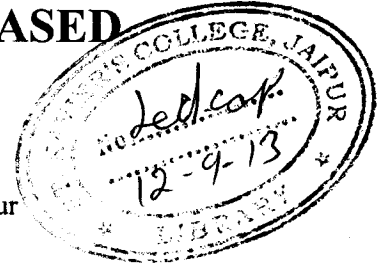


A FRAMEWORK FOR EFFECTIVE IT-BASED SUPPLY CHAIN MANAGEMENT

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Abstract

Effective configuration management and global resource supply has become the focal point of market competition under the influence of global market and its economy. Though the supply chain management provides a concrete foundation and impacts the demand and supply process to a great extent in terms of operational, financial and statistical aspect; it still has many limitations which restrict the enterprise's ability to gain an edge in a competitive environment. In today's information age, there is a need for an extensive use of information technology and its tools in the process of supply chain management. In an environment of complex and tricky competition and ever-changing market, organizations can offset the limitations of supply chain, improve operating efficiency, reduce operating costs and establish quick response strategies by resorting to a proper blend of information technology and supply chain management. The research paper discusses the role of information technology as an enabler in supply chain management and also highlights the vast benefits a company is likely to derive with the adoption of a comprehensive IT strategy. The paper focuses on the synchronized usage of information technology and its various tools and techniques for supply chain management. It also highlights the contribution of information technology in restructuring the entire distribution setup to achieve higher service levels and lower inventory and supply chain costs. Further, it proposes a framework for analyzing the effect of IT service quality on supply chain performance and a tool for supply chain communication.

1. Introduction

In today's global scenario, business environment demands an increased collaboration between the customer and manufacturers. To succeed in this interaction, supply chain management (SCM) is possibly the most appropriate solution (Gawande 339). SCM provides a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers (Harland). SCM is a field where innovative technical applications of the principles of SCM are increasing every day.

Information technologies aim at solving the difficulties involved in the process of supply chain management. The utilization of information technology, in turn, is considered an imperious requirement for dealing with supply chain networks, and has been associated with major supply chain efficiency improvements. The past literature on SCM deals with strategies and technologies for effectively managing a supply chain and focuses on showing the inter-organizational information technologies framework and information exchanging. Therefore, the actual role of IT in supply chain management along with the reasons for using IT in a specific way still remains ambiguous. Due to these recognized limitations in the previous literature, the main aim of this paper is to identify those areas of IT which support the supply chain and develop a

framework for applying IT in SCM. Further, it proposes a new emerging IT tool for supply chain communication.

The paper is structured as follows. First, the previous literature discussing the concept of SCM and the use of IT in SCM is reviewed. Second, the framework for applying IT in SCM is presented, followed by the presentation of the findings of the study. The last section focuses on the communication tool for SCM. Finally some conclusions are drawn.

2. Literature Review

Supply chain management is a vast concept where researcher frequently give different definitions based on their personal knowledge. To some, it is an effective way of receiving orders and supplying goods taking into account the distribution and transportation costs. In other researchers' views supply chain management is a concept, managing relationships with the various suppliers and determining what to outsource and to whom, also managing the supplier base. Another set of researchers defined that how the different corporations are incorporated in terms of information sharing systems in the distribution network or value chain (Jayashankar 3-4). IT has a great impact on SCM. There have been an increasing number of studies on IT's effect in supply chain management and interorganizational interactions. In these studies, IT appears to be an important factor for collaborative interactions. While these studies might have focused on different types of E-security in supply chain management, most of them reported the positive effects and advantages of application of IT in supply chain management and in interorganizational collaboration. Bakos and Brynjoolfsson proposed that application of IT in supply chains points to faster buyer-supplier relationships (301-329). Stump and Sriram delivered empirical evidence to the view that the use of IT contributes to the overall closeness of buyer-supplier relationships (127-136). Subramani brings to our attention a constructive relationship between an IT-based supply chain management and organizational benefits (50-75).

Past literature commonly accepts that SCM and IT are intertwined and that ITs can increase the information sharing in supply chain relationship and provide benefits to companies in terms of increasing the quality of supply chain management. This paper tries to investigate the relevance of IT in SCM.

2.1. Previous Research

Various researchers proposed the study on the use of IT in SCM. Many of them have included over a hundred journal articles in their recent literature survey addressing the use of information systems in supply chain integration and management. In this literature review, the aim is to discuss the logical and conceptual aspects of the research.

2.2. Logical and Conceptual Research

A section of previous research seeks to quantify the effects of information flow and information sharing between supply chain partners and to classify the frameworks that describe how IT is used in supply chain management. This section also highlights the role of IT and interorganizational cooperation in supply chain management. For example, Anderson et al. proposed that it is essential to improve a supply-chain-wide technology which helps in multiple levels of decision making and gives a clear view of the flow of products, services, and information.

For example, Gavirmeni et al., Lee et al. and Raghunathan have studied two echelon of supply chains for one product, while the model of Evans et al. consists of four echelons. Previous study described that the clearance

of information sharing has been estimated to depend on the certainty of demand. Later, Cachon and Fisher proposed the theory that information sharing can be of great advantage in situations with unknown demand. On the other hand, as Raghunathan has observed, in a situation of predictable demand, information sharing is likely to be less positive. Reflecting on the reasons for the effectiveness of IT use in SCM, Cachon and Fisher have suggested that the benefits of IT are more due to the positive effects of IT on transaction execution. Bagchi and Skjoett-Larsen studied the role of IT in relation to levels of supply chain integration.

Past literature discussed the use of IT in SCM in relation to transaction execution, information sharing and decision support. Many companies assume that drivers of IT used in transaction execution and information sharing along with decision support differs, and the profits of IT in information sharing and transaction execution are easier to measure.

Previous research shows that in a situation of high transaction capacities and business relationship, companies use transaction execution while in uncertainty demand and regular product introductions use information sharing and further for giving a clear view of products use decision support.

The literature review shows that in previous literature there is a lack of research on how companies actually utilize IT in supply chains to make them more efficient. Also there is limited research on drivers for using IT in SCM. These limitations of previous research necessitate further research, which this study proposes to undertake. It also proposes a framework for classifying the areas of IT use in SCM and examines the IT tools helpful in supply chain communication.

3. Framework Design

Previous studies have focused on the types of IT in SCM and on the drivers for using IT in SCM. Two frameworks have been established based on this study. One of these frameworks highlights in more details the areas of IT in SCM.

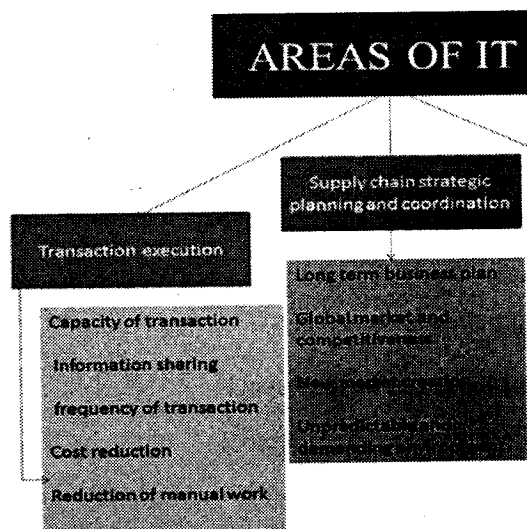


Fig. 4.1: Areas of IT

3.1. Areas of IT in SCM

This framework describes areas of IT use in SCM, and the reasons for which companies use IT in SCM. It also focuses on the three areas of IT application: transaction execution, strategic planning and coordination of supply chain, and decision support.

The first area of IT application, transaction execution, stands for the use of IT for increasing the efficiency of routine information exchanges among supply chain partners. Exchanged information contributes to reduction of cost and manual work, increases information quality, reduces of human error, and produces order (Jaana et al. 5). According to previous survey, companies aimed to reduce manual work associated with sales transactions and thereby to reduce the related costs, and to increase the reliability and speed of information transfer between companies. In most cases, the partners of the IT applications were selected on the basis of the volume of transactions. However, several companies stressed that especially with lean IT solutions, such as extranets, a high volume of transactions is not needed for receiving a positive payback of the integration effort.

The second area of IT application, namely, strategic planning and coordination of supply chain, represents the use of IT for long-term business plan and to deal with globalization. It is also useful for unpredictable and logically demanding business environment. Furthermore, it includes such tasks as maintaining inventory information and production capacity information for increasing the effectiveness and quality of supply chain management (Jaana et al. 3-5).

The third type of IT use in SCM, i.e. decision support system (DSS), is a detailed session of computerized information systems that supports business and inters organizational decision- making events. DSS is a properly collaborating software system. It is designed to provide help for decision makers. DSS uses raw data, and experience for compiling useful information. This is also used to identify and solve problems and make informed decisions. It delivers a record of all current information properties such as relational data, data warehouses, and data marts (Nair and Venkitaswamy).

4. Emerging IT Solutions for Supply Chain Management

4.1. Radio Frequency Identification (RFID)

The barcode was developed to increase efficiency in the trade market, but it cannot uniquely identify some specifics such as the date of production of items, the date of expiry, etc. RFID was able to take care of these issues. Clampitt and Sweeney reported some major advantages of RFID over barcoding:

- No line of sight is required
- Multiple parallel reads are possible
- Individual items instead of class of items can be identified
- Read/write capability.

To illustrate these advantages, consider a purchasing operation in a warehouse where a mixed pallet of goods is bought. If all individual products on the pallet need to be entered into a computer system to produce the receipt, then in the barcoding scenario, a worker needs to break the pallet, open the cases, and scan each product. But in RFID the pallet would simply be pulled through an RFID reader portal, and all products on

the pallet would be identified almost instantaneously. Barcoder, in comparison to RFID, is time consuming.

Another advantage of RFID is that it can give more information than a barcode. Consider, for example, a can of soft drink. The barcode on each can of soft drink is the same and it describes the price of product but in RFID each can of soft drink has its own identifier which provides not only the source of each product, but also such information about product as warranties, authenticity and so on.

The read/write capability of the RFID tags is a benefit when a computer links it to a network database. Even when link to the network to database fails, the read/write tag provides the facility to store and change data about the item on the tag itself, without resorting to the database record that corresponds to the tag's serial number (Gaukler 1-3).

RFID is emerging as a key enabler of Supply Chain Management (SCM) operations (Nair and Venkitaswamy). It is a type of automatic identification system. The aim of an RFID system is to transmit data with the help of a portable device. This is done by reading a tag by an RFID reader. A tag is a microchip which may provide identification or location information or specifics about the tagged product, such as price, color, date of purchase, etc. (EPIC). This tag is connected to a small antenna. The chip can encode a predetermined amount of data. RFID tag and the reader communicate with each other with the help of radio waves.

The RFID applications are wide-ranging and widespread and covers areas such as retail, manufacturing, shipping and distribution, health care, food and drug, distribution, inventory management and asset tracking, vendor-managed inventory (VMI), and customer relationship management (Nair and Venkitaswamy). RFID offers businesses increased supply chain and inventory visibility for greater operational efficiency, better tracking of transportation and warehouse channels with reduced or zero inventories. It also enables managers to capture and deliver information necessary to make good decisions. It has the potential to cut costs, deliver better asset utilization, reduce shrinkage and counterfeiting, and increase sales by reducing out-of-stocks.

RFID is used for traceability and visibility of products. It also reduces labor costs.

4.2. Software Agents

A software agent is a software system, which has attributes of intelligence, independence, perception or ability to act on behalf of a user. The software agent paradigm is a natural fit to certain classes of dynamic supply chain problems because the paradigm focuses on coordinating the activities of loosely coupled entities, e.g. raw material suppliers, shippers, manufacturers, distribution centers, and retailers. One goal of the paradigm is to enable agents to meet deadlines and resource constraints. To achieve its goals it has to be flexible, robust, responsive and adaptive. With agents these behaviors are obtained without centralization and without assuming complete static knowledge. Agents can perform separately or proactively. The intelligence of an agent refers to its ability to perform tasks or actions using relevant information gathered as part of different problem-solving techniques such as influencing, reasoning and applying specific knowledge (Nair and Venkitaswamy). Java is a good example of a common tool for building such intelligent agents, which are progressively becoming more mobile.

Conclusion

The present century is the century of information technology (IT) and globalization. Information technology is playing a significant role in the betterment of the organizations. Customers' expectations are increasing

and companies are encountering more and more uncertain environments in the face of growing competition. To survive, companies will find that their conventional supply chain integration will have to be expanded so as to integrate all stakeholders. Adoption of IT tools is essential for such efforts. This study focused on the areas of IT use for SCM which are divided into three parts: transaction execution, supply chain strategy planning and coordination, and decision support system. Further, the reasons for using IT in SCM were examined. Moreover, this paper discussed the role of IT as an enabler in SCM and also highlighted the benefits that accrue to companies as they adopt IT in their SCM. This paper also presented an overview of IT which is helpful in making the SCM more efficient. Future studies need to examine how the IT can deal with SCM failures.

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