is a growing acceptance that individual businesses can no longer compete as stand-alone entities but rather as supply chains. Supply chain management (SCM) has been both an emergent field of practice and an academic domain to help firms satisfy customer needs more responsively with improved quality, reduction cost and higher flexibility. This book discusses some of the latest development and findings addressing a number of key areas of aspect of supply chain management, including the application and development ICT and the RFID technique in SCM, SCM modeling and control, and number of emerging trends and issues.

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InTech Europe

University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
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Unit 405, Office Block, Hotel Equatorial Shanghai
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中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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