

Evaluating the growing importance of IT in the management of logistics and supply chain

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Abstract

The term logistics originates from the Greek word "logistike" that means the practice of measurement. Nonetheless, the modern interpretation of the word logistics has its roots in the military, where it was used to define activities related to weapons production, and essential supplies for front-looking troops. Logistics not only includes activities related to the physical movement of the products but also maintains interactions with vendors and consumers. Nevertheless, logistic management is a process by which consumers' needs are met by supply chain alignment and planning. The paper's main objective is to describe the different technology used in logistics and supply chain management including information technology, communications technology and automated recognition technology. The analyst focuses primarily on secondary data for data collection relevant to the different technologies used in logistics and supply chain management. It can be concluded that Technology is a vehicle for increasing the competitiveness and performance of the supply chain by increasing the overall efficiency and effectiveness of the logistics system. In addition, the task has been made easier and faster by various technological innovations besides being less laborious.

Keywords: Supply Chain Management; Logistics; Information Technology;

Introduction

Every organization struggles to survive at the today's competitive marketplace. The information flow in supply chain networks in the era of paper-based trade and correspondence was time consuming and prone to error. Because of globalization, organizations have begun to change the way they communicate, implement technology, increase the diversity of business transactions and

improve processes to improve business performance through IT applications in their supply chain networks. Traditional supply chain work won't help an organization cope with market demands and clients. IT technology changed the face of the supply chain that used to be only a few years ago. IT offers a clever and reliable supply chain for an organization. The challenge lies in creating economic benefit by dynamic strategic technology organizations, technologies, and software. Indian supply chain business is still under growth and has recognized the role of IT in the supply chain.

Supply chain management (SCM) is an interconnected and complex network term which refers to the amount of all processes starting from the manufacturer / manufacturer's procurement of the raw material and ending with the end-product delivery to the customer (Silver et al., 1998) as far back as the 1950s.



Fig. 1 Supply Chain Management Phases

Due to increased data complexity, the risk of uncertainty in supply chains is increasing (Christopher & Peck, 2007; Hillman & Keltz, 2007), which is also leading to increased vulnerability of electronic risks (e-risks). The upstream and downstream alignment of the supply chain network is therefore the basic requirement for achieving the Supply Chain Management objectives.

Information technology plays a vital role in improving the performance of supply chain drivers. Information Technology is the use of inter-organizational technologies used for information sharing and/or retrieval across organizational borders. The IT-enabled SCM can easily manage

information flow for key business systems, resources, capital inside and outside the networks and add to firm income by improving quality and reducing costs of communication and transaction threats (Stroeken, 2000; Mabert et al., 2001; Sanders & Premus, 2002). IT in SCM offers a decrease of cycle time, a decline in inventories, a minimization of the Bullwhip effect and an increase in distribution channel performance, Radio Frequency Identification (RFID) systems in the supply chain, innovative software and production technology to better manage their supply chains. The purpose of this paper is to identify the numerous IT tools used in supply chain management and logistics and how can they improve and streamline and connect the whole process.

Impact of IT in an Organization

Knowledge influences all parts of the supply chain. Knowledge acts as the relations between different stages of the supply chain, helping them to collaborate, optimize productivity in the supply chain. Especially essential to the day-to-day activity of every point in the supply chain is knowledge. Companies need to view information as an essential catalyst to become more sensitive and effective, and information plays a vital role in competitive strategy. Timely and accurate details is now more important than at any time.

The shift in the value of knowledge was greatly influenced by three factors.

- The consumer needs must be fulfilled.
- Reducing the pressures on human resources and supplies to a competitive level.
- Information is important for the strategic planning and resource deployment.

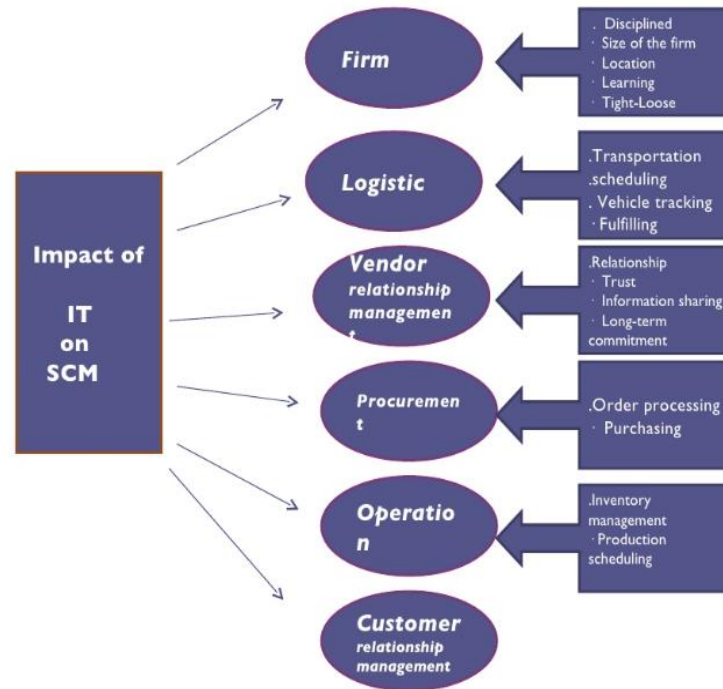


Fig 2. Impact of IT on SCM

Theoretical Review

Information Technology in Supply Chain and its impact

Automatic Identification Technology

Automatic Identification (Auto ID) is the term used to describe direct data or knowledge entry into the computer system, programmable logic controllers or any device operated by microprocessors without the use of a keyboard. These include Bar marking, Radio Frequency Identification (RFID) and Voice Recognition technologies. Auto ID can be used to monitor the customers' bins, parcels, cartons or a truck carrying the products on time-bound dispatch. Auto ID's advantages include precision, cost savings, speed and ease of data storage, and information processing.

The relevant Automatic Identification systems in use are—

Bar coding and Scanners

Bar coding is a series of various thickness parallel lines with gaps between them. Such bars are nothing but the details objects in the codified type, which can be interpreted using a scanner. The information written in bar code contains country code, name of the supplier, product details, date of production, item quality etc. Those data are needed for inventory management at the end of the customer. The bar codes are used in various industries, including pharmacy, healthcare, consumer goods, telecommunications, cars, and so on.

Advantages-

- Ease of recognition during transport, retrieving, pick-up, examination and dispatch of product items.
- Reduce paperwork and processing time to reduce human error
- Improves the productivity of the logistics system through speed, accuracy and reliability

Using Bar Code can help in various Supply Chain and logistics process like procurement, processing, production and distribution operations. In Procurement process, Bar codes are allocated to the parts and components delivered from manufacturers, and contain information regarding item name, batch no, date of production, order no, serial no etc. The Barcode information helps to identify and monitor the item. When the goods enter the warehouse via a conveyor, the hand held scanner or scanner attached alongside the conveyor scans them further. In the central computer, the details decoded by the scanner is automatically registered to further maintain product data throughout real time. In Processing, the bar code will help in keeping items identified based on their date of entry into the warehouse or store during order processing. This will promote stockpiling, retrieving and delivery of products in the inventory management framework of FIFO (First in First out). In Production procedure, the detection of in-process and completed products is simpler thanks to bar coding during the manufacturing process. You can easily track the various baths at different stages of production. In Distribution operation, Barcode helps identify and track the transit of finished goods to the customers during distribution.

Radio Frequency Identification (RFID)

RFID is an Automatic Identification and Data Capture (AIDC) system. RFID first emerged in monitoring and control applications during 1980. RFID-based systems allow non-contact reading, and are useful in manufacturing and other hostile environments where bar codes cannot survive.

These are used to communicate the inventory data to the reader via radio waves as an alternative to Barcodes. RFID exchanges information wirelessly between an object tagged, and a reader.

An RFID system is compromised by the following elements.

- One or more Radio Frequency Tags (RFTs) tags including a semiconductor chip and antenna.
- One or more read / write tools often referred to as writers.
- Two antennas or so, one on the cover and one on the page.
- Computer framework and host computer system.

Advantages-

- RFID lets Indian exporters get stronger and more visibility by getting their products within the supply chain to multinational retailers such as WAL-MART and thus become more profitable.
- Boost producers ' capacity to better manage stock levels.
- Improve the complex system of defense distribution.
- Boost Indian Postal services ' diverse monitoring and delivery activities.
- Boost Indian Railways ' mapping, logistics and preparing activities, State public transport authorities / Allow automated fare collection on a large network of roads.

Communication Technology

Communication, whether oral or recorded, has a very important role to play in business success. The following are the few evolving communications technologies that allow superior customer service through speed and accuracy in communication contributing to competitiveness.

The relevant Communication Technology systems in use are–

Electronic Data Interchange (EDI)

EDI technology is used to move business documents from one device to another. Business records such as invoices, cheques, and challans are sent from one company to another online through EDI. EDI is in reality a move toward paperless movement of records or transactions. The distinction between the email message and the EDI message is that, although Email is written and interpreted

manually, EDI message is composed using one program and interpreted by another machine. Although EDI data or correspondence is organized, e-mail data is not standardized. EDI communication requires legal status in the trial.

Advantages-

- Faster transactions-the movement of records in the supply chain in real time.
- It is essential to follow just-in-time production methodology.
- Reduction in transaction costs due to paperless operations / Reduction in cycle time and inventory order which will help to improve customer competitiveness.
- Enhance business supply chain trading relationships and create barriers for rivals.

Very Small Aperture Terminal (VSAT)

The satellite communication networks play a crucial role in the gathering and sharing of real-time data, which is essential to customer service. A dish antenna is mounted on the automobile to locate and monitor the products carrier. This facilitates contact between owner, shipper and consignee. The real-time contact helps to keep the truck route and distribution status up-to-date details. For starters. –US retail giant Wal-Mart employs this system to control the flow of inventories.

Geographical Positioning System (GPS)

The GPS is a more precise system used in developed countries where the precision of one meter in terms of latitude and longitude could be measured precisely with the aid of Geo Stationary Satellites. Once the vehicle's location is identified, it can be conveyed through the communication network, i.e. mobile phones or internet, to the consigner or the consignee.

Geographical Information System (GIS)

GIS is a software tool for visualizing the unique position of any object on Earth that is contained in spatial repositories. It could be used in terms of physical maps of the Earth's surface, the layout of the inner Earth's surface, or the configuration of streets or highways.

Web-Based Tracking

Logistics service providers working in India are providing Web-based consignment monitoring services to their customers. AFL, Fed-Ex, Blue Dart and others shall supply their consumers with

the status report of the consignment. By connecting via the Web, customers can access this article. Such information helps to prepare the timetable of transfer as well as to allow follow-up with payment transactions for customers.

Automated Guided Vehicle System (AGVS)

The system makes use of an optical or magnetic guidance system. The magnetic system uses energized wire to direct the material processing devices placed on the warehouse floor. Eliminating operator in AGVS. The new generation AVGS is video driven and does not pursue the set route. Without any human involvement, AGVS will handle all of the material handling activities. Robot combined with AGVS is used to pick up exact necessity of content for a consumer request.

Information Directed System (IDS)

In this the material handling machinery is managed by a single device. Communication between the device and the hardware is via radio frequency. The required movement is fed into the machine and it transfers the jobs to the specific equipment taking into account the full loading capability and handling speed. IDS may conduct a variety of complex material handling activities such as multiple order picking or multiple vehicle loading by the same material handling equipment leading to increased efficiency in the warehouse and versatility in handling variation.

Information Technology

IT is composed of hardware and software capturing, analyzing and providing information wherever it is needed. Since supply chain management is defined as an organizational network, these organizations cannot form a network unless they are connected to the supply chain through IT resulting in transparency and alignment of supply chain activities with customers. Reason—DELL's supply chain success was due to IT, where internet was used to actively capture customer orders and shared the information with vendors so that they could properly predict and provide the demand.

The relevant Information Technology systems in use are—

Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) is corporate planning structures that operate around core business processes and has all functional frameworks that ensure smooth fluidity of knowledge

through the enterprise within the framework of the supply chain, also interfaced with external network. It is not a program, but a process that encompasses administrative (finance, accounting), human resources (payroll, benefits) and industrial resource planning (MRP) (procurement, output planning) and is a common term for a centralized platform that handles and controls much of the personnel, assets and operations of an organization (Boyle, 2004).

ERP programs enable companies simplify and incorporate the operation and company of their supply chain. Essentially, they enable data collection in a single software package from raw material to consumers with all the details flow without manual intervention for the whole company. Some of ERP's advantages could include cost-cutting internal operations, flexibility across the expanded supply chain, improved customer service, and network partnerships (Davenport & Brooks, 2004).

With the continuous improvement of incorporation and preparation through creative thinking, ERP's growth took place. ERP's goals are to:

1960's MRP

Material Requirement Planning (MRP) is a computerized manufacturing and inventory control system that includes material bills (BOM), item master, requirement, order and output as master production schedules (MPS). It plays an important role in fabrication organizations. It is the foundation of Manufacturing Resource Planning (MRPII).

1970's Cloud Looped MRP

The target preparation and capability planning is related to MRP in the changing conditions of the manufacturing environment to meet changes in demand and supply leveraging input from operational strategies and implementation stages.

1980's (MRP II)

Manufacturing Resource Planning (MRP-II) is a production planning system which transforms a Master Production Plans (MPS) into scheduled releases of orders. In MRP, the MPS is viewed as input details, but in MRP II, the MPS would be regarded as part of the system and would be considered as a component for judgment.

New Generation ERP

The whole supply chain management system is integrated in the new generation ERP and expands the preparation process to trading partners where full exposure is available throughout the organization and promotes the idea of virtual business through online commerce. In terms of Just in Time (JIT), Business Process Reengineering (BPR), improvements in organizational structure, personnel and change management, it will have consequences.



Fig. 3 Components of ERP

SAP, Oracle, Baan, and People Soft are the market players in the high-level integration ERP system package by using a single data model, developing a common understanding of what shared data is and establishing a set of rules for data access. Such ERP services play a vital role in managing to reduce their supply chains' theft or e-risks.

Advantages-

- Quicker Customer Requirement response.
- Loss of the quality of inventories.
- Change in the internal and external level of service.
- Increase in product turnover rate
- Reduction of costs in logistics.

Distribution Requirement Planning (DRP)

It is another IT tool, and also a sophisticated planning approach that takes into account multiple distribution stages and distribution system characteristics. The requirement for the inventory of finished goods is determined by DRP taking into account the customer demand at multiple distribution centers located in different markets. DRP helps consolidate shipments to multiple locations spread over the vast geographic area and thus helps to reduce freight costs. DRP increases market visibility in the supply chain resulting in reduced inventory rates and need for warehouse space.

Automated Inventory Tracking System (AITS)

The AITS is an IT device that provides the inventory status of all products at retail stores, feeder and mother warehouses in real time. After the commodity inventory amount is reviewed at feeder and mother stores, information is transmitted directly to the retailer for replenishment of the items sold. Based on the commodity take-off pace at retail stores, the protection stock, product in transit etc., the manufacturer initiates the operation to replenish the merchandise element while maximizing the inventory in the supply chain. Example–Wal-Mart, a leading US retail chain giant who with the help of AITS controls inventory investments throughout the supply chain.

Impacts of IT in various SCM and Logistics functions

Procurement

The e-procurement should be embedded into the broader value chain of Purchase-to-Pay (P2P) with the trend of computerized supply chain management. The e-procurement is carried out with a software application that provides functionality for supply control and dynamic sales with an Indent Control, e-Tendering, e-Auctioning value chain, Catalogue Management, Vendor Management and Contract Management.

Web-based ERP (Enterprise Resource Planning) methods of e-procurement: generating and accepting purchasing demands, issuing purchase orders and requesting goods and services using an Internet-based software system. e-MRO (Maintenance, Repair and Overhaul): the same as web-based ERP, except that the goods and services purchased are non-product-based MRO supplies; e-sourcing: Identifying potential suppliers for a specific category of buying criteria utilizing

Internet technology. e-tendering: submitting details and pricing demands to suppliers and obtaining replies from Internet technology suppliers. e-reverse auctioning: using Internet technology to purchase goods and services from a number of known or unknown suppliers and E-Informing: storing and distributing information obtained from and to internal and external parties using Internet technology.

Planning

In the initial period before the introduction of IT, production and distribution preparation was performed based on historical data. There was not much linkage with business planning and production changed with varying demand. Nevertheless, coordinated preparation, scheduling, and replenishment (CPRF) are included with the introduction of IT strategy method. This requires long-term commitment to sharing information for purposes of strategic preparation such as collective business planning (SKUs, brands) and financial planning (sales, inventory, protection storage, cost, filling rate).

Scheduling

In the initial period the scheduling was done to improve asset utilization and reduce manufacturing costs. However, with the advent of IT strong linkage is established between supply chain partners and customers. As such scheduling is done to serve the customer at the right time.

Web-based Collaboration

The web-based shared framework allows for the exchange and coordination of predictions, replenishment and marketing strategies for supply chain stakeholders to achieve the best level of customer service and productivity.

Inventory Management

Each department in the initial period tried to minimize the inventory by moving it to the next stage of the supply chain. Thus, the average product expense in the supply chain was high, as the inventory kept in the supply chain was not clear. However, with the advent of IT, techniques such as collaborative replenishment and inventory managed by the vendor have been followed where the manufacturer takes responsibility for replenishing the inventory of the distributor, resulting in inventory control and access to information on demand.

Customer Service

Customer service had been only reactive in the initial period. The grievances or facts became difficult to reach the agency concerned and procedure became time consuming. Customer service, though, is more pragmatic with the introduction of IT as it meets the customer via the internet and generates constant input from them.

Logistics and Warehouse Management

In the initial period the transportation was more labor based and the movement of goods was not noticeable. Nevertheless, due to the advent of IT and innovations such as RFID and GPS, complete awareness during products transport is assured resulting in productive distribution and warehouse operations.

Need for the Study

With the rise of competition in the marketing world, business confronts difficulties from internal and external environment and to maximize their profits and create a brand name, use a variety of marketing strategies and gimmicks to attract existing and potential customers. To gain a competitive advantage, marketers need to focus their attention on reducing the overall cost related with various Logistics and Supply Chain Operations and provide quality throughputs. Various technological tools have continued to prove beneficial for an organization in achieving goals and also reduces overall cost and manual labor associated with various tasks.

This research tends to determine different technological tools used in logistics and supply chain management including information technology, communications technology and automated identification technology by collecting data from various secondary sources.

Scope for the Study

Do all the above technologies prove beneficial to all the organizations remain a question. Every organization needs to evaluate the advantages/disadvantages of every technological tools and choose the ones adjusting and suiting their organizational goals and objectives.

Objectives of the Study

- Review various IT tools used by an organization.
- Impact of IT tools on various Logistics and Supply Chain functions

Limitations

- The study limited to respondents and cannot be considered as a general common view.
- Research limited to only online respondents.

Research methodology

Research Design – Research design used is both Descriptive and Explorative.

Respondents chosen would be based on convenience sampling.

Sample Area – Data will be collected from both rural and urban areas based on the location of the respondents.

Sample Unit – Respondents between the ages of 25- 65 years involved in Logistics and Supply Chain Operations will be included. The response of 10-50 respondents will be included in this research.

Tools and Techniques: This research would involve the collection of primary data through a self-structured online questionnaire.

Analysis

This paper examines the impact of the IT on Indian industry supply chain performance. It also highlights the advantages obtained by introducing the information system into the supply chain.

A questionnaire was designed to research the effect of information technology on supply chain management. The feedback from this questionnaire shows that the company benefits significantly through the implementation of various information systems.

Does your organization have a separate budget for investment in IT?

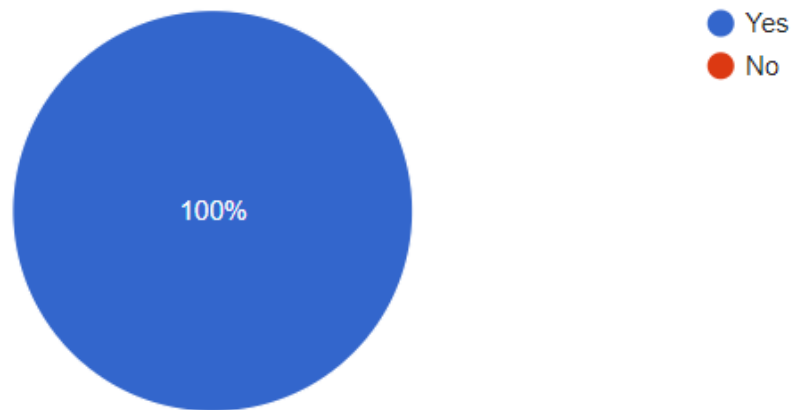


Fig. 4 Companies that have a separate budget for IT

Responses from employees of 10 different companies confirmed the allotment of separate budget for IT infrastructure development in their firm. From this data, we can conclude that organizations are necessary steps to invest on efficiency and effectiveness of their Supply-chain and logistics operations.

Impact of technology on various Logistics and Supply Chain functions

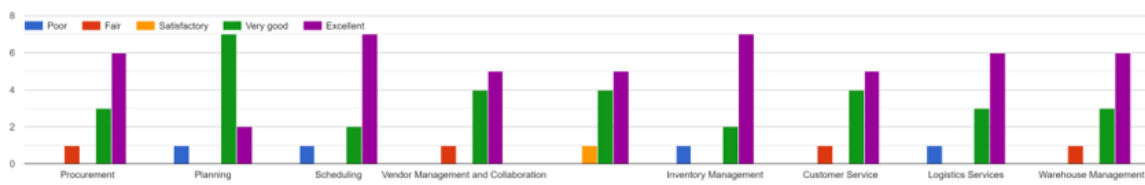


Fig. 5 Impact of technology on various Logistics and Supply Chain functions

Research shows that allotment of an IT budget and use of various IT tools have proved beneficial for an organization in various SCM functionalities and have resulted in overall efficiency and effectiveness of various operations.

Influence of technology implementation on various factors

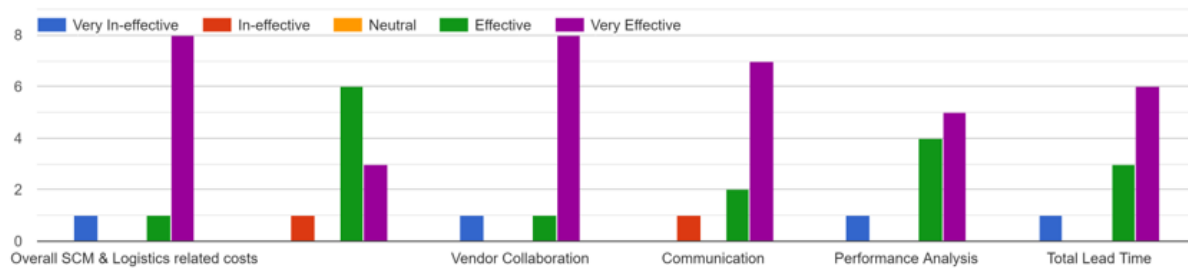


Fig. 6 Impact of technology on various Logistics and Supply Chain functions

Implementing necessary technologies have proved beneficial for various factors such as reduction of overall SCM Logistics cost, workforce efficiency, collaboration with suppliers and other shareholders, transparency and communication, and lead time reduction.

Impact of IT on the performance of suppliers of the company

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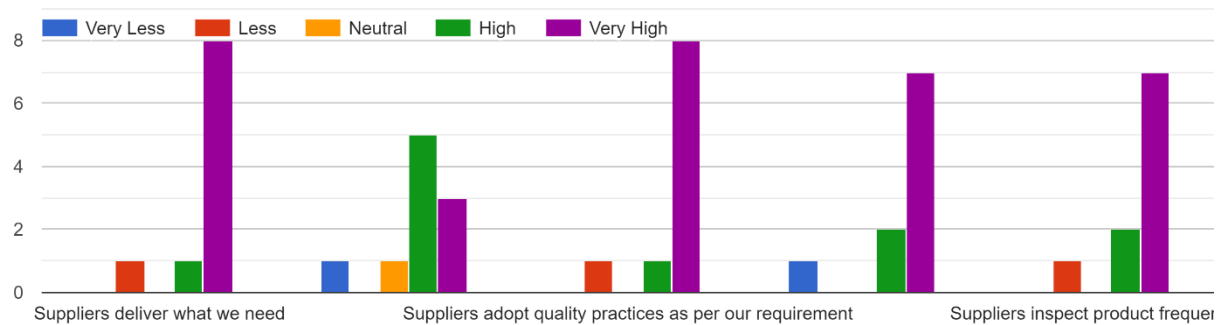


Fig. 7 Impact of IT on the performance of suppliers of the company

Impact of IT on responsiveness in the supply chain of the company

Impact of IT on responsiveness in the supply chain of the company

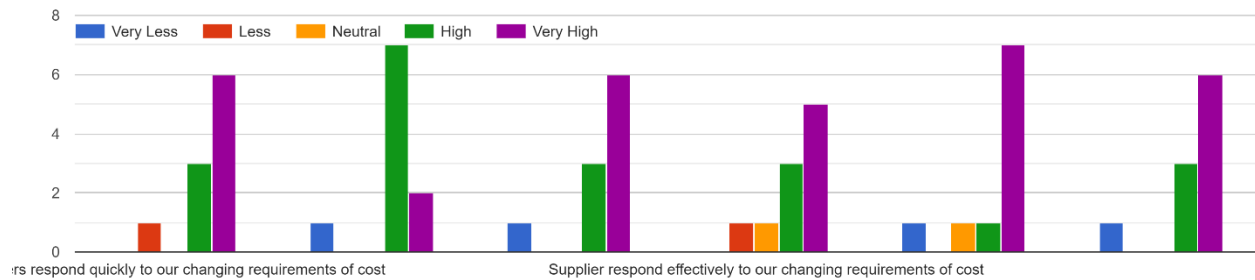


Fig. 8 Impact of IT on responsiveness in the supply chain of the company

Impact of IT in decision making

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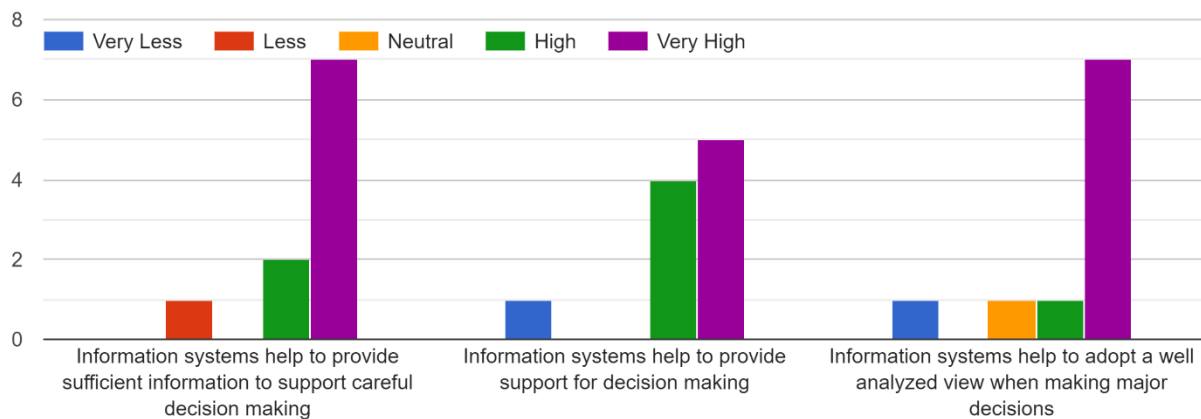


Fig. 9 Impact of IT in decision making

Impact of IT on customer relationship practices

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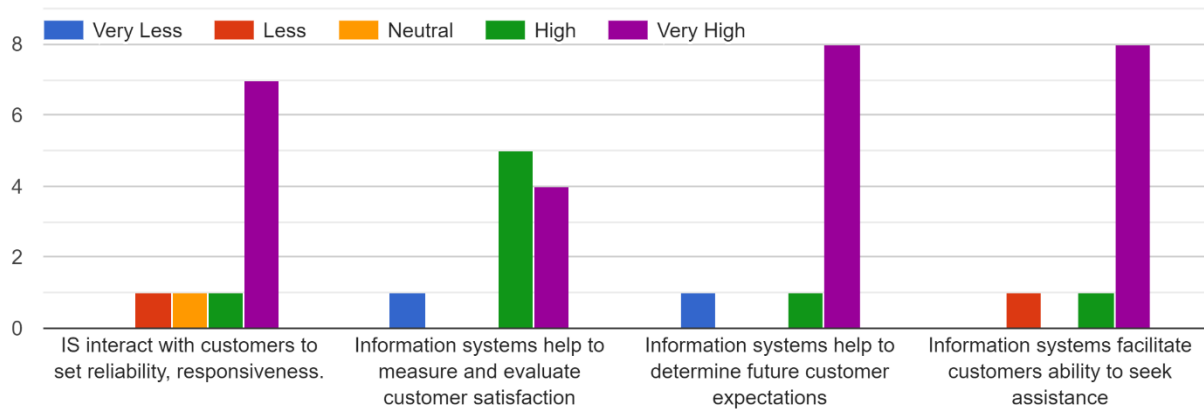


Fig. 10 Impact of IT on customer relationship practices

Conclusion

"Technology" is a tool for improving the productivity and profitability of the supply chain by maximizing the overall efficiency and effectiveness of the logistics system. To achieve a competitive advantage in today's competitive market, choosing the right technologies for different logistics operations or sub-processes is therefore very important for any enterprise.

Finally, to better understand the complex supply chain management phenomenon, research on the use of IT in SCM should be complemented with research on the other means of supply chain coordination.

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