Study on the Application of Information Technology in Supply Chain Management

Madhavi Neman[1], Singh Gaurav[2], Vaishy Keshav[3]

Asst. Professor[1] and FYBMS[2,3]

Uttar Bhartiya Sangh's Mahendra Pratap Sharda Prasad Singh College of Commerce & Science, Mumbai, Maharashtra

Abstract: *Modernization has compelled organizations to adopt efficient supply chain management strategies as a result of outsourcing, customization, time to market, and pricing constraints. Organizations will realize that in order to endure, they must extend their conventional supply chain integration beyond their national boundaries to encompass all parties involved. Information technology tools are crucial for such endeavors. This article examines the role of IT in enabling supply chain management to reduce electronic hazards and bring substantial benefits to organizations. Technology is inherently dualistic. The prevalence of technology in society is leading to an increase in cybercrimes, since digital attacks are replacing physical violence. In order to stay ahead of cybercriminals and cyberterrorists, it is crucial to address new and unforeseen challenges. However, the only way to achieve success is through collaboration and partnership between the corporate sector and the public sector. Throughout history, it has been evident that no level of legislation or technological progress has ever succeeded in totally eliminating crime. A significant risk in supply chain management is the vulnerability of both physical and virtual systems, particularly the sabotage of computer systems and unauthorized access to data and databases by cybercriminals. Delinquents may intentionally manipulate crucial facts or information with the aim of acquiring illegal monetary benefits through supply chain networks. Information technology can be utilized as a means to address and prevent several forms of fraudulent activities, including bid rigging, phantom bids, nepotism, substitution, false counting, counterfeiting, and the creation of deceptive accounting entities, such as ghost employees, fictional vendors, fraudulent customer or vendor payments, and fictitious hours. The IT technology alignments in supply chain management, specifically. In order to mitigate electronic hazards and enhance efficiency, implement electronic record management solutions like as Bar Code, RFID, and EDI, as well as ERP systems like SAP, Oracle, and PeopleSoft. Additionally, utilize Microsoft package, Data Warehouse, software agents, decision support systems, web services, e-commerce, and electronic supply chains.*

Keywords: Modernization

I. INTRODUCTION

Information flow in supply chain networks was time-consuming and error-prone during the era of paper-based transactions and communication. Due to globalization, organisations began to alter their communication practices, deploy technology, increase the variety of their business transactions, and improve their business processes in order to boost their supply chain networks' business performance. Supply chain management (SCM) is an integrated and complex network concept that dates back to the 1950s. It describes the collection of all processes that begin with the acquisition of raw materials from manufacturers or producers and end with the delivery of the finished product to consumers. The uncertainty risk in supply chains is increasing as a result of the complexity of data (Christopher & Peck, 2007; Hillman & Keltz, 2007), which also increases the vulnerability of electronic hazards (e-risks). In order to achieve the goals of supply chain management, the upstream and downstream integration of the supply chain network is a fundamental prerequisite. By enhancing quality and lowering coordination costs and transaction risks, the IT-enabled SCM contributes to firm profits (Stroeken, 2000; Mabert et al., 2001; Sanders & Premus, 2002).

It can also manage the flow of information with key business processes, materials, and money both inside and outside the network. Many researchers discussed the relation between IT and SCM viz.; Internet increases the richness of com-

munications through greater interactivity between the firm and the customer (Watson et al., 1998), IT as cures for Bullwhip effect in Supply Chains (Lee & Whang, 1997), Internet as the foundation for new business models, process and new ways of knowledge distribution (Laudon et al., 2000), IT in SCM provides a reduction in cycle time, a reduction of inventories, a minimization of the Bullwhip effect, and improvement in the effectiveness of distribution channels (Levary, 2000), applications of Radio Frequency Identification (RFID) in supply chain (Gould, 2000), advanced information and manufacturing technologies for better managing their supply chains (Talluri, 2000) providing information availability and visibility and allowing decisions based on total supply chain information (SimchiLevi et al., 2003), Electronic Data Interchange (EDI) (Ngai & Gunasekaran, 2004), inadequate enterprise without IT systems (Davenport & Brooks, 2004), e-commerce applications (Chou et al., 2004), increasing information sharing within organisations and between organisations with inter-organisational systems (Chen & Paulraj, 2004), IT is closely related toprocess changes, most of the benefits are overlapping and interlinked (Auramo et al., 2005), Electronic Data Interchange (ERP) (Davenport and Brooks, 2004), mobile agent technology, as applied in an e-commerce application (Patel, R.B & Garg K, 2004) inter-organisational information systems (Da Silveira &Cagliano, 2006), designing collaborative planning forecasting and replenishment (CPFR) (Danese, 2007), online ordering (Kull et al., 2007), SCM and IT (van Donk, 2008), supply chain coordination and integration, uncertainty and variability (Ambrose et al., 2008), spread sheet based vendor (Mahamani & Rao, 2010)

II. SUPPLY CHAIN MANAGEMENT AND INFORMATION TECHNOLOGY

The administration of a network of connected companies that ultimately provides the product and service packages needed by end customers is known as supply chain management (SCM) (Harland, 1996). In order to create connected and coordinated supply chains for successful supply chain management, the supply chain drivers can cooperate by sharing information throughout supply chain networks. Because information provides mechanisms for executing transactions and gives opportunities for decision makers when they need it and, in the format, they need, it also improves performance and lowers risks in supply chains. IT, which consists of hardware and software programmes, plays a part in this. In order to meet the number and quality of products, IT is also crucial in integrating suppliers, manufacturers, distributors, and customers. By implementing SCM efficiently, businesses may acquire crucial data along the whole supply chain and respond rapidly to any predicted market changes, giving them a competitive advantage (Tummala & Schoenherr, 2008). The goals of IT in SCM are to provide information availability and visibility, enable a single point of contact for data, allow decisions based on all available supply chain information, and enable partner collaboration (Simchi-Levi et al., 2003). Transaction Execution, Collaboration and Coordination, and Decision Support have been identified as the functional functions of IT in SCM (Auramo et al., 2005). IT systems like data integrity, real-time accessibility, information visibility and processing capacity, and business process standardisation are expected to improve supply and demand matching among supply chain participants and provide a great foundation for integrating with external partners in the supply chain (Tarn et al., 2002). Consistent information technology use across the supply chain increases the risk of cybercrime, including "computer-assisted" crimes like hacking and phishing as well as "computer-focused" crimes like hate crimes and telemarketing/internet fraud. Computer crime, computer-related crime, computer misuse, cyber crime, digital crime, e-crime, internet crime, online crime, etc. are common terminology for crimes involving computers. So, according to Davenport and Brooks (2004), IT is a crucial prerequisite for managing supply chains.

Another crucial function of IT in SCM is reducing e-risks through following ways:

Management of Electronic Documents

Electronic records management (ERM) refers to all paperless business transactions carried out using enterprise resource planning (ERP) systems, automatic identification (Auto ID), and electronic data interchange (EDI). The goal of implementing ERM in SCM is to guarantee process flow accountability, which helps to mitigate cybercrime risks (also known as e-risks) that are generated through e-communication.

Scanner and bar codes

With data recorded in magnetic or optical form as a component of a communication system, bar codes can be oriented as ladders (width lines in a horizontal order) or picket fences (width lines in a vertical order). It is being used by the companies in supply chain networks to automate product and service tracings and tracking at each process flow.

Because it is the representation of a number or code in a form appropriate for reading by machines, it also gives necessary precise and timely information which is useful to reduce errors (Ellram et al., 1999). Bullwhip effect, which is frequently experienced by the consumer goods industries and causes significant inefficiencies such as excessive inventory investment, poor customer service, lost revenues, misguided capacity plans, ineffective transportation, and missed production schedules, has been developed and applied in parts of the supply chain where bar codes and scanners are used to remove inaccuracy. Wal-Mart's introduction of this technology in their sales and distribution data in 1983 and later implementation of satellite communication for real-time inventory data in 1987 had a substantial outcome. FedEx makes this possible so that their clients can receive thorough tracking information in real time. This is frequently used for product identification, to speed up data entry, improve data accuracy, reduce on-hand inventory, enhance customer service, decrease product recalls, verify orders at receiving and shipping, decrease work-in-process idle time, monitor and control shop floor activity, improve shop floor scheduling, optimise floor space, improve product yield/reduce scrap, record attendance, and for debit and credit cards, ATM cards, and ATM cards in banking organisations. Bar codes assist us in lowering supply chain risk, which is increasing as a result of human error or insider data entry fraud. Bar code process duplicacy creates hazards that can be removed by using biometric authenticity and authorization. However, there is a risk of data tampering, which is carried out by unauthorised alterations to data beforehand, adding fraudulent data during input, altering or omitting the desired input data, posting a transaction incorrectly, making changes or additions in the master file records, posting the transactions partially, destroying the output and substituting the counterfeit output, or entry of a virus that alters data, the programme, the database, or application, exchanging valid dia with fake dia

RFID: Radio Frequency Identification

RFID is a technology that relies on tags, which transmit and receive an object's identity in the form of a distinctive serial number using wireless radio signals, and readers, which gather the information the tags transmit and transfer it to the business's information system for further evaluation and analysis. Both RFID and bar codes are based on Auto ID technology, but while RFID uses radio frequency signals to read tags, bar codes use optical laser or imaging technology to scan printed labels. By implementing RFID technology, supply chains can benefit from increased visibility into customer needs, effective business processes, accurate and reliable order forecasts, productivity gains, operating cost savings, better tracking, counterfeit identification, and theft prediction (Attaran, 2007). RFID also includes authentication (Coronado et al., 2004), lowering channel volume, and improving forecasting and planning capabilities (D'Avanzo et al., 2004). Wal-Mart started imposing deadlines on suppliers to begin including RFID tags on shipments in 2003 (Coronado et al., 2004). Suppliers are able to manage product recalls and the return of faulty and defective materials by using RFID through its Electronic Security Marker (ESM) (Sabbaghi et al., 2008). RFID is an emerging technology that is being adopted by Indian retailers (Chandan et al., 2009). As the most recent type of artificial security tags that can be easily linked with existing chains, RFID tags play a key role. Due to the uniqueness and authenticity of the tags, RFID aids the organisation in preventing item duplication. Additionally, it can lessen the likelihood of fraud brought on by entry manipulation and customer-to-supplier authorization. Secure RFID tags and smart cards require specialised cryptography implementations due to cost and implementation issues.

Electronic Data Interchange (EDI)

The term "Electronic Data Interchange" (EDI) refers to the computer-to-computer exchange of business documents and/or information in a standard, structured, machine-retrievable data format (a computer can process the information without human assistance) between trading partners. It is most often used to refer to the use of EDI communication standards like EDIFACT and ANSI X.12. Within the supply chain network, it was used for paperless communication to share transactional data for order processing, inventory control, accounting, transportation, quick information access, improved invoicing, better customer service, increased productivity, improved tracing and expediting, cost efficiency, and competitive advantage. By employing technology to enable the real-time sharing of true demand and supply information, supply chain organisations can overcome the distortions and exaggerations in supply and demand information and counteract the Bullwhip effect.

Electronic commerce, or "e-Commerce"

Electronic commerce (e-commerce) refers to methods and instruments for conducting business without paper. Electronic data interchange (EDI), email, electronic file transfers, electronic publishing, image processing, electronic bulletin boards, shared databases, magnetic/optical data capture (such as bar coding), the Internet, and websites in the form of B2B (Business to Business) websites such as Covisint, B2C (Business to Customer) websites such as Amazon.com and Wal-Mart.com, C2B (Customer to Business) websites such as priceline.com, C2C (Customer to Customer) To organise its online marketing initiatives, Intel established the Internet Marketing and E-Commerce Group (IM&E) in 1995. In 2013, Filpkart received the single largest capital for an Indian e-commerce startup, valued at a net Rs. 1200 crores. As a result, it significantly contributes to integrated supply chain management (SCM) and the following changes in the nature of business:

E-commerce

With the trend towards computerised supply chain management, an e-procurement is anticipated to be incorporated into the larger purchase-to-pay (P2P) value chain. A software programme is used to conduct an electronic procurement, and it has features for managing suppliers and conducting intricate auctions with a value chain that includes contract management, vendor management, catalogue management, and e-tendering and e-auctioning. Web-based ERP (Enterprise Resource Planning) refers to the process of creating and approving purchase orders, placing purchase requisitions, and receiving goods and services using a software system based on Internet technology. E-MRO (Maintenance, Repair, and Overhaul) is similar to web-based ERP, with the exception that the goods and services ordered are MRO supplies that are not related to products. E-sourcing refers to the process of finding new suppliers for a particular category A record-breaking $1 billion in product orders were placed through Intel's global online ordering system in its first month of operation in 1998. Today, almost all of Intel's clients conduct business with the company online, accounting for approximately 85% of Intel's total revenue. Intel is actively pursuing paperless deployment, shipment notice, and purchase order processes.

e-Auctions

The electronic auction (e-Auction) is conducted in real time, with participants accessing an auction site via a browser at a predetermined time and placing bids on items like in regular auctions. The amount of fraud is decreased by this transparent process.

e-tailing

E-tailing refers to the practise of selling products online. The Amazon Company is well known for solely selling books online and for not even accepting phone orders.

Electronic Signature

In order to guarantee the security and authenticity of papers filed electronically, the Information Technology Act, 2000 allows for the use of digital signatures on those documents. This is the only legitimate and safe way to submit a document electronically.

Technology for Secure Electronic Transactions (SET)

It is a suggested industry standard for accepting credit cards online. A pair of digital keys—one public and one private—held by each party to a transaction forms the basis of the system. In reality, banks will hand both keys over to a client along with an electronic certificate of authenticity. Customers who want to make an online purchase must first present the public key to the retailer together with the certificate to validate its legitimacy. Similar to that, the merchant offers its own public key and certificates to demonstrate its legitimacy so that the transaction can go through. To verify that accounts and clients match, issues with key distribution and customer identification may occur.

WWW

The World Wide Web (WWW) is an Internet system for multimedia document hypertext linking that enables users to go between different Internet sites and browse the information they have access to without needing to learn complex commands and protocols. The number of supply chain management-related websites is expanding quickly. Recently, Metasys Inc. released Enterprise Transportation management via the Oracle Web Applications Server; this system disseminates a range of crucial data regarding transportation and distribution applications all throughout the supply chain.

Decision-Support System

Demand planning, logistics network design, sales and marketing region assignment, distribution resource planning, material requirements planning, inventory management, production scheduling, and workforce scheduling are just a few of the decisions that go into supply chain management. The decision support systems (DSS) are computerised tools that assist organisations in making complicated, irregular, and ad hoc decisions related to their supply chains. DSS support decision-makers in the planning and management of interconnected supply chains. These DSS will aid in the identification of opportunities for supply chain optimisation as well as the detection and prevention of fraudulent activity.

III. CONCLUSION

Globalisation has forced businesses to implement effective supply chain management due to outsourcing, customization, time to market, and pricing pressure. Organisations will discover that in order to survive, their traditional supply chain integration will need to be expanded outside of their borders in order to include all stakeholders. For such endeavours, the use of information technology tools is essential. In order to reduce e-risks and provide significant advantages to enterprises, this paper explores the role of IT as a supply chain management enabler. Technology always has two sides to it. Cybercrimes will rise as a result of bytes replacing bullets in a society that is becoming more and more reliant on technology. To keep ahead of cybercriminals and cyberterrorists, there will always be fresh and unanticipated problems, but we can only succeed via cooperation and partnership between the private sector and the public sector. No amount of regulation or technological advancement has ever been able to completely eradicate crime, as history attests. One of the major hazards for supply chain management has always been the security of physical and virtual systems, which is sabotage on computer systems and their access to data and databases by cybercriminals. Criminals may purposefully distort important facts or information in order to obtain illicit financial gain via supply chain networks. Information technology can be employed as a tool to combat bid rigging, phantom bids, nepotism, substitution, false counting, counterfeiting, and the creation of bogus accounting entities, such as a ghost employee, fictitious vendor, fraudulent customer or vendor payments, fictitious hours, etc. The IT technology alignments in SCM, namely. To reduce e-risks and improve performance, deploy electronic record management (Bar Code, RFID, EDI), ERP system (SAP, Oracle, PeopleSoft), Microsoft package, Data Warehouse, software agents, decision support systems, web services, e-commerce, electronic supply chains, etc.

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ISSN
2581-9429
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