

Research Papers



Supply chain traceability: Moving supply chain towards 21st century

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Abstract

Information technology plays crucial role in the firm of success. According to recent research of supply chain , many supply chain member believe to improve information sharing is vital for firm of success (Trainor 2011). This suggests that information enables relational exchange between supply chain partner to increase in both intensity and effectiveness. Further sharing of information can support firm to achieve more benefits from cross-functional and cross-organizational partnering. One study suggests (Jones 2002) that information technology investment reached up to the 40% of total expenditure of organization expenditure. In the era of globalization, every organization wants to capture new avenues for their business by expanding an organization globally, information technology has become supportive tool to achieve such objectives.Main purpose of this study to analyze impact of traceability impact on supply chain performance.

Key words: Information technology, EDI, RFID, supply chain performance.

Introduction:

Information technology has divided into two major parts one is internal and other is external. Internal logistic information system (LIT) practices utilized within firm like, data base and applications, which produce support for financial, supply chain operation. There is need to improved internal information exchange by implementation of database or more advanced software like enterprise resource planning (ERP) (Li 2009).

Organization need to improve internal information exchange to react ever changing market place and increasing competition via more fast response to the market and product changes with improvement of information exchange. Thus internal LIT convey fast information, which gives support for managerial application to provide greater managerial control on organization as a system.(See 2007)(Lai 2006).

External logistics information technology which facilitates communication and information exchange between supply chain partners, which make possible to obtain information from customer to facilitate desired change in product or services.

The success of supply chain can be counted on the basis of four important parameters like minimum cost, maximum quality, speed and flexibility or adoptiveness and to achieve this integration between supply chain members should equally respond changing business scenario by quickly accepting new communication technology. The big firm like Wal-Mart, IBM, and Motorola put extra pressure on supplier to adopt new technologies.(Heaver 2005) (Hoek 2008)(Kearney 2000). In general IT produces following advantages.

- IT developments help to increase awareness of customer.
- 2. Efficient computerization helps to reduce cost of moving goods through EDI, tracking systems etc.
- 3. Speedily analysis.
 - Lower operating cost.
 - Improved reaction time
 - Give better picture of market and customer.

Fig 1: IT benefits

The review is divided into three parts; first part

represents Electronic data interchange, use of EDI, security risk in EDI and types of trading arrangements, implementation, and barriers for implementation. The second part consists of impact of auto ID, benefits, challenges in front of Auto ID and difference between RFID and Auto ID. The third part consist of Web based technologies and use of internet, intranet and extranet to integrate customer in logistic system to improve overall performance of logistical supply chain management.

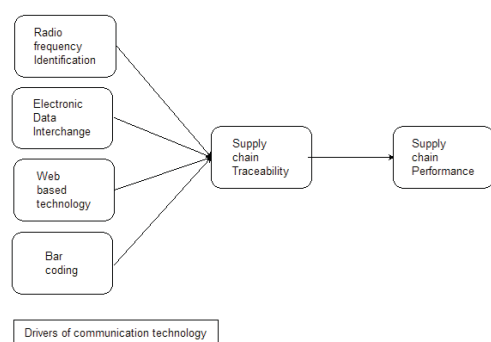
From above discussion it can be concluded that EDI, RFID, bar-coding, Web sources are the integral part of communication technology it is represented by diagram as below.

Fig: 2 conceptual model of impact of communication technologies on supply chain performance

2. OBJECTIVES OF REVIEW OF LITERATURE.

1. The suppliers are integral part of supply chain. Effectiveness and efficiency of whole supply chain depends on supplier performance. Some big firms creating extra pressure on supplier to adopt communication technology. It is important to find out the impact of forceful adoption on supplier performance.

2. Evaluate current business practices to identify the best RFID opportunities, and identifying where enhanced information and visibility from RFID would provide faster rate on investment, cost deployment, and saving time.



To examine current process to determine whether improve or hurt current operation. It is also interesting to find out that implementation of technology in to supply chain gives lesser pain and confusion to manufacturer and retailer?

4. To determine risks and its impact on firm performance involved in the early adoption.

5. To investigate potential benefits of impact of electronic data interchange (EDI) on improving relationships, resolving conflict and co-operations among supply chain partners.

6. Integration of customer always beneficial for a firm to understand market fluctuation. The internet is acting as connective tool for same. To asses impact of Internet technology on supply chain performance

2.1 Electronic Data Interchange:

For over two decades, electronic data

interchange (EDI) has been one of the primary enabling technologies for conducting business-to-business (B2B) transactions. EDI-based transactions enabled more than \$2 trillion of trade among various firms in 2001, with as many as 55% of all North American large and mid-size companies reporting the use of an EDI network. While the economics associated with EDI has long been a concern for many companies, the arrival of the Internet has made the technology feasible even for small firms. International Data Corporation (IDC) estimated the total value of EDI—traditional and Internet—grew from \$10.99 trillion in 2003 to \$ 20.68 trillion in 2010, with 45.9% of EDI commerce revenue attributable to Internet EDI (IDC, 2010). Far from becoming a legacy technology, EDI continues to be a preferred platform for sharing business documents in many supply chain-based transactions (Closs & Xu 2000).

To understand the impact of EDI we have divided it into four general categories: (i) external factors, (ii) internal factors, (iii) firm operations, (iv) anticipated benefits,

Firstly external factors characterize the environment in which an organization competes. These are such as industry pressure, industry structure and concentration, environmental uncertainty, and other competitive market influences can impact a firm's EDI adoption decisions. EDI may be the only way to provide the customer with the service it demands in order to retain or increase that share of the business. Widespread industry use of EDI, in the automotive, retailing, grocery, and health care industries, can also create a climate where use of EDI makes competitive in the industry (Forslund 2007) (Keebler 2009). Secondly internal factors impact on the adoption decision; related to how the managerial, technological, and organizational resources possessed by the firm influence the readiness for adoption. It include technical compatibility, availability of technical and professional staff, managerial competencies, and size of the organization, financial support, proactiveness, and organizational readiness for EDI adoption. The absence of these factors can also constitute barriers to adoption (Garstone 2001) (Jackson 2003) (Banerjee 2006) (Brah 2006).

Firms operations refer to the plant or production facility level. EDI adoption at the plant level is the appropriate unit of analysis for study, not the enterprise level. Some of the relevant factors in EDI adoption include just-in-time (JIT) practices, product customization, product variety, and business process improvement (Langhem 2001). These drivers are plant specific because they impact the degree of variability and uncertainty experienced in managing production processes to meet forecasted customer demand. In particular, JIT practices advocate the use of EDI as a vehicle for supply chain collaboration and the sharing of linked planning information including forecasts, production schedules, inventory levels, and

scheduled/in-transit deliveries to stabilize the production environment. The role of EDI in enabling JIT is more than just a means of improving operational efficiency by squeezing time and waste out of manufacturing operations. EDI can also be a basis for information sharing through collaborative forecasting to help combat the bullwhip effect, thus leading to stabilization of manufacturing schedules. (Ngai 2004)(Sanchez 2003)(Walton 2000).

The fourth category, anticipated benefits, is an important motivator for EDI adoption. Many of the anticipated benefits attributed to EDI are derived from information-processing theory and/or transaction-cost economics (TCE). Information-processing theory suggests that reducing information uncertainty and time delays in EDI-based business transactions will reduce costly buffers in the form of higher inventory levels and longer delivery lead times while improving resource utilization. A TCE perspective suggests that EDI facilitates closer coordination between suppliers and customers and leads to reduced transaction costs for both parties. TCE also shows how business processes can be streamlined through the automation of information exchange. Process improvement can lead to lower costs, improved order accuracy, shorter lead times, and enhanced responsiveness for both supply chain partners.

2.2 Moving towards RFID via Bar-coding:

The globalization and digitization of supply chains have triggered innovative applications of connective technologies to improve the efficiency in product and service deliveries, and to provide deeper market and consumer intelligence for future development. The specific connective technology widely applied for supply chain management is tagging. When integrated with databases, software for pattern matching, wireless protocols, global positioning system (GPS), or other location identification technologies, tagging provides a way to quickly make connections between objects and events in time and space (Palsson 2004)(Lin 2010)(Ngai 2004). Tagging technology is important in today's economy, enabling exact tracking and matching of products or assets. The use of labels to describe or identify an object using tagging technology connects the digital and physical worlds. As such, it is the ultimate broker across media, tasks, locations, accounts, etc., even across a crowded room (Wyld 2006)(See 2007)(Smith 2009).

The ancestor of (and the most popular) tagging technology is the Universal Product Code (UPC) or bar code. Bar coding is still widely adopted in part and product tracking in a supply chain. Owing to its effectiveness and lower cost, bar coding will continue to be adopted by manufacturing and service enterprises. However, intelligent bar coding has emerged in the form of RFID, which is increasingly applied for supply chain management (Sari 2009) (Sletteameas 2009).

A fully RFID-enabled supply chain is yet to be realized. Tag costs are still high; readers cannot always read all the cases on a pallet; one frequency and one tag design does not fit all; standards are in a state of flux; end users lack real RFID knowledge; and radio interference can upset the best-laid plans (Trappey 2004). As early adopters of RFID technology have to go through many steps like evaluation of current system, deliberate and well-planned project.

There is no doubt that RFID and other connective technologies present massive potential for creating competitive advantages. To realize maximum return on investment, business needs to leverage their information architecture strategically. (Hellostorm 2009)(Chao 2011) Issues like cost of technology, implementation cost always point of concern for the management, more focus is required to analyze return on capital employed.

A fundamental issue with RFID technology is that the read range and high-frequency (13-56 MHz) applications are hindered by the limited maximum read distance, at best a couple of feet, which is not suited to tracking applications in distribution centers and warehouses. However, ultra-high-frequency (UHF) RFID applications have read ranges of up to 3 to 4 m, and results from the latest field trials and pilots with UHF are demonstrating performance well suited to applications in the supply chain (Hingly 2007) (Kauremma 2009) (Kim 2011).

It is clear that RFID is here to stay, and enterprises can achieve significant business value by embracing it. Because of the high cost of investing in RFID, each enterprise needs to evaluate its own business processes to determine where, and if, RFID without making any confusion. Then it can be applied to improve operational and process efficiencies to positively affect the bottom line. If that evaluation suggests that the technology can benefit the business, the next step is to develop a roadmap for RFID implementation (Lee 2011)(Chow 2007). For suppliers that need to meet customer-mandated deadlines given by main manufacturing organization's to match this speed, it is important for the supplier to adopt and implement of communication tool like RFID in his organization.

2.3 Web (Internet) based technologies:

Logistics just might turn out to be the crucial element that separates the successful Internet retailer from all the others. Companies today need to move beyond plan, source, make, and move to take a holistic view of the supply chain if they want to score a market hit, or indeed to survive (Sameer 2003)(Spier 2009). The key to supply chain excellence will be the ability to extend the business into customers and trading partners. That's why this technology attracting maximum focuses now days. The impact that IT has on managing the integration of the supply chain community is profound. However, it has to be realized that integrating systems is more than just linking computers. Integrating systems is integrating business processes, data, and then systems (Alshawi 2001).

Companies will have to work harder than ever at constructing and managing the complex supply chains that will take shape during the twenty-first century. Supply chains will become more complex as people sell through more diverse channels like the Internet or in other parts of the globe (Dowine 2010). The extended enterprises operating these supply chains will face the enormous challenge of

Sr. no	Improved communication benefits in supply chain	Researcher name
1	Improved relationship with vendor.	Sari 2009, Qu 2011, Ding 2011,
2	Improved relationship with supplier.	White 2008, Gimenez 2006,
3	Integration of data base.	Ngai 2008, Li 2008, Chieh 2009,
4	Co-ordination with supplier.	Sameer kumar 2006,
5	Help to track shipment.	Jayaramman 2008, Voronneau 2009, Bazaras 2010
6	Decrease inventory cost	Johanson 2009,
7	Paper Reduction.	Hasan 2011, Closs 2000,
8	Employee reduction.	Larson 2007, Kent 2006
9	Increased efficiency of staff.	Kim 2011, Festo 2010,
10	Lowered cost of general management.	Li 2009, Byrd 2009, Angeles 2000,
11	Expand customer base.	Zhang 2005, Lai 2006, kauremma 2009, Kearney 2004,
12	Gain competitive advantage.	Lin 2011, Forslund 2007, Cho 2008
13	Increase market share.	Ngai 2008, Fleisher 2008, Alshawi 2001

co-coordinating many activities simultaneously. Although that task appears daunting, leading companies today have shown that it can be done if they mind the details.

Many challenges exist in setting up an Internet which is also known as e-marketplace. Primary among these are identifying the tools necessary to use the market, providing a secure environment, pricing, payment, and fulfillment. (Jayaraman 2008).

For an orderly marketplace, Internet protocols must be selected. Security and privacy must be adequate to ensure confidential transactions. Authentication and authorization of users from many organizations must be possible. Private communication must be assured. The cost of the technology to access and engage in the market must not be prohibitive. (Chow 2007)

3. Improved communication benefits in supply chain:

4. Research Methodology:

The aim of this study is to analyze impact of traceability impact on supply chain performance. To accomplish the study aims, this research is based on the examination of various journals, all of which are directly related to Information Technology and its application. As we believe that journals are the

recourses that are most commonly used to acquire information and release new findings, conference papers, Master Theses, doctoral dissertations, text books, news reports, and unpublished working papers are excluded. Due to the youth and diversity of this area of research, journals, and thus a literature search was conducted using the following electronic databases.

- ABI/INFORM.
- Academic Search Premier.
- Emerald Fulltext.
- Science Direct.
- IEEE/IEE Electronics Library.

Every article that was retrieved through the search process was carefully reviewed before making a decision regarding its inclusion in the survey. WE classified each article using a single category for each diversity characteristic.

5. Research Gap:

1. Cost of new technology is seemed to be high at entry level, and become less in latter phase. RFID technology is not exception to this (Bazaras 2010) (Ding 2011) (Lee 2011). Big organization has strong financial support to overcome this issue. Few studies have focused same issue. More detailed focus is required to find out is cost factor biggest hurdle for adoption of new technology.

2. Supplier is important element of supply chain. Though main manufacturing unit is ready to accept new communication technology, it is important to focus supplier compatibility to accept new technology.

3. Implementing new technologies resulted in deployment of operations. This will result in decrease labor cost. As successful implementation could possible with co-ordination and communication. Few studies have done on this line (Fabbe-coster 2009) (Fleisher 2008). A study should require carrying out employee response in implementation of new technology.

4. Adopting and implementation of communication technologies involved greater risk, problems, uncertainty's Indian organization are moving towards accepting new technologies for supply chain. It is required more focus on security issue to prepare for future problem.

5. Many studies (Sum 2001) (Li 2010) has reported importance of external factors (legal, political, economical, social, Infrastructure.) in adoption and integration of technology. As intensity of this factor changes from country to country. It is important to carry out a study focusing on this in Indian context.

6. Conclusion:

This review focuses on impact of communication technologies on supply chain performance. The competition of an organization has extended up to communication technologies. This integration result in better supply chain performance by providing information in real time for decision making. The organization like Wal-mart, IBM using this as

competitive tool to remain top in the market.

In spite of some advantages this communication technology carries some serious issues like supplier infrastructure, security issues, early adoption difficulties and investment. If an organization focus on this issue will result in smoother and faster implementation of communication technology.

From above discussion it can be concluded that to achieve collaborative information it is required to redefine business information exchange process. This can be only possible with integration of supplier and customer. This could be result in competitive advantage.

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