Project Report on

"Impact of Information Technology in Supply Chain Management and Logistics"

Submitted by

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Certificate

This is to certify that **MR. VARAD NANDKIDHOR REDIJ** has worked and duly completed his Project Work for the degree of Master in Commerce under the Faculty of Commerce in the subject of **SUPPLY CHAIN MANAGEMENT AND LOGISTICS** and his project is entitled, **IMPACT OF INFORMATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT AND LOGISTICS** under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University.

It is his own work and facts reported by his personal findings and investigations.

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Declaration by learner

I, the undersigned **MR. VARAD NANDKISHOR REDIJ** declare that the work embodied in this project work hereby, titled **IMPACT OF INFORMATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT AND LOGISTICS** forms my own contribution to the research work carried out under the guidance of **MR. HIMANSHU LAPASHIA** is a result of my own research work and has not been previously submitted to any other University for any other Degree to this or any other University.

Wherever reference has been made to previous works of others, it has been clearly indicated as such and included in the bibliography.

I, here by further declare that all information of this document has been obtained and presented in accordance with academic rules and ethical conduct.

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Signature of the Student

MR, VARAD NANDKISHOR REDIJ

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Introduction

1. Introduction
1.1. Introduction to the project

Information Technology (IT) revolution changed the world and all aspects of business processes. The developments in Information technology has resulted in many possible alternative solutions for managing the supply chain effectively. Supply chain management is information driven function. Information Technology enabled supply chain management will provide a competitive advantage to an organization over rest of the competitors in market place. IT plays a vital role in decision making process. IT is beneficial for cooperation and coordination within the supply chain. This paper highlights the overview of information technology for effective supply chain management, software focused supply chain characteristics as well as IT tools used in IT enabled supply chain management. The purpose of this study was to determine the benefits of Information Technology on Supply Chain performance. The study also sought to investigate various IT applications used in supply chain operations. The main aim of the study was to enlighten other SMEs to fully implement IT in their supply chain operations was well A case study was done on an several firm like International Energy Technik Limited, Colgate-Palmolive, Dabur, Nike Inc. & PepsiCo. Data was collected on a qualitative approach where an interview was conducted with the main people in the supply chain activities. IET is one of the SME's that has fully implemented IT in its operations and has achieved good results. Findings show that IT has improved the processes of transactions across the various functions and also it is integrated in such a way that information flows along the various functions between procurement and planning; logistics and warehouse. The various technologies used have reduced costs of operations in the supply chain and a lot of savings have been achieved. It is also noted that lead time for orders have reduced. There has an improved customer services where both internal and external customers are happy in due to faster response from the supply chain. The study recommends that companies especially in the SME sector should implement IT in their supply chain operations to improve efficiencies. Every organization is struggling in order to survive in today's competitive marketplace. Traditional supply chain working is not going to help an organization to cope up with market demands and customers. IT revolution changed the face of supply chain which was used to be few years back. IT provides an organization to have a smart and robust supply chain. The challenge lies in creating economic value through vibrant organizations, innovations and applications of strategic tools. Indian supply chain industry is still under development and has understood the role of information technology in supply chain. Information technology plays a vital role in enhancing the supply chain driver's performance. Information Technology is the use of inter organizational systems that are used for information sharing and/or processing across organizational boundaries. There is an ever increasing need for fully integrated supply chain management solutions which incorporate all the functionality of network strategy, configuration of supply chain, planning of demand, transportation and warehouse management systems for any organization.

1.2. Purpose of the study

This project introduces the impact of information technology in the supply chain activities of the firm that are involved in he procurement, logistics, and international trade commerce activities like import and export. Information Technology (IT) is where an organization uses technology   to acquire, store, process and organize data. As Graham states, IT involves software, hardware, firmware and middleware as well as network infrastructures, platforms, operating systems and the worldwide web. Supply chain management is a management of network of interconnected business involved in the ultimate provision of product and service packages required by end customers. This project talks about application and involvement of Information Technology in the Supply Chain which has led to profitability and easing of some manual and tedious processes which use to take place in traditional commerce.

1.3. Importance and scope of study

The role that Information Technology plays in the modern supply chain management is of utmost importance. IT has enabled many labour some tasks to be automated which has helped the upper management to focus on the improving the profitability in the industry. Supply Chain can only work efficiently when it is properly integrated and well-coordinated, IT performs a crucial task by bringing in multiple technologies and combining them to optimise the supply chain industry. It helps increase the productivity and reduce cost which helps a frim to sustain in long period. IT plays a crucial role in supply chain decision phase which can be categorized as design, planning, or operational depending upon the time frame during which decision made apply

1.4. What is Supply chain Management?

Gibson and Novack describe supply chain management as the management (SCM) of flow of products, services, information and finances from supplier's suppliers through intermediate organizations out to the customer's customers. Supply chain management encompasses the management of all logistics process of a business. These logistics processes include activities such as procurement, warehousing, inventory control, manufacturing, distribution and sales order of a business. Information affects every part of the supply chain. Information serves as the connections between various stages of the supply chain, allowing them to coordinate, maximize the supply chain profitability. Information is also important to the day today operation of each stage in supply chain. To become more responsive and efficient, companies need to consider information as an important driver, information plays vital role in competitive strategy. Timely and accurate information is more critical now that at any time. Three factors have strongly impacted this change in the importance of information.

In today's world, companies are often seen as parts of multi-company, multi-echelon networks which has made IT a crucial part in a firm's supply chain activities. In today's world, the business environment is fast and complex and there must be an efficient and effective supply chain. Firms keep on procuring materials for manufacturing and some to deliver to customers at the right place and the right costs.

In order to improve their operations, companies must find ways of improving their flexibility and responsiveness. This will be done by changing the strategy on operations, methods and technologies that include implementing the supply chain paradigm and IT. In order to manage the supply chain networks, organizations need Information Technologies to manage these networks. There is a need to increase information flows along the supply chain using these technologies. According to Boone and Ganeshan, use of internet and related Technologies has enabled companies to do business with other firms outside their scope as efficiently and effectively as they conduct business within themselves.

Companies use the Information Technology in various ways. IT is usually one of the best ways to cut costs and also improve the performance of the firm. Most large firms use Information Technology to synchronize processes along their supply chain. These processes include upstream procurement, internal production, downstream sales, customer service as well as information sharing along the supply chain. There are various supply chain activities that use IT. These activities include use of the internet to buy and source materials. According to Chopra & Meindl Intel Company implemented an online ordering application that saw hundreds of clerks being laid off their jobs. With E-business technologies, companies are able to conduct business transactions online. This includes transfer of documents like orders, invoices, and payments. Enterprises Resource systems such as CRM, RFID, Inventory management systems are being used by companies to integrate activates in the supply chain.

Da Silveira and Cagliano, mention that the invention of internet business and business applications has created new innovative opportunities for supply chain management.

Organizations in the supply chain use Information Technology for their supply chain activities. The companies use ERP systems such as tally and pastel to integrate activates such as finance, manufacturing, inventory control and purchasing. They also use electronic data interchange to exchange electronic documents such as invoices, RFQs, purchase orders and waybills.

Many companies use computerized shipping where they have real time tracking devices to track their shipments. They usually receive notifications such as location, weight and the number of packages when tracking the shipments. They are also able to transmit information between different regions regarding the shipments and their destinations. All these use of IT helps these companies to improve their flexibility and also reduce the costs in the supply chain. British American Tobacco uses Information Technology to integrate manufacturing and supply chain activities. Major supermarkets are also using information technologies in their supply chain activities. They use barcode readers to identify products. They also use electronic point of sale at the cashiers register. There is also use of CCTV cameras to monitor burglars in supermarkets.

1.5. Supply Chain Performance

Supply chain is seen as a part of network that supplies set of products and services from supplier's suppliers to final customers. It is a whole commercial chain that is embedded in the network with a common goal of efficiency and effectiveness.

Ackerman states that performance measurement is seen as an important management task to achieve objectives. According to Hald, supply chain performance is supposed to evaluate the extent to which supply chain itself is currently delivering customer value and outline how it could be improved. Performance in a supply chain is measured in three dimensions which are efficiency, effectiveness and flexibility. Efficiency is a cost related advantage while effectiveness is an advantage of customer responsiveness. Efficiency improvements are achieved through Just-in-time production and logistic supplier nets. Effectiveness on the other hand is achieved through customer orientation. The main aim of an efficient supply chain is to coordinate flow of materials and services so that inventories can be minimized. The efficiency of manufacturers and service providers within the supply chain is also maximized.

Effective supply chain management requires continuous improvements in both customer service levels and internal operating efficiency of the companies in the supply chain. In order to provide the best customer service, there consistence high order fill rates, delivery rates should be high and on time and the rate of products being returned by customers should be low. When it comes to internal efficiency in the supply chain, the organizations should get an attractive rate of return on their investments in inventory and other assets. They should also find means to lower their operating and sales expenses. Efficiency and effectiveness in a supply chain improves the value of a supply chain. Value is viewed in terms of monetary as well as non-monetary outcome and value creation is a set of direct and indirect relationship function. According to Moller and Torronen, supply chain efficiency has a direct influence on value while supply chain effectiveness has an indirect influence on value.

1.6. Information Technology and Supply Chain Management

IT increases scale efficiencies of the firms operations, processes basic business transactions, collects and provides information relevant to managerial decisions and also maintain records of status and change in the fundamental business functions within the organization and maintaining communication channels. Such functionalities are also expected in a supply chain. IT links can connect all the processes of a supply chain into an integrated and coordinated system that is fast, responsive flexible and able to produce a high volume of customized products at low costs.

Companies are always in the race of improving their organizational competitiveness. Organizations nowadays are faced with a lot of challenges in their supply chain. This is due to the increase in construction scale and the cost of purchasing equipment, storage, maintenance and supply are one of the challenges that organizations face. Organizations in the 21st century view supply chain management as a global organization strategy for achieving organizations competence. In order to improve their flexibility and responsiveness, companies are changing the way they operate by implementing Supply chain management paradigm and Information Technology. The market nowadays is electronically connected and dynamic in nature.

1.7. Application of Information Technology in Supply Chain Management

Information Technology helps to assess structure of the supply chain companies, the nature and management of supply chain and the environment in which the businesses operate from. The SME firms have the potential to improve their Information Technologies so at to lower the costs associated in the supply chain. The companies have effective Information systems that lead to efficiency and effectiveness of the supply chain. However, the management feels that it is not enough and the targeted number of costs have not yet been reduced as desired. Organization's management need to assess the structure, nature and management of the supply chain by using tools and techniques of IT to measure cost and performance.

- Warehouse Management Systems

Warehouse management systems carry out functions such as planning commands and running day to day operations of a warehouse. This system covers areas such as receipt of goods, allocation of storage locations, and inventory replenishment of picking locations, generation of picking lists, order picking and issue of goods. These systems also keep track of inventory in warehouses.

- ICT, EDI, WWW

Development of Information Communication Technologies (ICT) like electronic data interchange (EDI), the internet and World Wide Web (WWW) has improved the concepts of supply chain design and management paradigm. These technologies have been developed to prevail over the demanding complexity of the systems that drive the relationship between buyers and suppliers. Watson et al., (1998) state that the internet improves the communication rapport between the organization and the customer. The internet on the other hand is used to build supply chains that are commercially workable in order to meet the setbacks that are present in the virtual enterprises. Organizations are doing businesses online and this is a sign of evolution in the business communities. Use of EDI technology in the supply chain facilitates sharing of information along the chain. This enables reduction in uncertainty and also improves shipment performance of suppliers thus leading to an improvement in supply chain performance.

- Enterprise Resource Planning Systems

One of the IT applications being used by organizations is the Enterprise Resource planning Systems (ERP). ERP system is an enterprise management model which is modern. It is based on computer aided information management system. ERP system makes supply chain activities be a network system by using the modern information technology. Activities such as logistics, capital flow, and information flow are effectively integrated to achieve the target of optimal allocation and sharing of capital resources. ERP is a comprehensive transaction management system that combines many kinds of information processing abilities and places data into a single database. ERP can also be defined as an integrated business software system that powers a corporate information structure, controlling a broad range of activities from the procurement of supplies to shop floor control and financial accounting. ERP system enables an organization to efficiently and effectively manage the use of resources such

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as materials, human resources and finance by providing a total integrated solution for the organizations information processing needs. E-business and supply chain management are the two frontiers of the ERP. When supply chain applications are linked with other business systems, users can slash cycle times and reduce inventory. The users also reach beyond their own corporate walls to connect better with suppliers, distributors and customers to engage in e-business.

- Radio Frequency Identification

Radio Frequency Identification (RFID) is an IT technology that is used in manufacturing, logistics, supply chain management and inventory control. They are used for automatic object identification. The RFID systems have radio frequency tags that are used for transmitting resident data; the tags have a unique serial number for identify each product. The data transmitted in the RFID can be read automatically. RFID tools are very common among airports, shipping companies, transporters and manufacturing firms that have high value items. RFID assists in providing operational efficiencies and improved stock level transparency in short shelf-life products distribution. RFID also assists in managing cargo that travel by air. Freighters are able to know where their cargo is due to the tags attached to the pallets and containers and a logistic manager can easily monitor and control cargo movement. There is also less delay and avoidance of misplacing items thus providing efficient and high quality service.

- Flexible Manufacturing Systems

Technologies such as Flexible manufacturing systems (FMS), group technology and computer integrated manufacturing help to improve flexibility in the supply chain. The internet facilitated transfer of information and communication thus facilitating quick response of control systems. Flexibility of these systems leads to customer loyalty. One example is the Toyota Company that uses FMS in order to respond to customer demand.

- E-Commerce

E-commerce is an IT application that is used by many businesses in their supply chain operations. The increase in popularity is brought about by the operational benefits that they bring to the purchasing practices. E-commerce has brought about cost savings in a business. There is less paper transactions, the order cycle time is short. The speedy transactions of purchase orders have led to subsequent inventory reduction and there is also improved partnership between buyers and suppliers through the introduction of website of business to business communication networks. With E-commerce, organizations are also known to reach new markets and segments and also improve their core processes. Supply chains adapt well to the fast changing Internet commerce environment. This is because organizations are able to enter and evolve more quickly than the traditional ones. Relations created by E-commerce include business to business (B2B), business to consumer (B2C), consumer to business (C2B) and consumer to consumer (C2C). This maintenance and creation of relationship enables the firms to succeed in their operations. These systems enable communicate benefits of relationships to firms, clarify customer needs and expiations, improve performance

measures with suppliers and also create competitive advantage. Fast-Moving Consumer Goods sector has a collaboration movement known as Efficient Customer Response Movement that has multiple technological and managerial innovations. This movement aims to transform retailers, distributors and manufacturers into a more efficient inter-linked organization.

- Point of Sale Tracking System

The Point of sale tracking system is also another application used in supply chain management. It is known as a customer facing IT application where the scanning system and the retailer's inventory management systems are connected. The goods are usually marked with a bar code and are scanned by a reader that recognizes the goods. The POS provides an instant record of transaction because the items are noted, tallied and a transaction is recorded. Researchers notes that replenishment of products can be coordinated in real time to ensure that stock outs in the retail store are avoided.

- Decision Support Systems

Decision Support systems covers various levels of decision making in supply chain management. These levels include strategic, tactical and operational levels of supply chain management. According to Gibson and Novack, the different levels have different information needs; operational decisions where decisions on how to fulfil a customer's order, tactical decisions entailing how to stock a particular product and strategic decisions where on warehouse locations and products to develop.

1.8. Benefits of Information Technology in Supply Chain Management

The modern information and communication technologies (ICT) make it possible to develop and implement a variety of flexible supply chain design options that can create significant cost and value advantages. Information systems like ERP systems have integrated the information embedded in functional business processes. Companies like Cisco reported savings of 500 million dollars when it restructured its internal operations and integrated processes with suppliers and customers with the help of web-based tools. 90 percent of Cisco's sales are facilitated online.

Information Technology helps companies respond fast to customer demand thus improving customer service in the company. For example, Celestica Company one of the world manufacturers in electronics has applied a web-based solution to better co-ordinate its global supply base.

IT changes industry structures and rules of competition, creating competitive advantage and creating new business opportunities (Porter and Millar, 1985). In terms of supply chain, IT is the key to supporting companies creating strategic advantage by enabling centralized strategic planning with day to day centralized opportunities. Researchers argues that electronic supply chain management combines the structural benefits of SCM with the efficiency benefits of an arm's length approach enabling lower costs. IT in supply chain management also provides a reduction in cycle time, reduction in inventories, minimization of bullwhip effect and improvements in the effectiveness of distribution channels.

Successful companies have developed focused e-business solutions for improving customer service elements that are success factors in their business operations. EDI for example contributes positively to order cycle time, product availability, distribution malfunctions, product availability, and distribution flexibility among other things. Information Technology has enabled companies to streamline logistics flows, reduce inventory and improving customer service thus improving efficiency in information transfer. The use of internet has made it easier to share information along the supply chain. This has led to improved operational performance, good customer service and solution development. Supply chain relationships and collaborations have also evolved as a result of information technology and the information sharing along the supply chain. A good case is seen in the industries that deal with Fast Moving Consumer Goods (FCMG). The collaboration has been articulated through the efficient Consumer Response Movement.

Vendor-Managed Inventory has enabled sharing of information between buyer and seller. Buyers are able to share their information on demand to their supplier. The supplier in turn manages this information and can be able to do forecasting based on the data received. This is mostly seen in supermarkets. This data is also transmitted from warehouse inventory reports and orders information.

IT enables a firm to keep costs down. In the fast changing world, organizations must be innovative, offer new service packages and organizational linkages with the

customer. In order to do this, there must be a discipline of change which encourages innovation and yet retains the stability of existing procedures until innovations are ready for wide spread adoptions. This is the work of IT. Large firms are also using IT to communicate with customers on order status and also manage outsourcing of customer service functions.

Order track and trace allows organizations to have smooth and accurate information about order status. This is especially useful where organizations have multiple tires of suppliers, inventory locations and plants. Order status also enables customers to enquire about their order status regardless of their locations.

Researchers noted that IT is also useful in supply chain decision support. Transaction system captures data on orders, stock, shipments among others. There is collaboration and coordinated system that ensures all supply chain data is available in a timely manner to all entities in a supply chain. Decision Support Systems (DSS) use the data captured to create feasible and economical plans dealing with different stages of the supply chain. The management is able to answer important questions as what should be produced, when and where.

1.9. Case Studies on impact of IT in Supply chain management
1.9.1. International Energy Technik Ltd.

International Energy Technik Ltd (IET) started out as a subsidiary of British Airways in 1949. IET has developed as strong local team of technical people who offer turnkey solutions to industry at affordable prices and a local presence. The company partners internationally with manufacturers and suppliers. They include companies such as Siemens AG in Germany, Epcos AG, Omicron and Indian suppliers. The company has also started getting products from new markets in Turkey, Spain and The Netherlands.

IET has been manufacturing type tested low voltage switchboards under license from Siemens AG under their trusted brand name SIVACON. IET has a large stock of electrical products that are bought from international suppliers. The company participates a lot in the international supply chain. Raw materials, goods and services have to be bought from international suppliers and the process of logistics has to be completed.

Information also flows between IET and the international suppliers. There is a lot of exchange of documents like invoices, orders, waybills, shipping documents. There is also exchange of emails and correspondences in order to know status of goods, push for delivery and also coordinating the movements of goods from the country of supply to the Nairobi airport or Mombasa port. The company also has a GPS system to track the shipments that are out for delivery. In addition, the stores and workshops have systems that monitor the flow of inventory that goes in or that leaves the premises. The company has Oracle ERP for running the whole supply chain. The company also has online systems that are used to generate documents like orders, import declaration forms among other import documents needed for clearing. The procurement and logistics personnel use systems such as Simba and Orbus to process clearing documentations for the shipments coming from international suppliers. They also use SAP system to book orders online, process and check their status.

1.9.2. Colgate-Palmolive

Colgate-Palmolive is a leading Multinational Corporation that is ranked on the top for consumer product category. It has its head quarter in New York, USA and it is believed to have assets of $94 billion that comprises of all products that it is selling in more than two hundred countries. The major products that it produces are cleaning products, soaps. Toothpaste, etc. Since the company has its operations in various regions across the globe, it is of immense importance to have a well-integrated supply chain management that will help in efficient and quick exchange of valuable data and information. In November 1999, the management of the company decided to revamp its IT infrastructure by implementing a unique and innovative system that ensured integration of every function throughout the organization across all its operational activities on international level.

Colgate-Palmolive to solve the issues regarding their supply chain system introduced three key strategies that formed the basis of the system. First one was the introduction of the Vendor Inventory Control (VMI) product so that there was a decline in the inventory channel and timing of the cycle as well. Second strategy as implementation of a resource planning system at cross border level so that regional models were developed for the international patterns. Last strategy was the implementation of a collaborative program that ensured there was a well-balanced downstream business system for effective management of the market demand of supply chain along with effective coordination of the systems activities.

With the strategies of supply chain management system implemented by Colgate-Palmolive has led to enhancement of the company's market competiveness along with strengthening its position in the global business development, gaining competitive edge in the price war and marketing its product in a strategic way. With the help of these effective SCM system the companies can maintain its image as a global leader in the consumer products market.

1.9.3. Dabur India Ltd.

Dabur is one of the leading personal and healthcare company among the top FMCG giants in India. Dabur offers many diversified products from Ayurveda and Natural Health Care Products to beverages and skin care products. Having a wide variety of products to offer has lead the company to think about its SCM. Dabur has improved its distribution system through its unique Retails Excellence Program "DARE" (Driving Achievement of Retails Excellence), the program covers a major objective as a channel focus, activating key customer, improving rural focus, rewarding distribution efficiency, maximising brand impact and building information capabilities. Dabur used direct shipment strategy in order to bypass warehouses and distribution centres.

Dabur has achieved cost reduction in the transportation process which overall adds to the reduction in price of the product. The SCM strategies have lead to other elements of the Supply Chain closer which improves overall efficiency of the supply chain. Efficient tactics in the supply chain has made Dabur to succeed and sustain in the FMCG industry.

1.9.4. Nike Inc.

Nike is an American multinational corporation that is engaged in the design, development, manufacturing, and world wide marketing and sales of footwear, apparel, equipment, accessories and services. The company is headquatered near Beaverton, Oregon. It is considered as the largest supplier of athletic shoes and apparel and a major manufacturer of sports equipment, with revenue in excess of US$37.4 billion in the fiscal year 2020.

As one of the most recognizable brands in the world, the American multinational is arguably the most influential player in the modern textile industry. Although there are undoubtedly significant challenges involved in managing this complexity, Nike's proactive approach to supply chain management has been credited by many as a significant contributor to its phenomenal success. Nike is known for its great quality product and this is partly due to their offen evolving supply chain. Its supply chain model has evolved a lot during the last decade. Nike has completely outsourced the procurement of raw materials this strategic sourcing has helped Nike to reduce its carbon footprint. Nike's supply chain extends to several nations. The primary focus of Nike is to remain sustainable and focus on the quality. To ensure that the suppliers follow the best practices, Nike has set a proper quality check and due codes of conduct.

Apart from the its network of suppliers, Nike has an efficient distribution system to cater the needs of its individual customers. It has established a smarter distribution and logistic centers also serve as critical touch. There are several outstanding things about Nikes supply chain, and the most important of them have been their focus on sustainability and strong logistics infrastructure.

1.9.5. PepsiCo Inc.

PepsiCo is an American multinational food, snack, and beverage corporation headquartered in Harrison, New York. PepsiCo has interest in the manufacturing, marketing and districution of grain based snack foods, beverages, and other products. It is worlds second leading beverage and snack company, PepsiCo's streamlined supply chain is a key aspect of the company's success.

PepsiCo's overall philosophy of cooperation, integration and invocation helps ensure its varied and complex supply chain remains stable, resilient and flexible. As a vast, multinational company, Pepsi must input, analyse, and act on an enormous amount of data to properly manage the flow of its food and beverages. PepsiCo has been increasingly focused on investing in digital tools and advanced technologies to create a more efficient, streamlined supply chain. Sophisticated data analytics also helped Pepsico's distributors and retailers track inventory. By improving ordering algorithms, stores are able to put in much more accurate orders, accounting for sales histories and purchasing trends.

PepsiCo has been a role model when it comes to focusing on new technology, in particular the use of modern technology to enhance the sales and streamline the logistics aswell. It has showed that in this modern era the power of data is something every company should already tap in. Todays sophisticated data collection and analysis tools make it easier than ever for businesses to create highlt accurate forecasts, prepare for dips and spikes in demand and pinpoint areas for improvement in the supply chain.

1.10.   Evolution in Supply chain management
The Supply Chain Management has seen enormous changes over the last few decades. Every part of how companies manufacture and transport goods has seen changes that have influenced the industry. Lets look back at how the supply chain worked and the key innovations that have driven things forward.

History of SCM in 1900s
The industrial revolution had started to change things, as the railroads were laid, it had become faster, easier and cheaper to transport goods over longer distance. Industrial engineering and operations research both have their roots in logistics. Fredrick Taylor, who wrote "The Principles of Scientific Management:" in 1911 focused his early research on how to improve manual loading processes. Operations Research began when scientists established the value of analytics in the study of military logistics problems during World War 2. While Industrial Engineering and Operations Research have both tried to maintain separate characteristics, many of their greatest achievement have occurred when used in a collaborated framework to address supply chain issues.

The development of pallets, pallet handling and storage system also continued for the next few decades. The intend was to use warehousing storage space more efficiently and optimize racking and layout.

History of SCM in 1940s
In the period of 1940s and 1950s, the focus of the logistics study was on the use of automation, to improve labour intensive processes of material handling and to utilize space management with the techniques of using racks and improved warehouse layout. In the 1950s this concept was stretched to transportation management with the expansion of intermodal containers together with ships, trains, and trucks to handle these containers. This was the period when shipping containers were invented but weren't fully standardized until the late 1960s.

History of SCM in 1960s
During the 1960s, goods distribution shifted away from railroads and towards trucking. The continued evolution of pallets, handling equipment, containerization and other areas meant that freight transportation was more reliable. This led to the efficient transport of time sensitive raw materials, parts and products, over longer distances.

Computerization started to gain popularity in the mid-1960s and IBM developed the first computerized inventory management and forecasting system in 1967. Before the 1960s, logistics records and data were captured, sent and reported through paper. Data computerization started to streamline logistics, and created opportunities in many areas including more accurate forecasting, better warehouse storage, truck routing and better inventory management. These researches led to creation at Georgia Tech of the Production and Distribution Research Centre, the Material Handling Research Centre, and the Computational Optimization Centre. Around the same time, barcodes made it much easier to scan products, starting the move away from manual input of SKUs and

product codes. This was the beginning for new innovations in the industry of Supply Chain Management.

History of SCM in 1980s
The 1980s saw the beginning of a new phase in the history of supply chain management. The rise of personal computers in the early 1980s provided enormous computer access to the planners and a new graphical atmosphere for planning. New software's like flexible spreadsheets, mapping and route planning made it easier to track costs and maximize profits. The production and distribution research centre was the early innovation leader in merging map interfaces with optimization models for supply chain design and distribution planning. The Material Handling Research Centre provided guidance in developing new control technology for material handling mechanization. Much of the methodology developed in these centres speedily began to find its way into profitable technology. This was coupled with other advancements including air freight optimization, supply chain distribution networks and the introduction of Enterprise Resource Planning (ERP) systems. ERP systems were further developed in 1990s which marked the era of Globalisation. Company administrators learned from logistics that they had tremendous opportunity to improve the bottom line if they were willing to invest in trained professionals and new technology.

History of SCM in 1990s
The logistics flourished further in the 1990s with the development of Enterprise Resource Planning (ERP) systems. These systems were inspired by the successes achieved by Material Requirement Planning (MRP) systems developed in the 1970s and 1980s, despite some major setbacks in getting the ERP systems installed and working, by the year 2000 large companies had acquired ERP systems. The result of ERP was a wonderful improvement in data availability and accuracy. The new ERP software also intensely increased recognition of the need for better planning and integration among logistics components. ERP software identified planning and integration needs for logistics components resulting in a new generation of "Advanced Planning and Scheduling (APS)" software.

History of SCM in 2000s
The worldwide recognition of the term "supply chain" has come as a primary result of the globalization of manufacturing, since the implementation of LPG policy. One of the biggest influences has been the explosion of manufacturing in Asia, with China, Japan and Korea becoming major suppliers and exporters of goods. The focus on globalization emphasized the need for logistical strategies to deal with complicated networks including multiple entities across multiple countries with diverse control. At the same time, AI and Machine Learning combines with predictive and prescriptive analytics to provide better forecasting, enhanced order management and more. In the recent years supply chain has been evolving towards a more data-driven, network-driven and collaborative supply chain ecosystem that drives real value and growth for all participants.

1.11.   Future for Supply Chain Management

In the recent years, the rise of artificial intelligence (AI), big data and increased automation has led the framework for the future when it comes to supply chain management. Whether facing technology and digital disruptors, changes in workforce skillsets or the transformation of operating models, supply chain executives can be certain is, that the ways of past century will not position in this century. Artificial intelligence and machine learning are already beginning to change the face of the supply chain industry, which will further help companies develop and improve their customer relationship and sustainability in the long run. It has been helping to deliver the powerful optimization capabilities required for more accurate capacity planning, improved productivity, high quality, lower costs, and greater output, all while fostering safer working conditions.

ML and AI make use of huge volumes of data generated by each individual companies to adapt and optimize a solution as per the companies demand. ML techniques can be used to streamline and automate processes such as load forecasting and vehicle scheduling. New AI software's include functionality that teaches computers how to provide real time information from raw data, on which key decisions then are based. Further applications are being tested and worked on to get the best out of the new technology to improve the functioning of the industry.

AI and ML can deliver enormous benefits to the supply chain management and logistics operations. Some of the benefits are as follows:

- Reduces time taken by manual work – Businesses spend long hours doing manual, paper based processes and warehousing and inventory planning which can be very easily automated using AI and ML
- Accurate inventory management – Accurate inventory management can ensure that the right flow of items in and out of a warehouse, and AI & MLs ability to handle huge mass data to interpret huge datasets quickly has helped the industry to flourish.
- Warehousing efficiency – An efficient warehouse is an integral part of the supply chain and automation can assist in the timely retrieval of an item from a warehouse and ensure a smooth journey to the customer.
- Reduced operations cost – With the involvement of AI and ML in the industry has a huge effect on the operational costs. Automation leads to greater speed and accuracy achieving higher levels of productivity.

1.12.   Challenges of AI in supply chain management

There are several challenges as well in using AI and Ml in supply chain. Adapting AI required major capital investments, updating of IT systems and making organizational changes. As a result, only the largest players can afford this change. Organizations with aged legacy systems face many other substantial obstacles to deploying and reaping the benefits of AI.

Despite its potential for adding value, there are already concerns that AI may replace routine and manual tasks resulting in job losses. Companies still need to develop strategies to address how workers role will be affected as AI systems automate some manual functions. In addition there are also security concerns for IT infrastructure and human life.

1.13. Summary

The paper examines the use of Information Technology in supply chain and how IT is used to increase performance of the supply chain. The study was carried out to benefit the SMEs and professionals in the supply chain so that they can enhance the use of IT to improve the supply chain performance and attain a competitive edge in their businesses. The main objective of the study was to determine the benefits of IT in supply chains and also understand the various IT applications used in supply chain activities. In the later report you can find the information on how IT has impacted the Supply Chain Industry in the data analysis part of the project.

An important observation is that IT has improved the processes of transactions across the various functions and also it is integrated in such a way that information flows along the various functions between procurement and planning; logistics and warehouse. The various technologies used have reduced costs of operations in the supply chain and a lot of savings have been achieved. It is also noted that lead time for orders have reduced. There has an improved customer services where both internal and external customers are happy in due to faster response from the supply chain.

Important information is the increase in communication across the various users of the supply chain. Information flows from the sales and planning team to the procurement team and to the logistics team using the oracle system which is an ERP. Documents such as Pos, invoices and requisitions are transmitted using the system and users do not need to physically exchange documents. Audit trails used in the organization have also led to minimal theft of stock in the organization. Further improvements in the Information Technology and embracing of newer technological models has led to further improvement in the working of the companies.

Objectives

2. Objectives of study

- To determine the benefits of IT in organizations.
- To establish the various IT applications are deployed in the organization to maintain its competitive position.
- To determine how the IT has contributed to efficiency and effectiveness of a supply chain and logistic
- To review the historical changes in the revenue, operational cost, and functioning of the general supply chain industry since the age of automation and technology.

Review of Literature

3. Review of literature

"The Impact of ERP on Supply Chain Management" – Henk A Akkermans, Paul Bogerd, Enver Yuecesan, Luk N Van Wassenhove (2002)
This article studies the impact of Enterprise resource planning (ERP) systems on Supply Chain Management. This study was conducted with 23 Dutch supply chain executives of European multi nationals. The findings of the study were as follows (1) ERP further integrates activities between suppliers and customers across the entire supply chain; (2) The ongoing changes in supply chain require flexibility from Information Technology; (3) More involvement of IT leading to increase in productivity and decrease in operating costs. This study also talks about some limitations with regards to the technological advancement and how it costs largely to remain sustainable in the industry and the ones not able to adapt to the increasing cost of IT usually perish away.

"Virtual Supply Chain Management" – A. Gunasekaran and E. W. T. Ngai (2004)
This report states that a comprehensive study of IT in supply chain will be useful to identify critical success factors of IT for an integrated supply chain. There has not been adequate attention from the industry researchers and practitioners in the design and implementation of the supply chain management especially in the business to business ecommerce and the supply chain. A. Gunasekaran also emphasizes on the importance of Big Data business analytics on logistics and Supply chain management.

"Supply Chain Management in Indian Automotive Industry: Complexities, Challenges and Way ahead" – Dr. D. Mukkhopadhyay and Dr. Sunil Giri (2014)
This report largely talks about the Supply Chain in Automotive sector in India, it focuses on adoption factor and impact of Electronic Data Interchange (EDI). In this study the authors who have made an empiric study on the use of IT in SCM have found positive correlation between EDI reductions in operational costs. This study talks about issues related to current SCM practices and its operation in current competitive market. It talks about adapting o the current technological advancement to get a competitive edge over the competitors. The project report conclude by stating that investments should be focused towards R&D to build enhanced supply chain.

"Evolution of Sustainability in Supply Chain Management" – A. Rajeev, Rupesh K. Pati, Sidhartha S. Padhi, and Kannan Govindan (2017)
This report talks about the impact that has resulted in negative impact on the society. This article urges several researchers and industry experts to work on sustainable production and consumption issues within the context of sustainable supply chain management. This paper comprehensively covers the exponential growth through the evolutionary lens. The study addresses social effects and environmental effects that can be reduced with the help of innovation and constant evolution in the Supply chain management and logistics.

Research Methodology

4. Research Methodology

4.1. Introduction

This section describes the general methodology applied in carrying out the project report. It will describe the data collection procedures and the tools used in obtaining data used in this project; the process of data analysis, the study design, the sources of research used in the project.

4.2. Objective of study

- To study the impact of Information Technology on a company with a history of SCM
- To examine the before and after effects of involving information technology in the organization
- To review various key elements of a business that are involved in the functioning

4.3. Scope of study

- This report will help review the effects on different parts of an organization that are affected by the involvement of IT in the organizations logistics department
- The data is majorly based on the secondary research and primary research methodology.
- The constraints of time, energy and financial resources requires the scope to be narrowed down to only certain impacts of IT on the Supply Chain and Logistics.

4.4. Data Collection

In this project report, both primary as well as secondary method of data collection was considered. Primary data was collected using questionnaire as a toll of data collection. The questionnaire is attached in the annexure, the questionnaire was drafted in order to obtain a clear image on the impact of IT on the Supply Chain Management. Questions were framed to elicit free and frank responses. The sample population to answer the questionnaire was a group of 12 respondents. The secondary data was collected from sources like research papers, journals, and various other articles and websites. The research also includes a case study (Secondary Research) conducted by the University of Nairobi which shows the before and after effects of IT in SCM.
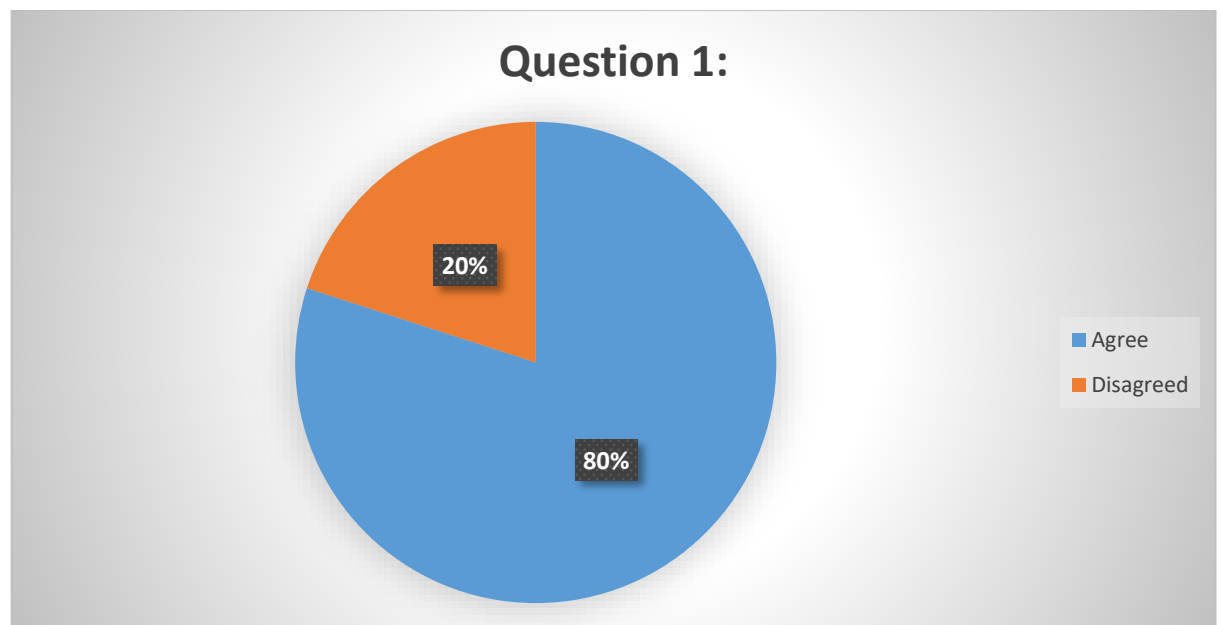
Data Analysis & Interpretation

5. Data Analysis
5.1. Introduction

This section provides a summary of the data analysis, results of the study and the discussion of the results of the study. This chapter includes a detailed case study by the University of Nairobi and other researchers on before and after effects of the involvement of Information Technology on the industry and this section also includes a short primary research.

5.2. Data Analysis and Interpretation (Questionnaires)
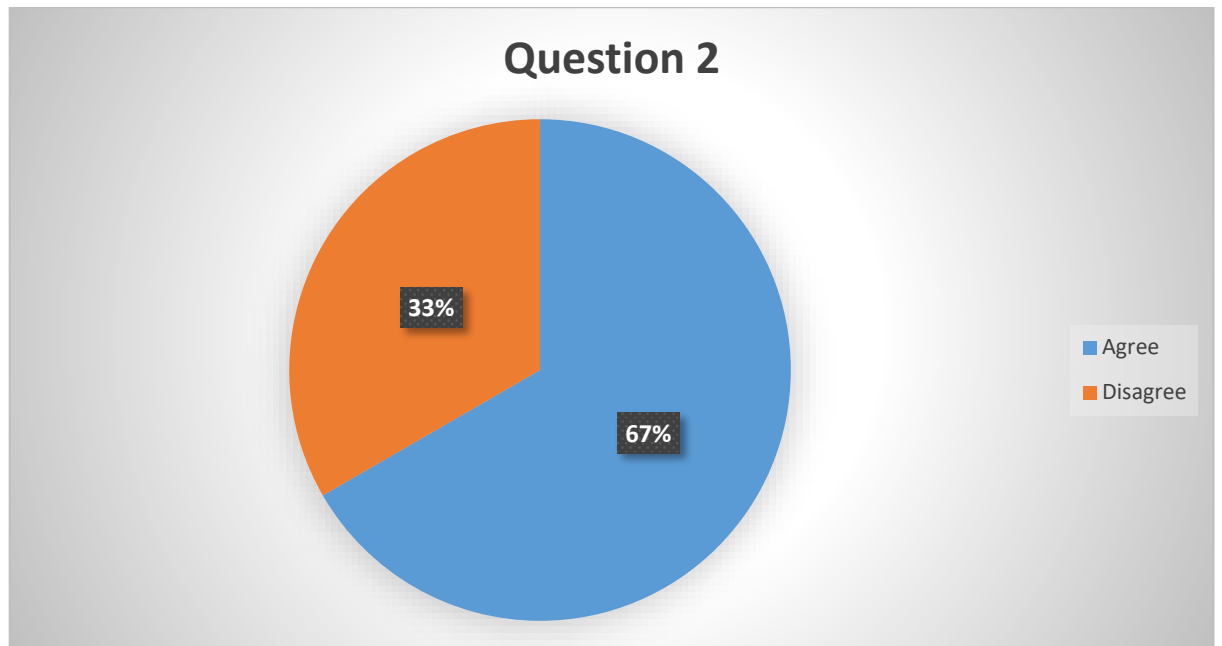
Question 1: Does using Information Technology give companies competitive edge over their competitors?

Interpretation and Summary

It can be interpreted that the sample population fairly agree with the point that involvement of information technology in the supply chain leads to competitive edge for that respectable company. We can back it by the analysis of empirical data where we have found that cementing IT in the processes and operations lead to further reduction in the operational cost and has a direct relation with increase in revenue and improvement in customer relationship.
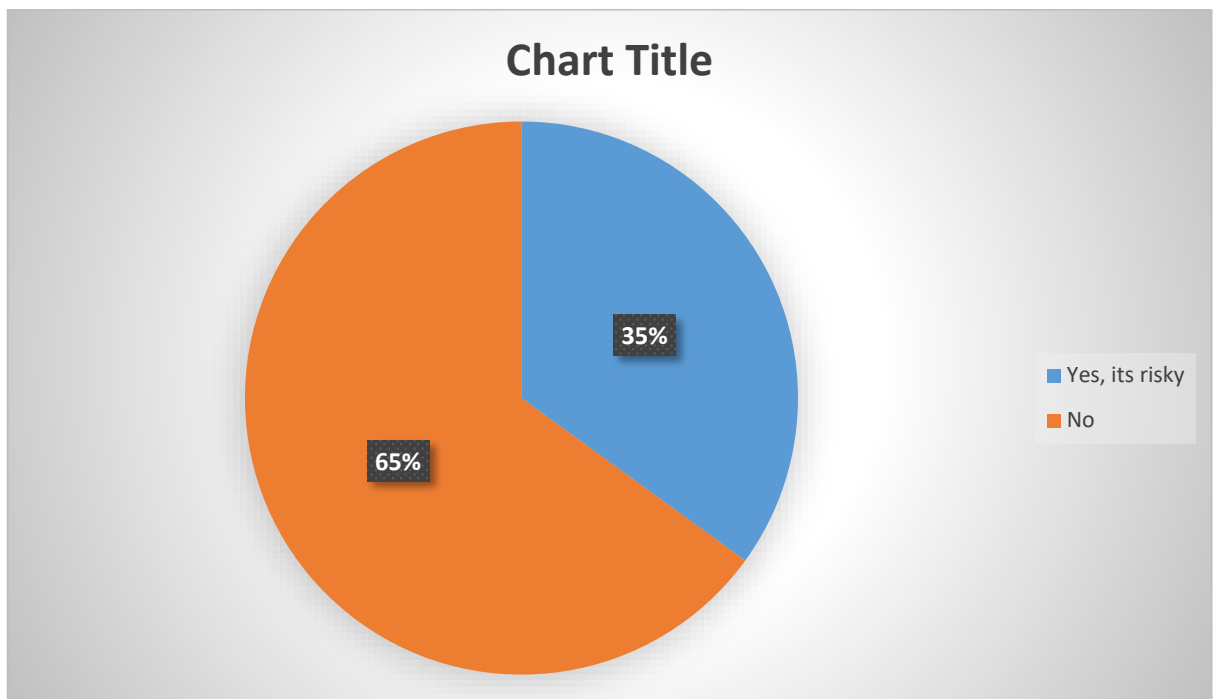
Question 2: Will automation lead to total eradication of human resource?

Interpretation and Summary

It can be interpreted that fairly majority people think that automation can lead to reduction in many manual tasks which are currently being occupied by humans. Through the project report we can understand that due to the continues evolution of IT in the Supply chain there are higher chances that many functions that require a human touch in the current era will get automated which will lead to a error free output.
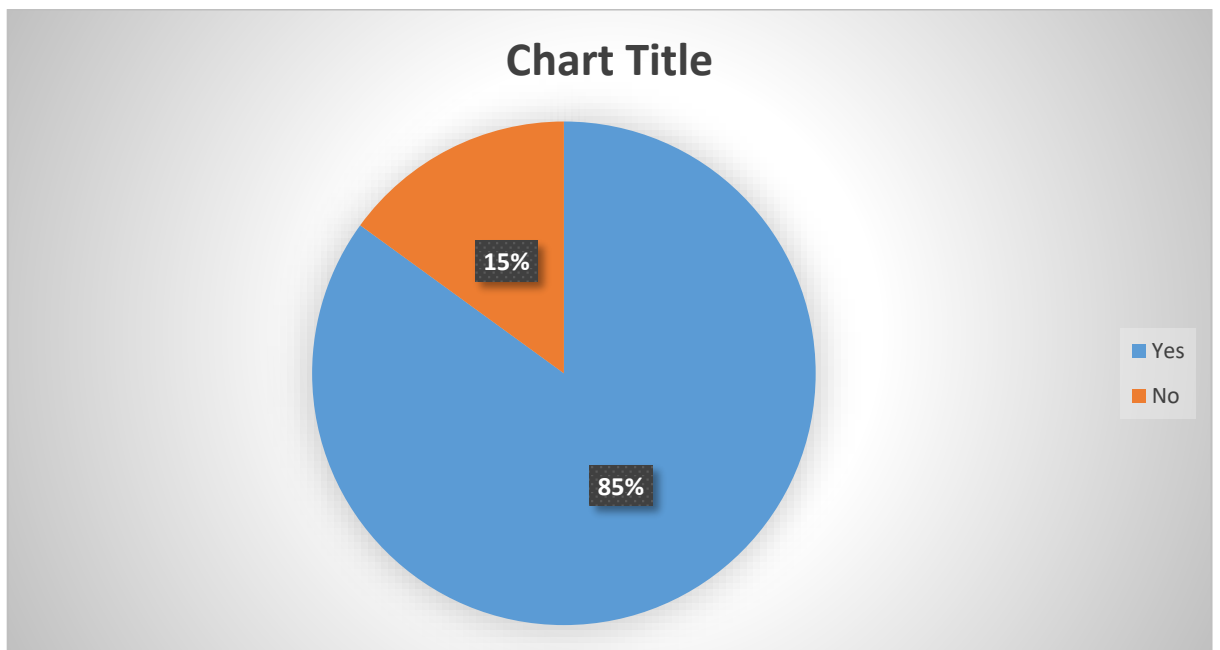
Question 3: Is relying completely on automation risk for the industry?

Chart Title

- Yes, its risky — 35%
- No — 65%

Interpretation and Summary:
It can be interpreted that people are quite optimistic about the integration of IT in the industry. There are still few who think that involving automation can lead to issues that will be rather be solved by human intervention.

Question 4: Does machine learning and Artificial Intelligence have future in SC?

Chart Title

- Yes
- No

15%

85%

Interpretation and Summary

It can be interpreted that majority think that AI and ML will play a vital role in the future. As discussed earlier AI & ML have been already started to be implemented in the industry. Large amount of data are analysed and made use for in the current era, these data's are used to forecast demand and adjust to the demand with adequate. Though there are some limitations to completely depending on automation as that can lead to black box error.

Conclusion

6. Conclusion

In general, companies should embrace the use of IT in the supply chain to minimize cost and maximize revenue. More focus should be put on the planning and sales function to regulate the buying since customer demands are high and can cost the company millions of money. In order to meet the current level of demand, the systems in place should facilitate the determination of the current level of demand and also predict future demands to curb stock outs or stock overruns.

Most SMEs do not consider supply chain as an essential function in the organization and procurement is seen as a finance activity. SMEs should consider implementing supply chain and use Information Technology to improve their operations as this will save the companies a lot. The companies should also use IT in planning their procurement activities and engage their stakeholders as well.

The results have also shown how communication is important in an organization that uses procurement. Most of the supply chain in SMEs is not transparent as the managers are known to have a conflict of interest. These results in poor revenues, bad customer service due to delay of product information to customers and also longer lead time. Through the user of IT, all these can be curbed and companies can enjoy longer benefits such as improved sales revenue and reduced inventory costs.

The supply chain industry should spend more efforts on innovation and improving the long term performance of each individual companies and the industry as a whole. Empirical research has confirmed that IT has been a crucial factor in today's SCM and hence maximizing IT investment could lead firms to higher profitability and effectiveness. With new technology like uses of AI and Machine learning could be the future of smooth functioning of complex tasks and giving competitive edge to the companies.

Recommendations

7. Recommendations

The study recommends that companies especially should implement IT in their supply chain operations to improve efficiencies as indicated in the project report. Levels of sales and customer service have improved over time with the adoption of IT in the supply chain.

Organizations are to integrate the supply chain function with the other functions that are involved in its running to enhance the overall effectiveness and also have a competitive edge over competitors through the resultant better prices and products.

The study also recommends the adoption of technologies that assist in increasing the effectiveness of the supply chain for both the customers and the suppliers. These should be systems that enhance transparency which will in turn improve the goodwill of the organizations.

Limitations

8. Limitations

The research is based on Primary as well as Secondary data. Hence, there are certain limitations that may affect the research study. The limitations of the project are as follows:

- Due to time constraints, the data obtained is limited. The conclusion and recommendation may not reflect the clear image.
- Due to the current pandemic situation there were few restraints with collecting primary data and conducting personal interviews
- The research had to be conducted within a period of 1 month as a result of which, the researcher could obtain limited data.

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ANNEXURE

10. Annexure

Questionnaire

1. Does using Information Technology give companies competitive edge over their competitors?
   - o Agree
   - o Disagree

2. Will automation lead to total eradication of human resource?
   - o Agree
   - o Disagree

3. Is relying completely on automation risky for the industry?
   - o Yes, its risky
   - o No

4. Does Machine Learning (ML) and Artificial Intelligence (AI) have future in SC?
   - o Yes
   - o No