

Information Technology for Supply Chain Management: Literature Review



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ABSTRACT

The technological growth of internet services and devices has enabled users easier access to online information. IT (Information Technology) is a necessity for all industries. Without IT, effective SCM (supply chain management) is unachievable. Thus, the development and adoption of IT has become a common phenomenon in SCM. The objective of the article is to list the impacts of IT on SCM by reviewing existing literatures. This article is a literature review. This review uncovers a better understanding of IT adoption and their role on SCM.

Key words : Information technology, Supply chain management, Impact.

1. INTRODUCTION

The role of technology on Supply-chain (SC) is important to a successful framework for the delivery of goods and services to customers and consumers. Many industries recognised that IT (information technology) has the potential to increase profitability and consumer satisfaction and to gain competitive advantage. Given the new forms of services and the need for information development and consumer value, IT has become a major source of competitive advantage. IT can certainly influence how the industry models its business.

2. IMPACTS OF INFORMATION TECHNOLOGY

The adoption of IT helps Small Medium Enterprises (SMEs) to enhance their competitiveness and business performance in the global market. Customer satisfaction, saving time and costs are invariably the main factors for IT adoption. The promotion of the development of IT in the form of ERP systems enhances operational excellence of SMEs by reducing costs, better utilisation of resources and improving business performance [1]. IT helps companies perform better in operational performance especially in customer responsiveness and cost efficiency [2].

The reduction of overall cost in SC operation process is main factor of IT usage. Reduction of transaction costs is one of the main impetus for IT implementation allowing companies maximise inventory efficiency and effectively manage the entire SC. enhanced IT system is more sustainable, with better coordination and reduction of transaction costs. Adopt IT in SCM minimises lead-time, reduce inventories, eliminates the bullwhip effect and increases the effectiveness of transportation channels.

The basis of the SC is that IT plays an important role to enhance customer service. The study found that the effect of using high quality IT services enables faster response and communication interface, self-service capabilities, solves practical problems, online sales and quicker new product development. Customer service are impaired if retailers do not manage their resources well, which negatively affects customer satisfaction and ultimately the economic success of the retailer.

Transaction costs consist of costs relating to market exchanges, which include search costs, negotiating contracts and executing agreements. Data pertaining to goods and services available on the market is also a middle-level product that can lower transaction costs of these goods. IT also play a role in reducing transaction costs associated with the provision of public products and reallocating transfer payments. The implementation of IT brings possibilities for opportunistic behaviour. The transaction cost can be lowered by the reduction of transaction risks.

It is affirmed that the inability to communicate information effectively with external customers and internal suppliers could escalate transaction costs [3]. The contribution of IT in SCM is that it increases the performance in transactions within SC members through effective information flow. This can be done through the use of IT devised to administrate multiple information flows among companies [4]. The deployment of IT to share data between buyers and suppliers has led to evolution of virtual SCs.

So far, SCM has paid inadequate attention to reduce the uncertainty of behaviour, thus the implementation of IT cannot ensure successful reduction of transaction cost. This lead to the recognition of specific situation under which IT-based transaction costs are decreased. The benefit of this coordinated form depends on the relevance of factors to the transaction costs. On the other hand, the market can be used for almost all transaction when generating highly variable transaction costs. Relatively speaking, due to long-term contracts, grades result in low variable transaction costs.

Real time information is the information that is delivered immediately after collection. Timely and correct information is important to the design and operation of a logistics system. The customer perceives the real-time information obtain of order, inventory handle, parcel tracking, and receipt as the compulsory dimensions of the customer's settlement. The IT on real time information sometimes will cause the error and the negative effects resulting from inaccuracies with the real-time data.

Retailers will invest in technologies such as electronic data interchange continuously to promote addition reductions in SC inventory levels and promote powerful SC links between their users and the SC suppliers. Previous studies investigating implement of IT had showed decrease stock levels up to 50% [5]. The forecast is that the number of warehouse floors will decrease, resulting in a reduction in the number of warehouses. The results of the study illustrate the benefits of IT implementation in decrease stock level due to the 66% average reduction in the retailer's inventory. With IT, it can be affirmed that technology a good variable for inventory reduction.

Express delivery costs have been gradually reduced. Despite increased competition, IT productivity growth allows workers to reduce rates while remaining and improving service performance. IT provides better services by increasing delivery efficiency, providing speedier value-added services that meet the requirement of each customers. With instant availability, online and updated information, transporters can provide well-functioning services that meet the growing demands of their buyers.

IT is proven to be significant in increase transport performance. Communication technologies such as bar code scanning and RFID provide organisations the opportunity to track their goods, thus improving recording processes. This is an important matter which assist logistics service providers plan assets.

The transport management application is a tool that allows planning, optimisation and execution of transportation activities. They usually include goods quotations, processes,

dispatch, tracking, freight payment and auditing systems. The intelligent transportation system and its interaction with the traffic management system, through the proper exchange of information between the vehicle management system and the cargo management system, the internal freight flow in the city can be optimised. This can merge the two sources of information to develop a distribution plan that optimises the number of trips and the number of shipments for each trip, resulting in the lowest total cost of the distribution system [6].

IT significantly enhance communication within the organization play an important role in all organizations. On the other hand, employees prefer to communicate via email as an effective way to share information. Research findings on the level of communication satisfaction of employees working in virtual operating environments and traditional workplaces. The advantages of IT efficiency are not limited to the communication activities. IT can leads to detect and analyse communications properly, or to keep and retrieve information.

Reduce labour costs is also a significant impact for companies. Manually operating activities can lead to mistake leading to scrap costs. IT reduces labour usage while improving performance and reducing mistakes and raise productivity. IT provides facilities for the company to maximise their labour skills, produce standard materials, increase sales and ultimately reduce production costs and labour cost [7]. For example, fewer workers are required to provide information to customers or other prospects because most of the information is accessible via the Internet.

IT in large company is mainly use for increase productivity [8]. Using these advanced levels of computerised (s) inventory management systems for large industries with high raw material and finished products has become a major and important part of the company's strategy to increase productivity and remain competitive. IT had the potential for productivity growth but they require changes in business practices. Researchers argued that investments in IT had little to no effect on productivity [9, 10].

Improvement of information quality can be attained through IT adoption. The major drivers of IT used in relation to information standard in information systems enhances high quality information transfer, development of close links and connectivity, elimination of errors in data processes, increased transparency, knowledge transmission and skill availability. Most of researchers and empirical studies concluded that fast, high-standard information sharing among SC members is a necessary requirement for excellent SC operations [11]. High-quality information transfer through IT capabilities [12]. It can reduce the inaccuracy of inventory records and improve inventory efficiency.

In addition, using IT in SCM allows companies to eliminate manual processing mistakes. IT maintains records of inventory, suppliers, and customers. Most large companies begin to use the automation technology in processing the data. However, this does not mean that there is no access to the manual inventory management system. Companies use the efficiency of IT as an opportunity for cost savings, reduced data entry errors, and improved customer service. Data entry errors are one of the biggest mistakes the company has made. With these information systems, organisations are able to remove the human factor, reducing errors, labour costs and long-term risks.

Without proper technology, information disclosure policies cannot be implemented effectively. IT strategies are the antecedent of any transparency strategy [13]. In this competitive technological environment, companies can use transparency plan by interpret information strategically. The transparency of a particular market based on the level to which the product or service is expressed in digital form. In addition, many companies do not have transparency or same strategies, such as information disclosure policies. In this information era, it is very important to develop a strategy that is transparent because it impacts the entire chain of a company's information framework including disclosure policy, especially through its online business.

IT has significant impact in eliminate product, pallet and truck counting and location error. The information about the condition of the shipment may be the value for the supplier sending the material, the producer who manufactures and delivers the final value-added product, the value of the various levels of the retailer and the final customer. In addition, due to the customers can access real-time information, this information can improve shipment traceability and higher service levels.

IT is an essential tool in the process of facilitate transfer of knowledge, but the existence of IT does not guarantee the creation of knowledge, knowledge distribution or knowledge use [14]. Knowledge presents a deeper level of understanding than is represented by information. Knowledge transfer is a practical issue of transferring knowledge from one organization to another, or transfer knowledge from one part of the organization to another (or all other) part of the organization [15]. Main target of knowledge transfer is organizing, creating, capturing or distributing knowledge and making it available to future users. For successful IT adoption, the supplier should be willing to transfer knowledge to the customer [16].

Researchers believe that information sharing and technology play an important role in enhance planning procedure. This sharing of information enables SC partners to

effectively plan, avoid safety inventories and avoid bottlenecks in all chain. The strategic planning process is one of the most important processes in any organization because they directly integrate or indirectly affect other processes, roles, and measurements. The results show that the SCM implemented in this forestry network has so far had only a small impact on the collaborative planning process [17].

Most of the companies use information systems to reach their objective. It places particular emphasis on the impact of information systems on enhance decision making. information system impacts the precision of decision making in companies. Business activities cannot be achieved if not using IT, and managers cannot make high quality decisions.

IT also contributes to accurate prediction. Electronic markets are generate according to the centralisation of such data in the SC. Previous information can make the firms accurately assist prediction of order quantities and batch sizes. The information can help suppliers and manufacturers create value, help in develop manufacture plans, and determine the number of retailers, the frequency and quantity of orders.

The sharing stock information is a major impact in the SC. The retailer's point-of-sale data and stock levels for each stock keeping unit are the significant types of information used to reduce the bullwhip effect [18]. The results show that this IT-supported strategy helps SC members solve the problem of uncertainty in the quantity of transportation.

IT in SC is consider as a strategy to reduce cycle and lead times. Issues related to long-term delivery time and order fulfilment cycle time can seriously affect SC operations. As the delivery cycle time increases, the uncertainty of customer orders increases. This produces manufacture planning and control issues that companies must solve with IT [19]. IT can reduce delivery cycle time in SCs and improves operational capabilities. Chain partners need information to deliver to customers on time [20].

The IT in SC can help to improve stock management. Systems such as bar code scanning and RFID make warehouse workers to increase response time by providing real-time stock control and reducing labour costs for preparation and processing. Warehouse operations contain processes that direct physical activity, including product receipts, material movement and keeping, and order chosen. Warehouse management uses a combination of batch and real-time allocation to guide all material handling activities.

An efficiency improvement in SCM can be achieved by advanced just in time. Just in time (JIT) is a streamlining processes that companies can increase their return on

investment by reduce waste and improve productivity. With a flexible manufacturing system, production equipment can be used instead. With a wide range of products and short installation time, it can quickly respond to changing needs. Even successful companies that shorten delivery time through JIT practices can benefit from the IT integration practices embodied in the enterprise resource planning system [21]. The success of the JIT method due to the continuous transfer of communication and information within the organisation.

IT enhances knowledge sharing and accelerates the flow of information and communications. Advances in IT provide an efficient platform for the rapid delivery of this information. The supplier can shorten the response time with the customer. When the order is received, the supplier can immediately know the information and promptly respond to customer. Boost the response time of information result and information exchange can enable IT guarantee the accessibility and timeliness of significant information relating to the relevant parties.

Solving practical problems in the IT industry is a constant problem faced by many IT companies. As technology changes rapidly, IT industry demand is changing at unprecedented rate. In order to gain and maintain a competitive advantage in the IT market, problem-solving strategy that addresses market evolution issues and provides a framework to quickly find the root cause of the problem before time and resources are exhausted. IT is an integral part of modern companies and can help companies solve several key issues [22].

Past research has pointed out that one of the major challenges facing the knowledge management process is helping employees share what they know within the organisation. The challenge here is to use IT tools for sharing professional understanding, so it is important to understand the attitude and behaviour of users when using IT for knowledge sharing [23]. In collaborative SCs, all related the future predicting decisions should not be only decide by personal companies.

The online sales management is heavily reliant on IT. E-commerce has brought more activities to logistics service providers. In many cases, the product is distributed directly to the buyer instead of being delivered from the store. The widespread use of the Internet and related technologies will greatly reduce transaction costs, resulting in the growth of e-commerce and productivity.

The efficiency gains of IT can be achieved through the new products advancement which is important to reduce costs and increase market size. Organisation must uses appropriate IT to shorten development time and quickly distribute products to international markets [24].

The information accessibility in the SC is based on the level of effectively the system is connect to enable information storage and retrieve from anywhere in the chain. The companies use IT to produce information accessibility for all SC participants [25]. Support systems and technologies are needed in order to produce knowledge keeping and transmission capabilities [26]. This motivation to use IT for accessing information readily is often due to the requirement to provide entry to orders.

Operational capability is one of the impact of IT in SCM [27]. The use of IT in the SC is subject to total time and cost reduction, tracking product capabilities, increasing security and reducing loss and damage, increase inventory transparency and eliminate time and distance. Although many researches had showed that IT can be effectively increase operational capabilities [28]. IT is a key source of competitiveness for many companies.

IT can strengthen security and reducing damage of information. IT allows a company to securely store company documents and sensitive customer or patient information. Information security is one of fast-growing issues in the world. Since many cloud-based services are still in their early stages, it is prudent to keep the most confidential data on your own network [30].

IT can reduces the possibilities of out of stock. Vendors (retailers or distributors) regularly obtain buyer inventory levels and sales data information through the Internet or EDI [31]. When stock falls under a certain level, the order is automatically generated on behalf of the buyer. In this case, the supplier will in charge of manages the inventory procedure. IT alerts the person in charge about the less of inventory in warehouse. This will enable the organisation minimize out of stock.

In strategic partnership, the company has established an inter-organizational network increased the risk of lack of control over participating companies. Outsourcing is one of the partnership, companies adopt IT to form powerful outsourcing networks or logistics alliances through agreement hence partners can share corporate risks [32]. If a company can use IT and its members jointly establish a powerful network and minimise the risk of SC activities, this risk-sharing strategy can be very helpful and effective to the organization. Sharing risk with partner would be a fair driver of IT use in the SC.

The global market can be expanded by the organization using IT. This information allows customers to select between various products and retailers. This information also enable seller to spread their products to the global market. Organisations can use IT to share markets to enable them to spread into new markets [33].

Using IT systems to analyse information can have can lead to better SC performance. Successfully implementation of IT related software in SC can positively the firm. A better SC should enable the product export to market faster and reduce the cost of transferring goods from original sources to customers.

Another impact of IT is sharing capital. This is to increase the accessibility of products on the shelf. Other important concept implemented by this information is the sharing of inventory between each retailers for the same product. This can increase product availability to customers and reduce order costs when each retailers obtain real-time information about inventory levels at other locations [18]. In this situation, it creates value for all retailers sharing inventory. IT can used in the share of the resource from the other companies. When the inventory is not enough, the company can share capital with other companies.

IT enables the collaboration of different functional units in the new product development process. In order to share information between suppliers and buyers, a partnership can be established so that suppliers can take responsibility for orders and replenishment [35]. Besides, the advanced SC can also enhance the integration of firms between the joint venture partners.

3. CONCLUSION

This literature review projects that IT was considered to play an important role in operate SC, from now even until the future. From the historical data, it seems major usage of IT in SC, specifically in fast growing industries, and particularly for operate supply network. In table 1, impacts of IT on SCM had been listed down according to the previous researches. This study achieves the objectives of identifying the impacts of information technology implementation in supply chain management. From the result, supply-chains can better understand of IT adaption according to the organisation needs.

Table 1: Impacts of IT on SC

Impacts	Source
Enhance customer service	[40], [27], [37]
Lower transaction costs	[37], [38], [22]
Real time information obtain	[39], [22]
Decrease stock level	[39]
Cut down transportation cost	[40], [22]
Increase transport performance	[40]
Enhance communication	[39], [40]
Reduce labour cost	[39], [22]
Increase productivity	[9], [27]
Facilitate high quality information deliver	[37], [22], [27]

Elimination of manual processing mistake	[39]
Improve product information transparency	[39], [13]
Eliminate product, pallet and truck counting and location error	[22]
Facilitate transfer of knowledge	[16]
Enhance planning procedure	[41], [27]
Enhance decision making	[41], [22]
Assist prediction	[41], [39]
Sharing stock information	[29]
Reduce delivery cycle time	[40], [27]
Improve stock management	[42], [27]
Advanced just in time	[22]
Speeding response	[39]
Solving practical problem	[22]
Sharing professional understanding	[26]
Online sales management	[22]
New product advancement	[40]
Accessing information readily	[22]
Increase operational capability	[41], [22], [37], [27]
Improve SC visibility	[29], [25]
Strengthen security and reducing damage	[22]
Minimise out of stock	[22]
Sharing risk with partner	[22]
Broaden market	[40], [22]
Sharing capital	[22]
Enhance collaboration with partner	[39], [22], [27]

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