



**PROCESS AUTOMATION AND LATEST TECHNOLOGICAL
IMPLICATION FOR SUPPLY CHAIN MANAGEMENT**

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Further, I certify that the work is based on the investigation made, data collected and analyzed by him and it has not been submitted in any other University or Institution for award of any degree. In my opinion it is fully adequate, in scope and utility, as a dissertation towards partial fulfillment for the award of degree of MBA.

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EXECUTIVE SUMMARY

The linear models of many consumer goods supply chains have remained largely unchanged for decades – they rely on bulk materials and produce standardized products in large centralized factories to maximize economies of scale. Now, however, this traditional model is fundamentally changing. We're shifting towards consumer-led, data-driven, highly complex supply networks. These are operated by a more age-diverse workforce where employees move from company to company every three to five years. The consumer increasingly drives innovation from the heart of the supply network, rather than being on the receiving end of a supply chain. These shifts demand mass product customization, more accurate supply chain planning and synchronization, and faster multichannel retail responsiveness that go far beyond the abilities of the typical workforce and infrastructure. They require instant visibility, quick decision-making and increased flexibility across the whole network.

This will enable innovation, ensure optimum service levels and deliver growth at low cost. Recent advances in Artificial Intelligence (AI) and Robotics automation have the potential to overcome these challenges and revolutionize supply chains. PA Consulting Group and The Consumer Goods Forum, through this End-to-End Value Chain Learning Series paper, show that behind the hype, the adoption of AI and Robotics automation is an inevitable evolution you can't ignore. It will become a major source of competitive advantage. Change will happen, but not overnight.

We emphasize how this requires supply chains to evolve into truly consumer-driven networks. We also define the core cyber and physical aspects of the technology and give examples of relevant applications in supply chains. And we explore the potential impact on the workforce and offer suggestions on how organizations can prepare themselves. AI and Robotics automation in supply chains offers great potential for organizations that are willing and able to embrace it.

CHAPTER: 1

INTRODUCTION

1.1 OVERVIEW:

- **Greater Efficiency and Transparency**

Shippers are under pressure to reduce supply chain costs as part of greater company cost saving initiatives. Shippers want more services and better transparency from their supply chain managers, ideally without driving up costs. Since the start of the wireless era, many third-party logistics providers (3PLs) and supply chain managers have turned to wireless technologies and cloud computing to automate systems and improve accuracy.

Not only are automated systems faster and more efficient than their manual, fax-based predecessors, the mobile and automated methodologies also provide better data-capture, which can, in and of themselves, improve processes and can also be stored and analyzed to target areas for improvement. For example, handheld mobile devices can deliver wireless proof of delivery and real time transportation monitoring, which can help managers discover and address operational anomalies. 3PLs are also turning to technology to streamline their client supply chain activity and improve client relations. The use of Customer Relationship Management (CRM) technology continues to provide easy-access dashboard visibility of supply chain operations, helping leaders to identify inefficiencies and bottlenecks in commercial operations.

- **Technology like radio-frequency identification (RFID) is a popular way**

Of automatic identification & data-capture. Because “RFID” tags can be attached to clothing, inventory, or almost any item, the tracing possibilities are extensive and applicable to numerous aspects of the supply chain. Technology reduces labor costs by streamlining data-capture and reducing error-prone manual processes. Access to real-time, up-to-date information across the entire supply chain is having a significant impact on how companies are doing, and expect to do business. Shippers want to be able to answer the question, “When exactly will my delivery arrive?” Integrating new technologies will make answering that question much easier. Access to real-time information has significant impact. APIs offer logistics providers the ability to interface with multiple systems in a much-improved way and decrease the amount of time it takes to get data from one point to another. By doing so, 3PL providers

are enabled to use self-service portals with shippers. The improved information flow also opens the possibility of better asset utilization providing loads to help the shipper return home with freight, reducing empty miles from the transportation network.

- **Focus on Individual Employees**

Smartphone technology offers shippers and vendors the abilities to pair workers with the devices most appropriate for their daily work. As mobile devices become more diverse and varied, companies are striving to match the job with the right device. While smart phones are gaining precedence in supply chain operations, they are still subject to the wear and tear. However, ruggedized cases have increased reliability for handheld devices to withstand daily outdoor usage. Today many asset- lite carriers leverage smart phone technology. Using apps, proprietary programs and mobile interfaces, smart phone technology uses the pings from that smart phone that's sitting with the driver and creates a breadcrumb trail of how freight is being tracked. Also, applications on the backend enable a driver to signature capture information and create a proof of delivery. Smartphone's give an open network of carriers the ability to act like a closed-fleet network. Companies are able to get the same kind of status information from a cell phone that is available via proprietary technology or in a controlled IVMS/Electronic Logging Devices (ELDs) global unit.

- **Tighter Communication and Community**

Smoother and more frequent communication undoubtedly makes business operations easier. Mobile technologies and real-time communicating can create a greater sense of unity and development from those out in the field to those in corporate headquarters. Managers are often on the move, but improved communication and access to live information can make managers more in tune with daily happenings in the supply chain. Beyond the traditional communication options smart phones offer 3PL companies' employees, enterprise technology systems readily available in the marketplace use pings and the information pings improve communication and provide the capabilities to make big carriers nimbler. Strategic workforce management is especially critical for companies who are understaffed or having difficulty filling capacity. Flexible communication channels within all aspects of the supply chain can increase employee productivity and boost morale. Greater collaboration and communication ultimately boils down to better customer service. Communication aids in product tracking and delivery, which results in higher customer satisfaction with the supply chain process. When employees are connected through many stages of the supply chain, workers likely feel more fulfilled and operations often run

more smoothly.

- **Making Way for Small but Nimble Carriers**

Smaller firms with less investment in their current system have and will continue to find it easier to successfully integrate new technologies. Smaller fleets don't have to spend thousands on mobile resource management or automatic vehicle location systems anymore. Often, the job can be done with a relatively affordable mobile device or non-proprietary app, making the leap to wireless much easier. This flexibility may continue to give smaller carriers an edge, making them more agile and flexible in a competitive environment.

Government Requirements Tackled with New Technology As of December 2017, the Department of Transportation requires Electronic Logging Devices for drivers and fleets. (Some companies, converting from the grandfathered AOB RD to ELD, must meet the December 2019 deadline. All others were required to move to ELD December of 2017.) Fleets faced with stricter regulations are turning to better routing software and logistics management technology to save time and money. As the government looks towards technological solutions, supply chain managers will have no other choice but to do so as well.

- **Driver Shortage Drives New Technology**

Driver Assisted Truck Platooning (DATP) could relieve some of the strain of the driver shortage by enabling one driver to "drive" several vehicles in parade formation at once. The human driver would simply operate a single truck at the head of the "platoon" and one or more similar trucks would connect with the lead truck to follow along behind autonomously. DATP has the potential to reduce carbon emissions through better miles per gallon, as well as save costs as driver wages continue to rise.

Autonomous vehicles have been working along Interstate 10 between El Paso and Southern California since 2017. For now, a human driver rides in the cab to monitor the computer chauffeur. Even though the well-documented driver shortage is real, trucks continue to carry 70 percent of goods shipped around the country. According to the American Trucking Associations, the industry is short about 50,000 drivers and that number could grow as Baby Boomers retire and possibly hit 175,000 by 2024. Self-driving trucks could help save the day to fill the gap between need and scarcity of drivers — especially considering that a self-driving truck would not be subject to ELD rules limiting humans to 11 hours at a time behind the wheel.

The gasification of trucking is also being used to improve safety and combat the driver shortage and attract a new generation of drivers. Gasification uses game mechanics and dynamics to drive engagement and key performance indicators in a non-game context — it basically uses natural instinct and reward incentives to drive or change current behavior.

- **The Effects of Internet Shopping on Last Mile Delivery**

Amazon began experimenting with drone delivery in late 2016 and gained a patent for a delivery drone in early 2018. Mobile technology and APIs are already improving to the point of drones being piloted by central technology by someone not even near a particular neighborhood delivering packages to homes in the neighborhood.

Additionally, using autonomous vehicles to cross stock freight in warehouses is already happening and expected to increase as technology improves.

- **Internet-of-Things and Vehicle-to-Everything changes**

The Internet of Things and Vehicle-to-Everything (technology to connect the vehicle to other vehicles, the cloud and anything else) could work together to go far beyond ELDs. These networks of technology could improve safety in numerous ways, monitor drivers' health, assist with lane changes and more as information is passed between a vehicle and an entity on the road a traffic light, crosswalk or other signs.

More specific forms of this technology include connecting Vehicle-to-Cloud (V2C), Vehicle-to-Pedestrian (V2P) and Vehicle-to-Grid (V2G). These technologies could improve safety on the road as well as driving efficiency.

- **Inventory network Management**

Inventory network Management (SCM) is the administration of a system of interconnected organizations associated with a definitive arrangement of the item and administration bundles required by end clients (Harland, 1996). The sharing of data among production network systems permits the store network drivers to cooperate with the objective of incorporated and facilitated supply chains for successful inventory network the executives. Data additionally upgrade the execution and lessens the dangers of supply chains since it gives forms executed exchanges and it makes an open door for chiefs when they need it and in the organization they need it. This is the place IT comes into the job and it

comprises of equipment and programming applications.

IT additionally assumes a significant job in incorporating providers, fabricates, wholesalers and clients to fulfill the amount and nature of items. Associations can assemble imperative data along with the whole production network and respond rapidly to any anticipated market changes, accordingly increasing the upper hand by adequately using SCM (Tummala and Schoenherr, 2008). Giving data accessibility and permeability, empowering a solitary purpose of contact for information, permitting choices dependent on complete production network data and empowering joint effort with accomplices are the goals of IT in SCM (Simchi-Levi et al., 2003). The practical jobs of IT in SCM have been sketched out as Transaction. Execution, Collaboration and Coordination and Decision Support (Auramo et al., 2005).

IT frameworks, for example, information trustworthiness, ongoing accessibility, permeability and handling ability of data and institutionalization of business process are relied upon to encourage better coordinating of free market activity between production network individuals and make a magnificent background for leaving on mix with outside accomplices in the inventory network (Tarn et al., 2002). Through the utilization of data innovation in-store network is additionally producing the possibility of digital wrongdoing as "PC helped, for example, hacking, phishing and "PC centered" as abhor violations, telemarketing/web extortion wrongdoings.

Broadly utilized terms for wrongdoing including PCs are PC wrongdoing, PC related wrongdoing, PC abuse, digital wrongdoing, computerized wrongdoing, e-wrongdoing, web wrongdoing, online wrongdoing and so forth. Accordingly, IT is viewed as a basic essential for overseeing production network (Davenport and Brooks, 2004).

The gathering of strategic administration characterizes coordination's as "that piece of production network process that plans, executes, and controls the proficient, compelling, forward and turns around stream and capacity of merchandise, benefits, and related data between the purpose of inception and the purpose of utilization so as to meet client prerequisite". In conventional language the equivalent can be characterized as right item, at the ideal spot, in ideal time, and in right condition.

Notwithstanding, inventory network comprises of all phases that are required to fulfill the client demand. It begins from provider goes through maker, conveyance, retailer lastly achieves the client. The production network the board is the oversight of materials, data and funds as they move in the process from provider to producer to distributor to retailer to client. The developing new advancements are

making vital open doors for the associations to fabricate upper hands in different practical regions of the board including coordination and production network the board.

However, degree of success depends on selection of the right technology for the application, availability of proper organizational infrastructure, culture and management policies. In logistics, information, communication and automation technologies has substantially increased speed of identification, data gathering, processing, analysis and transmission, with high level of accuracy and reliability.

Technology is a means to enhance business competitiveness and performance. It plays a major role in success of supply chain by enhancing the overall effectiveness and efficiency of the logistics system. In logistics many new technologies are used in developed country while in India adoption process is very slow. However due to liberalization of the Indian economy the competitive pressure is building up and the only option to face the competition is to go in for technology enabled operations.

The latest technologies being used in “logistics and supply chain management” are segregated into

- Automatic Identification Technology
- Communication Technology
- Information Technology

Programmed Identification Technology Automatic Identification (Auto-ID) is the term used to portray the immediate section of information or data in the PC framework, programmable rationale controllers or any microchip controlled gadget without working a console. These technologies include Bar Coding, Radio Frequency Identification (RFID) and Voice Recognition. Auto ID can be used for tracking the containers, packages, cartons or a truck carrying the goods on time bound dispatches to the customers.

The benefits of Auto ID include accuracy, cost saving, speed and convenience of data storage and processing of information. The significant Automatic Identification technologies in use are:-

- **Bar coding –**

Bar coding is a sequence of parallel lines of different thickness with spaces in between. These bars are nothing but the items of information in the codified form, which can be read with the help of a scanner. Historically bar codes were first used in a supermarket in USA in 1952. The information printed in barcode includes, country code, manufacturer name, product details, date of manufacture, material content etc. These details are required at user end for inventory management. The bar codes are used in diverse industries such as retail, pharmaceutical, consumer goods, electronics, automobiles etc. The bar

coding offers the following advantages.

- Ease in identification of inventory items during storage, retrieval, pickup, inspection and dispatch.
- Reduce paper work and processing time leading
- Reduce human error
- Increases logistics system productivity through speed, accuracy and reliability.

Impact of Bar code technology on operations of “logistics and supply chain management”

- a) Procurement operation – The parts and components brought from suppliers are assigned bar codes, which contain information on item name, batch number, date of manufacture, order no, serial no etc. The information in bar code helps in identifying and tracking the component. In the warehouse, when the goods enter through a conveyor, they are further scanned by the hand held scanner or scanner fixed alongside the conveyor. The information decoded by the scanner is immediately logged in the central computer which helps real time update of inventory records.
- b) Processing – During the order processing the bar code will help in keeping identification of items based on their date of entry into the warehouse or store. This will ease material storage, retrieval and dispatch in FIFO (First in First out) inventory management system.
- c) Production operation – During the production process the identification of in-process and finished items become easier due to bar coding. The various batches at different stages of production can be easily tracked.
- d) Distribution operation – During distribution, barcode helps in identifying and tracking the transit of finished goods to the customers.

- **Radio Frequency Identification (RFID)–**

“RFID” is an Automation Identification and Data Capture (AIDC) innovation. RFID first showed up in following and access applications amid 1980. RFID-based frameworks take into account non-contact perusing and are viable in assembling and another unfriendly condition where scanner tags couldn't endure. These are applied as an alternative to Barcodes to communicate the inventory data to the reader via radio waves. RFID wirelessly exchanges information between a tagged object and a reader.

An RFID system is comprised of the following components as mentioned below.

- One or more tags called Radio Frequency Tags (RFTs), which includes a semiconductor chip and antenna.

- One or more read/write devices also called readers.
- Two or more antennas one on the tag and one on the reader.
- Application software and the host computer system.

- **RFTs:**

The reader is connected to the central computer. Radio Frequency Tags (RFTs) are a piece of silicon chip to store data in the microcircuit. The RFTs are programmable with erasable memory. Data is stored in coded form and communicated to the reader through waves. The basic principle of tag is that antenna emits the radio signals.

RFTs are very useful to accompany truck shipments. The label will contain data on sender, representative, stock things, amount and esteem, what time the thing voyaged certain zone; even the temperature and so on. The per user gets the label motion with its reception apparatus, translates it and exchanges the information to the host PC framework. RFTs can be attached to virtually anything-from a semi- tractor, to a pallet, containers etc.

RFTs will avoid paperwork and can be helpful in quick clearance at octroi and custom posts. In the warehouse, the barcodes can be applied to the individual inventory items while RFTs can be applied to pallets, containers etc. These will allow the staff to directly communicate to the warehouse computer. RFID has major impact on “logistics & supply chain” of many sectors.

- RFID helps Indian exporters to global retailers like WAL-MART get better and more visibility into movement of their goods within the supply chain and thus become more competitive.
- Improve the ability of manufacturers to better manage the inventory levels.
- Improve the complex distribution system for the Defense operation.
- Improve the complex tracking and distribution operations of the Indian Postal services.
- Improve the tracking, logistics and planning operations of Indian Railways, state public transport agencies.
- Implement automatic toll collection on vast network of high ways.
- **Electronic Data Interchange (EDI)-**

EDI technology is used for transfer of firm’s documents from one computer to another computer. With EDI the business documents such as invoices, cheques, and challans are sent electronically from

one organization to another. In fact, EDI is a drive towards paperless document transfer or transactions. The difference between the email message and EDI message is that, Email is composed and interpreted manually, while EDI message is composed using one software and interpreted by other software. E-mail data is not structured while EDI data or message is structured. EDI message has legal standing in the court of law.

The benefits of using EDI technology in logistics and supply chain management involves: -

- Faster transactions-real time document transfer in the supply chain.
- Just-in-Time manufacturing technique can be adopted.
- Reduction in transaction cost due to paperless operations.
- Reduction in order cycle time and inventory that will help to improve the competitiveness of the customers.
- Improve the corporate trading relationships between parties in the supplychain and creating barriers for competitors.

An advanced working model is tied in with executing computerized abilities alongside the authoritative layers of administration, forms, information and execution the board, and IT. It takes into consideration the required dimensions of reconciliation and institutionalization of procedures. Process automation and centralization help organizations make their personnel more efficient. Better visibility enables companies to manage their own as well as contracted assets in a more cost-effective way and optimize the customer and product portfolio. From our experience, process automation typically results in up to 20% cost saving for the relevant cost base, while centralization, including off-shoring, helps save up to 50% in cost. Further, with digital management of corporate assets, companies can improve EBIT margin by 5% and in some cases, even more. The benefits of a Digital Operating Model are broadly divided into three categories:-

- **Process Automation:**

Straight through processing, the complete execution of an end-to-end process without the need for re-keying or manual intervention has been identified as the ultimate automated process design target. It is important that all the data relevant to fully completing a transaction is available to an employee in a well-structured manner. For instance, complete data for a transportation manager would include details such as transit times, rates, and weight limits for all the suppliers and warehouses. Similarly, for a customer service agent, processing customer

orders would mean the agent has access to the complete contract and product master data. For the management of physical flows, it is important to have a closely-knit web of checkpoints and milestones that are tracked and monitored. This will ensure that the physical processes are in tandem with the digitally planned and documented processes.

- **Organizational Flexibility:**

With a Digital Operating Model, management has greater freedom to choose the appropriate degree of centralization needed to support specialization or minimize process costs given different local labor costs and productivity levels across locations. Off-shoring and outsourcing of functions depends on the capability of an organization to manage processes independent of the location of the customer or the physical flows. To do this effectively all process documents have to be accessible on a digital platform (an Electronic Document Management system) and the process has to be supported by a digital workflow. A major benefit for an organization when it centralizes certain specific functions is higher value through better quality and higher productivity. Furthermore, central master data management helps avoid double entries and inconsistencies; while supply chain planning activities benefit from a bigger pool of optimization objects.

- **Digital Management of Corporate Assets**

Physical flows captured by “digital finger prints” create improved visibility of all corporate assets. The utilization of a specific production line, truck or administrative function can be made visible with little extra cost. The major benefit of a fully Digital Operating Model in terms of visibility lies in the integration of operational and financial data (which today are often separated up to a profit center level). For instance, customer orders can be evaluated against individual process costs instead of average cost.

In some cases, connecting internal data with external facts such as market share or competitors’ prices can lead to meaningful new insights.

Consider the case of Amazon: they are responsible for front-end customer relationships and back-end logistics. Their fulfillment model links sellers of various products and consumers while being responsible for end-to-end processes such as consumer relationships, order management, inventory management and fulfillment activities. After sellers send products to Amazon’s fulfillment centers, Amazon’s business partners upload listings into Amazon’s online system.

The online system provides PDF labels and shipping statuses, receives and scans inventory, and records item storage dimensions. It also locates the products using methods such as advanced web-to-warehouse, high-speed picking and sorting and fulfills orders placed directly or by sellers. This way, both partners and customers are able to track their inventory and shipments. This digital management has helped Amazon achieve high performance and profitability standards.

- **Integrated Execution:**

It is important to integrate the different supply chain functions such as product development, procurement, production, maintenance, and logistics across locations in order to minimize “waste” or non-value added activities such as double entry of data, the reconciliation of information from different sources or the correction of customer invoices. The main aim is to design end-to-end processes which give employees all the information they need for straight-through processing. For example, ABB, in-line with its integrated global supplier strategy, built an adaptable and agile supply chain through technology architecture with its suppliers and other value chain functions at multiple locations. They implemented common processes across the globe for the relevant business domains by deploying various shared global applications, redesigning processes to improve flexibility to respond to uncertainty, and building a dynamic supply chain instead of a static one, thereby fulfilling the interests of multiple players.

- **Integrated Supply Chain Performance Measurement:**

Using Web 2.0 technologies, every order or transaction can be traced in a Digital Operating Model. Tagging technologies such as barcodes or RFID provide real-time data feeds for physical movements. Virtualized data centers make available information that was concealed, until now, by processing and storing data for multi- function and multiplication supply chains. Combining this operational data with financial information, along with data from external sources like market data or benchmark information, can help in better decision making compared to the reporting techniques often used today.

- **Supply Chain Technology Architecture and Infrastructure:**

Innovation engineering is the structure rationale for business procedures and IT foundation and mirrors the reconciliation and institutionalization prerequisites of the association’s working model. Though many technology requirements may already be in place, the challenge is to select and implement digital technologies and integrated platforms that employ reusable and exchangeable components with minimal investment in time and effort.

Walmart's extensive use of technologies such as demand pattern analysis, RFID, wireless tracking devices, warehouse labor management systems, vehicle management systems, and voice-directed picking devices for continuous improvement in its supply chain. If an organization aims to successfully implement a transformation program, it will have to address all the five dimensions discussed above in a consistent and well thought out manner.

- **Supply chain: -**

Supply chain is a series of business processes in which products or services are produced and delivered to customers through value adding activities implemented by involved parties. In a manufacturing supply chain, the value adding activities mainly include product development, product design, raw materials supply, manufacturing the product, product packaging, delivery to customers, and post-sale services.

Supply chain management for a manufacturing company refers to incorporating its manufacturing process to all value-adding activities implemented by parties who add values to its final products. The term, supply chain, is a simplified description for vertically related business processes. Nowadays, it is more frequently referred as supply networks or supply chain networks because a company is likely to be involved in more than one supply chain and the related companies form business networks. Since IT became catalyst of improving business processes, "Supply Chain management" has gained tremendous benefits from applying ICT to various aspects of its tasks. IT application moves from data management to control automation, and then moves to enterprise integration.

Supply chains have advanced the last two decades with improved efficiency, agility and accuracy. However, it was only at the time when the Internet technology became a practical means of information exchange in industries, that supply chain management started changing its way of allocating and controlling resources across organization boundaries.

When business activities of a company are electronically incorporated in value- adding processes, "e-supply chain management" becomes a new term that distinguishes itself by Internet-supported, net-centric and real-time features from traditional supply chain management. In this paper, principles, methodologies and examples of "e-supply chain management" will be discussed.

- **Principles of e-supply chain management:**

The fundamental challenge for "Supply Chain Management" is how to efficiently integrate and optimize supply chain operations with dispersed marketplaces and characteristic demands using the latest advances in information technology. E-Business using Internet technology to facilitate

information exchange and communication in business networks has emerged as an innovative approach further exploring value-adding opportunities in supply chains. The e-business approach plans and executes front-end and back-end operations in a supply chain using Web-based applications. Incorporating e-business approach in supply chain management has been proved as a competitive method for increasing values to be added and improving process visibility, agility, speed, efficiency, and customer satisfaction.

E-Supply chain refers to the business activities that incorporate e-business approaches into supply chain processes. "E-Supply chain management" involves applying e-business technologies to assist and optimize value-adding activities in supply chains. A more detailed definition of "e-supply chain management" can be found in the description of Norris et al.: "Electronic supply chain management (e- SCM) is the collaborative use of technology to enhance business-to-business processes and improve speed, real-time control, and customer satisfaction. Not about technology change alone, e-SCM is about culture change and changes in management policy, performance metrics, business processes, and organizational structures across the supply chain."

A key feature of e-business equipped "supply chain management" is network centric. This focuses on connectivity, co-operation, and co-ordination and information transparency. Networked supply chain partners share knowledge, information, and other required resources. The networked relationships change the traditional supply chain information flows from linear transmission to end-to-end connections i.e. information can be transferred directly from any partner of the supply chain to another partner without distortion and delay.

This networked information transfer provides transparent customer demand information to any part of the supply chains.

Impacts of information transparency on supply chain operations are not only in shorter lead time and leaner production, but more importantly, changes in the way that supply chain partners collaborate. Partnerships are built on enhanced mutual trust and interdependency. Based on the principle of network-oriented organizations, supply chains in an Internet-enabled environment should be managed by concentrating on their core business competence and contact with other partners for the other functions; sharing common goals of the supply chain and operating as an integrated system; co-operating with each other based on co-operative norms and solving conflicts; and recognizing and relying on interdependence of resources.

- **Statement of Problem:**

Despite of the attempts and the research work by the robot researchers to emulate human intelligence and appearance, the result is not achieved. Most robots still cannot see and are not versatile object is not properly recognized by it. For the effective and proper mechanism of robotics technology it is important to prioritize the inefficiency associated in it. Though the wide use of robotics technology will take away many jobs of human being and it will create unemployment in the society.

The use of robots in performing various jobs will lead in the reduction of jobs of the human being so the initiation should be done systematically. The developments of robots will lessen many high-end precision jobs and will help in various sectors like agriculture, military, health and so on. This will lead to robots as a helper in the workplace with some degree of balance between the actual requirement and the greed.

The society should support and care for the developments in the robotics technology as this will be beneficial for the people and the various sectors of an economy. Many tasks which are beyond the human ability can be performed with the help of robotics and robotics in the war will be very helpful in its operation.

The advancement of robot technology will be amazing and today, robots can be seen virtually in all the fields from transport to health, and recreations to industries. The use of this technology will get proclamations from the society for taking away the jobs of ordinary man. But to solve the issues related to this the usage of robots should be applied to selected tasks and mostly be used in the areas where human cannot reach or is not capable of performing.

There are many researches about the evolution of the technology within the industry and how is the new concept of “smart factory” which is called “Industry 4.0”. However, the concept of this development applied to logistics processes within the manufacturing, is still a non-spread topic. Therefore, the aim of this thesis is to talk about the evolution of logistics systems and towards this evolution is moving nowadays.

1.2 BACKGROUND:

New technology is transforming daily business processes for many in supply chain management. The need for real-time tracking and accurate delivery systems makes supply chain management ripe for technological innovation — and mobile, wireless, handheld technology is leading the way throughout the logistics and transportation sectors.

With the ever-changing aspect of technology, keeping up with new capabilities and best practices can be

difficult for large companies who have deep investments in older technology - it is a never-ending process. Although transitions take time, leveraging new technologies is key in this competitive industry.

- **The Objectives of this Dissertation are:**

- To give a brief perspective of what Industry 4.0 is
- To make a framework of Logistics 4.0
- To explain the state of the art of Logistics 4.0 and towards this concept is moving
- To give actual examples of the technology of Logistics 4.0
- To make an implementation in the Lab of RFID technology which is an essential part of the
- To explain a real implementation of the latest and greatest tech, which meets some of the Concepts of “Logistics 4.0”

1.3 PURPOSE OF THE STUDY :

- Boosting customer service by ensuring that the right amount of the right product is delivered at the right time with appropriate sales support.
- Reducing operating costs by decreasing purchasing and production costs as well as total supply chain costs.
- Improving a business’s financial position by increasing profit leverage, decreasing fixed assets, and increasing class flow.

1.4 HYPOTHESIS OF THE STUDY:

- There is positive impact of technology on supply chain management in terms of efficiency and transparency.
- Smoother and more frequent communication undoubtedly makes business operations easier.

Concepts of “Logistics 4.0??”

To enables to share information in real-time and to storage big amount of data in order to have access whenever and wherever is wanted, although it is essential a good security software in order to protect all this information. Therefore, by the use of Internet, a network can be created which connects factories and people as well as machines with each other, making a faster and more optimized logistics processes.

systems, which collect and analyses data and Hence, my main motivation is to finish my bachelor's study knowing what can be understood nowadays as smart technology in logistics. As well as read and know about the actual logistics scenario and towards this scenario is moving, writing about:

- How logistics have changed overtime?
- How the to is being implemented for supply chain management?
- How to and the RFID systems can change the actual logistics scenario?

Research Problems & Gaps

The main challenge writing this synopsis has been the lack of information, since Logistics 4.0 and Process Automation holds the future of this industry. This is not some tech which has been tried and tested and is at the maturity state, it has just begun. It is easy to find information about Industry 4.0 and its components but it is not easy to find this information focused in the logistics segment.

Furthermore, I have found a challenge in the fact that logistics is a broad term that encompasses many different processes, therefore it has been a challenge to include the right contents in order to give a clear understanding of the new evolution in logistics and make a proper framework of it. My main contribution in this paper will be a framework of the industry 4.0 and how the way of working and methodology has changed with the implementation of these new techs - like: Robotic Process Automation and how the use of the Internet of Things (to) and Radio Frequency Identification(RFID) systems can trigger an evolution of the actual logistics.

This paper has appeared flow status of SCM and coordination examine from point of view of research strategies, information investigation methods, information sources, and the dimension of examination. It has appeared present research is more thorough than the past research. Thoroughness suggests care in dodging arbitrarily finishing up something the exploration did not really uncover. It implies that examination ought to speak to the real world and yield ought to be relevant, all things considered issues. At that point just the examination network can really bolster and legitimize the cases it makes. The accompanying focuses offer some heading for future research:

- (1) Earlier Scand coordination scientists have taken a gander at the operational and money related parts of supply chains. Serious issues were stock administration, arrange advancement, office design and areas and request estimating. The most widely recognized research strategies utilized were reproductions and numerical demonstrating. Scientists were likewise intrigued to discover "what" part of the wonder, and for that study strategy

was utilized. In any case, with time and development in the order the exploration addresses changed to "how" and "why". Further the idea of issues additionally changed. Issues, for example, how works inside an organization can be incorporated, how organizations can arrange their exercises and the chain of client administration to consumer loyalty to client esteem. Every one of these issues includes conduct issues and is influenced by components like culture, relationship, trust and power. This brings the chance to social research techniques, which can bring more experiences to what we think about production network today.

- (2) Another purpose behind this move is the issue with positivist methodology, which accepts that entire is equivalent the entirety of its parts while SCM depends on "frameworks considering". In this worldview, it is accepted that the entire varies from the aggregate of its parts because of cooperative energy impacts, for example, information relies upon the framework and how it is characterized. One can without much of a stretch see that the hidden supposition of the exploration techniques and control are contracting with one another. Attributable to these positivist techniques predominance the exploration in the order can't look the framework comprehensively, and more research as on today is centering at the capacity or at the firm dimension.
- (3) Arlbjörn and Halldorsson (2002) expressed that the focal component or their-your-faceofcoordinationisthe"streamconsidering".Thebad-to-the -bone might be defined as pursues: Directed toward the progression of materials, data and administrations, along the vertical and even esteem chain (or inventory network) that tries to, arrange the streams and depends on, framework considering (an all-encompassing perspective), where the unit of investigation basically is the "stream". By stressing on the stream supposing he unmistakably implies that examination should concentrate on between authoritative dimensions and should scientist should treat production network as one framework. Be that as it may, this between authoritative dimension investigate is at present less in the order when contrasted with the central (work or firm level) inquire about. More research is required at bury association level then just a solitary one can build up energy about idea inventory network.
- (4) The advancement of new control depends on the utilization of ideas, definitions, speculations, standards, and standards from different orders. There are numerous speculations from different orders that are conceivably important to the examination and investigation of different coordination issues. Stock (1997) has suggested 53 hypotheses of other order like Anthropology, human science, Computing, Economics,

Philosophy, Political science and Psychology which can be utilized in coordination's inquire about. Bethat as it may, at present, the speculations and techniques for other control are connected in not very many papers.

- (5) Most of the creators in the distributed papers are from North America (basically the US) and Europe, and the setting taken by them is likewise from these nations. It would be better if in future these specialists additionally look inventory network issues of another piece of the world, particularly the creating nations which are currently winding up either the sourcing focuses or markets of numerous organizations.

It is prescribed that in future, research ought not to ignore the previously mentioned focuses, and after that, just the target to build the estimation of items and administrations to the client in the inventory network versus improved client administration and quality, and lower complete expense can be accomplished. It is trusted that this work will go about as an impetus in packing the expectation to absorb information as for research strategies rehearses in SCM and coordination, and furthermore quicken the utilization of more prominent methodological thoroughness in future research.

- Theories of other order are connected in not many papers. Just in two papers the hypothesis/systems of other order are proposed first is Lemke et al. (2003) led the exploration utilizing the repertory framework system (from brain science) and investigated the significance of provider producer relationship. Repertory lattice strategy was picked, as it is a ground-breaking research device for examining interviewees' comprehension of complex themes. Second is Pfohl and Buse (2000) utilized the examination strategy dependent on the thoughts of the grounded hypothesis approach and incorporated a few components of the ethnographic way to deal with touch base at a comprehension of social capacities.
- Secondary information sources are utilized in numerous papers, however not in an inventive manner. Aside from in a couple of papers, there was some investigation done on information, else they are simply taken from some administration report and put there.
- The explore at entomb authoritative dimension is less. In any case, the goal of the SCM is to coordinate every one of the organizations in the esteem chain and treat them as a solitary substance. In any case, the ebb and flow investigate has neglected to take a gander at that point of view of the SCM.

CHAPTER: 2

LITERATURE REVIEW

2.1 REVIEW AREA NARROW:

SCM is the integration process of dealing business partners, which starts from supplier of raw material to final customer/consumer, including all transportation activities, intermediate processes, storage activities and, finally, sale to the end customer/consumer. Nowadays competitive environment, the practices of SC are acting as a crucial supporter in the success of business in terms of reducing the overall business cost, eliminating waste, increasing the quality of products and services and, finally, building competitive edge. Since the 1980s, several firms have been aware of the benefits of supply chain. The foundation of SC can be seen in the areas of manufacturing, storing, procurement, with supply chain members and finally, as technology, political forces, economic conditions and market position change all over the world, the practice of SCM also changes. In simple words, these are major leading indicators of supply chain.

2.2 REVIEW AREA BROAD:

A. C. Fernandes et al. (2017). The purpose of this study is to develop a theoretical basis for integration of quality management (QM) and supply chain management (SCM). For that purpose, some common practices of both approaches are identified as having impact on the four balanced scorecard perspectives. The main concepts of SCM and QM were reviewed from the literature in order to develop key practices that are common to both approaches. The findings suggest that the synergies of QM and SCM can promote the integration of the approaches which will promote a set of significant organizational benefits. This study focuses on the integration of QM and SCM through their common practices. This issue has not been broadly explored and for that reason this paper contributes to the understanding of the critical factors for an effective integration of supply chain QM.

M. K. Lim et al. (2017). Sustainable supply chain management is one vital element in achieving competitive advantage in business management and knowledge management is seen to be one key enabler. However, in previous studies the interrelationships between knowledge management and sustainable supply chain management are still under-explored. This study proposes a set of measures and interpretive structural modelling methods to identify the driving and dependence powers in sustainable supply chain management within the context of knowledge management, so as to improve the performance of firms from the textile industry in Vietnam. The research result indicated that learning organisation, information/knowledge sharing, joint knowledge creation, information technology and knowledge storage are amongst the highest driving and dependence powers. These attributes are deemed

to be most-effective to enhance the performance of firms. To further enhance the value of this research, theoretical and managerial implications are also discussed in this study.

IMPACT OF TECHNOLOGY ON SUPPLY CHAIN MANAGEMENT

L. Wu et al. (2016).As traditional supply chains are increasingly becoming intelligent with more objects embedded with sensors and better communication, intelligent decision making and automation capabilities, the new smart supply chain presents unprecedented opportunities for achieving cost reduction and enhancing efficiency improvement. The purpose of this paper is to study and explore the current status and remaining issues of smart supply chain management. Studies in those aforementioned subject fields are reviewed, categorized, and analyzed based on the review questions defined in the study. It is notable that while the topics of converging atoms with digits are increasingly attracting attention from researchers and practitioners alike, there are many more interesting research questions needing to be addressed.

K. Oettmeier & E. Hofmann (2016).The purpose of this paper is to provide a systematic analysis about the effects of additive manufacturing (AM) technology adoption on supply chain management (SCM) processes and SCM components in an engineer-to-order environment. Based on two explorative case studies from the hearing systems industry, the impact of AM technology adoption on SCM processes and SCM components is investigated. General systems theory and the contingency approach serve as theoretical underpinning. Not only the internal processes and management activities, e.g. in manufacturing and order fulfillment, of producers are affected by a changeover to AM, but also the SCM processes and components relating to the supply and demand side of a firm's supply chain. Endogenous and AM technology-related factors are contingency factors that help to explain differing effects of AM technology adoption on SCM processes and SCM components.

L. Barreto et al. (2017).During the last decade, the use and evolution of Information and Communication Technologies (ICT) in industry have become unavoidable. The emergence of the Industry Internet of Things (IIoT) promoted new challenges in logistic domain, which might require technological changes such as: high need for transparency (supply chain visibility); integrity control (right products, at the right time, place, quantity condition and at the right cost) in the supply chains. These evolvments introduce the concept of Logistics 4.0. In this paper, it is presented some reflections regarding the adequate requirements and issues enabling organizations to be efficient, and fully operational in Logistics 4.0 context.

R. Cole et al. (2019).This paper aims to encourage the study of blockchain technology from an operations and supply chain management (OSCM) perspective, identifying potential areas of application, and to provide an agenda for future research. An explanation and analysis of blockchain

technology is provided to identify implications for the field of OSCM. The hype around the opportunities that digital ledger technologies offer is high. For OSCM, a myriad of ways in which blockchain could transform practice are identified, including enhancing product safety and security; improving quality management; reducing illegal counterfeiting; improving sustainable supply chain management; advancing inventory management and replenishment; reducing the need for intermediaries; impacting new product design and development; and reducing the cost of supply chain transactions. The immature state of practice and research surrounding blockchain means there is an opportunity for OSCM researchers to study the technology in its early stages and shape its adoption. The paper provides a platform for new research that addresses gaps in knowledge and advances the field of OSCM. A research agenda is developed around six key themes. There are many opportunities for organisations to obtain an advantage by making use of blockchain technology ahead of the competition, enabling them to enhance their market position. But it is important that managers examine the characteristics of their products, services and supply chains to determine whether they need or would benefit sufficiently from the adoption of blockchain. Moreover, it is important that organisations build human capital expertise that allows them to develop, implement and exploit applications of this technology to maximum reward. This is one of the first papers in a leading international OSCM journal to analyse blockchain technology, thereby complementing a recent article on digital supply chains that omitted blockchain.

M. A. Moktadir et al. (2018). Researchers and practitioners are giving significant attention to Industry 4.0 due to its numerous benefits to manufacturing organizations. Several aspects of Industry 4.0 have been studied in the literature. However, studies on the challenges for implementing Industry 4.0 in manufacturing operations have received less attention. To address this gap, this study identifies a set of challenges (framework) for implementing Industry 4.0 in manufacturing industries. This framework is evaluated in the leather industry of Bangladesh aided by a novel multi-criteria decision-making method named Best-Worst method (BWM). The findings of the study showed that 'lack of technological infrastructure' is the most pressing challenge that may hurdle the implementation of Industry 4.0 whereas 'environmental side-effects' is the less among the challenges that may hinder implementation of Industry 4.0 in the Bangladeshi leather industry. This result may help decision makers, industrial managers and practitioners in the Bangladeshi leather industry to realize the actual challenges confronting them when attempting to implement Industry 4.0 and focus their attention on how to address these challenges to pave ways for a successful implementation of Industry 4.0.

P. Khanna, & A. Sharma (2017). Business imperatives are changing for every industry across the globe. The focus is on transforming supply chain by improving its performance and efficiency. In today's dynamic world Internet of Things (IoT) is significantly contributing by the use of connected devices.

IoT facilitates with real time information using automated and intelligent seamless processes in the supply chain. The objective of this study is to understand the benefits and challenges of integrating IoT in supply chain. The research has done an extensive literature review to explore the role of IoT as an enabler for end to end supply chain. Technology cannot be functional without the intervention of channel partners. Therefore, the paper tries to explore and develop an integrated framework to link IoT with SCM and further attempts to see its implication on HR Management. Limited research has assessed the inter linkages between SCM performance and HR Management because of the intervention of technology, especially IoT. The researcher's anticipate that finding of this paper will be practical and will be beneficial for researchers, academicians as well as practitioners. The research would certainly help practicing managers to comprehend the significance and role of IoT in gaining SCM effectiveness by effective HR Management. The study would also broaden the understanding of interdisciplinary approach at the academic level. This transformation can be driven by the perception of motivated individuals and channel partners in end to end supply chain. Satisfied HR at individual and channel level is ultimate and vital goal of every supply chain.

G. Büyüközkan, & F. Göçer (2018). Suppliers, partners, companies and dealers in supply chains do use, generate and share information with others. These associations lead to a multitude of challenges and opportunities within the supply chains. A Digital Supply Chain (DSC) is a smart, value-driven, efficient process to generate new forms of revenue and business value for organizations and to leverage new approaches with novel technological and analytical methods DSC is not about whether goods and services are digital or physical, it is about the way how supply chain processes are managed with a wide variety of innovative technologies, e.g. unmanned aerial vehicles, cloud computing, and internet of things, among others. Recent literature highlights the importance of DSC and many industrial researchers discuss its applications. This article reviews the state-of-the-art of existing DSC literature in detail from both academic and industrial points of view. It identifies key limitations and prospects in DSC, summarizes prior research and identifies knowledge gaps by providing advantages, weaknesses and limitations of individual methods. The article also aims at providing a development framework as a roadmap for future research and practice.

S. Luthra, & S. K. Mangla (2018). Industry 4.0 initiatives can influence whole business system via transforming the means the products are designed, produced, delivered and discarded. Industry 4.0 is relatively novel to developing nations, especially in India and needs a clear definition for proper understanding and practice in business. This paper aims to recognize key challenges to Industry 4.0 initiatives and analyze the identified key challenges to prioritize them for effective Industry 4.0 concepts for supply chain sustainability in emerging economies by taking Indian manufacturing industry perspective. Industry 4.0 initiatives can help industries to incorporate environmental protection and control initiatives as well as process safety measures in supply chains towards sustainable supply chains.

However, adoption of Industry 4.0 initiatives is not so easy due to existence of many challenges. Therefore, the present research identifies 18 key challenges to Industry 4.0 initiatives for developing supply chain sustainability using an extensive literature review. These challenges were analyzed through 96 responses received from Indian manufacturing sector using a questionnaire based survey. Explanatory Factor Analysis results classified identified challenges into four key dimensions of challenges. Analytical Hierarchy Process further ranks the identified dimensions of challenges and related challenges. Findings of the study revealed that Organizational challenges holds the highest importance followed by Technological challenges, Strategic challenges, and Legal and ethical issues. This work is very useful for practitioners, policy makers, regulatory bodies and managers to develop an in-depth understanding of Industry 4.0 initiatives and eradicate the potential challenges in adopting Industry 4.0 initiatives for supply chain sustainability.

2.3. FACTORS CRITICAL TO SUCCESS OF STUDY

D. S. Prasad et al. (2018). Critical success factors (CSFs) are the enablers to address the successful implementation of sustainable supply chain management (SSCM) practices in organizations. This study identifies and consolidates various relevant factors to develop the SSCM constructs conducive to supply chains in the Indian steel sector. A comprehensive framework of sustainability measurement has been developed through successive stages of data collection, analysis and refinement. Data have been collected from various departments of Tata Steel, SAIL, Essar and Jindal in India. The outcome of this research is a set of reliable, valid and unidimensional first-order measurements that can be subsequently used in conceptualization and measurement of the sustainability of supply chains in steel industry. Using factor analysis, we identify four constructs, namely favourable organizational environment, sustainable procurement initiatives, compliances to sustainability standards and external environmental pressures, which the organizations need to focus on. Additionally, using relative importance index ranking based on the survey data, the top three CSFs are compliance to environmental standards (ISO 14001 certification), safety and health focus (OHSAS 18001 certification) and top leadership commitment and support—all of which are within the organization's own control. This study contributes to the continuing research of supply chain sustainability and provides supply chain managers with a practical approach for measuring and implementing sustainability practices across the steel supply chains.

S. Yadav, & S. P. Singh (2020). Way back the development of Blockchain (BC) technology, Traditional supply chain (TSC) failed to meet the demand of customer of reasonable price with high quality. The current trend is the time to integrate and to make the existing system smarter, automated and sustainable. Researchers are working on the integration of information and communication technology with the supply chain (SC) and continuously endeavor to achieve an efficient SC. This paper is an attempt to study the use of BC technology and a try to develop efficient sustainable supply chain management

(SSCM) rather than the inefficient design of supply chain management (SCM). Important variables related to BC are identified from the literature after going through discussion with academician and industry experts. These variables are further analyzed and modeled using Principal Component Analysis (PCA), Fuzzy-Decision making trial and evaluation laboratory (DEMATEL). PCA is applied to form the principal factor from these identified variables based on possible correlation. Although, the application of Fuzzy-DEMATEL is adopted to identify major causes that help to achieve sustainable supply chain (SSC) after integration of BC technology. The proposed integrated (incorporated) approach of PCA and Fuzzy-DEMATEL found six major causes namely Data safety and Decentralization, Accessibility, Laws and Policy, Documentation, Data management, and Quality. This study is revolving around the integrated approach of two streams namely BC-related Information technology and SC from Operations. This research represents the significant role of causes, which leads to the integration of BC with the SC resulting in achieving sustainability. BC technology is still in their nuance stage and this study will motivate researcher and industrial practitioners to achieve a more efficient and effective goal in SC practices to achieve sustainability.

2.4. SUMMARY:

The review of literature showed that current technology is the most success factor for supply chain management. The factors help in increasing efficiency and control over production, increased collaboration between supply chain partners and makes more effective order tracking and delivery.

CHAPTER 3

RESEARCH DESIGN, METHODOLOGY AND PLAN

This study implements a survey methodology. The unit of analysis is a dyadic SC relationship between a supplier firm and a customer firm. The proposed constructs were measured at the SC dyad level from supply chain partners' perspective. The approach of collecting SC level data has been adopted by a number of studies that focus on the impact of SC strategies or SC information systems on SC performance (Malhotra et al. 2005; Monczka et al. 1998; Naras, Pterimhan and Jayaram 1998; Tan et al. 1999).

The sampling frame of the survey included those supply chain professionals who have direct responsibility for and knowledge about the SC function in their firms, and are involved in one of two professional organizations (ISM and APICS) in the supply chain industry. This section describes the methodology and the development of measures for the empirical study. Specifically, three key areas are discussed: instrument development, operationalization of the constructs, and sample.

3.1 DATA SOURCES:

METHODS OF DATA COLLECTION

a. "Primary Data"

Of all the types of data, what we can obtain from direct experience is "primary data". "Primary data" is collected from managers on the basis of different factors. Closed ended Structured Questionnaire are used for gathering information.

- A "**questionnaire**" is the most general method of data collection. The procedure may seem very easy because after having a "sample or a focus group, we simply ask the questions and record the answers". The hard part is finding the "perfect group and questions". To ask questions, "we can use our survey, which can be completed online or in a personal format. Another way of asking questions is through interviews". The main benefit of this data collection method is that we can obtain plenty of data. It will contain 15 questions for the study helps to get conclusion for the study.
- **Interview Procedure** is the tool which helps to know the perceptions of the managers on how technology helps to make supply chain management smoother, effective and efficient.

b. "Secondary Data"

Secondary data is the analysis and synthesis of primary research that has been previously compiled. Secondary data was obtained from "market research data, journals, old reports or any other sources where relevant information was stored".

SAMPLING TECHNIQUE AND SIZE

Sampling refers to the way that observations are selected from a population to be in the sample for a sample survey.

Sample size

The sample related to the present study basically includes the managers as 100 sample size of companies' implemented technology to make supply chain management smoother and effective.

Sample technique

Convenience sampling method was used for this research.

3.2 RESEARCH DESIGN:

To fulfill the objectives of the study, in this research project the type of research used is descriptive in nature.

"Descriptive research" explains the individuality of the "population or phenomenon" that is being studied.

The present study has been carried out to assess the process automation and latest technological implication for supply chain management. For this purpose a survey carried out for the collection of data which is helpful for the study.

3.2.ANALYSIS AND INTERPRETATION OF DATA

The collected data was analyzed by using SPSS. Data analysis forms the crux of any research, particularly those which involve primary data collection. To analyze the data obtained through the questionnaire, it firstly be coded numerically to prepare the data sheet in MS-Excel. To further analyze the tabulated data, descriptive and inferential statistics was employed. Descriptive statistics refer to a meaningful presentation of data that enables a simpler interpretation of the data. It presents a quantitative description in manageable form. The same was employed in this study. For processing Content analysis, questionnaires were coded and the data was entered in the latest version of SPSS 21. Interpretation: After completion of all process of the analysis mentioned above, evolving learning from analysis was carefully observed and recorded. The meaning and reflection of categories and the pattern was clearly described. Thus the final result will be recorded for drawing conclusion of the study.

CHAPTER: 4

FINDINGS AND ANALYSIS

Pie Chart Count of 1. A sequence of business and information links is called a

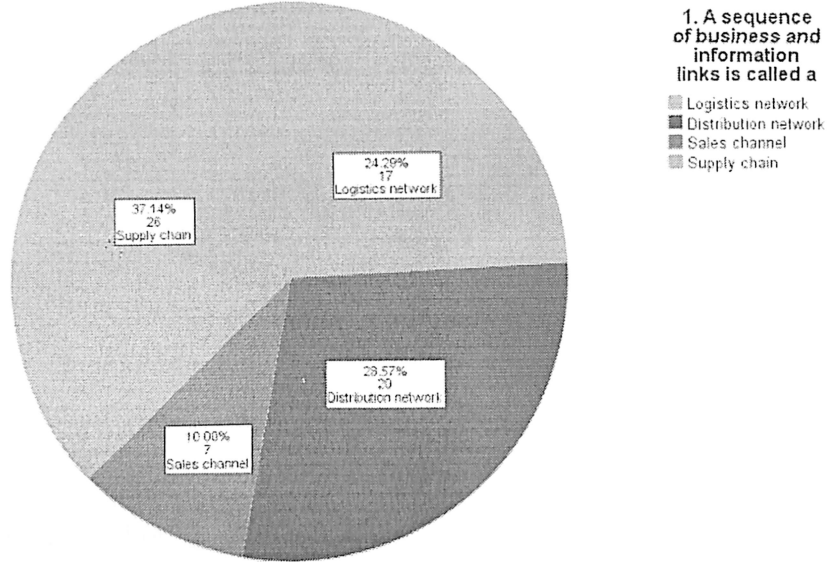


Figure No. 4.1 Business and information

Analysis:

Out of 100 respondents, above response had shown as a result 24.29% of the Logistics network, 28.57% Distribution network, as Sales channel and 37.14% as Supply chain for a sequence of business and information links.

Pie, Chart Count of 2. Supply chains link operators to suppliers in _____?

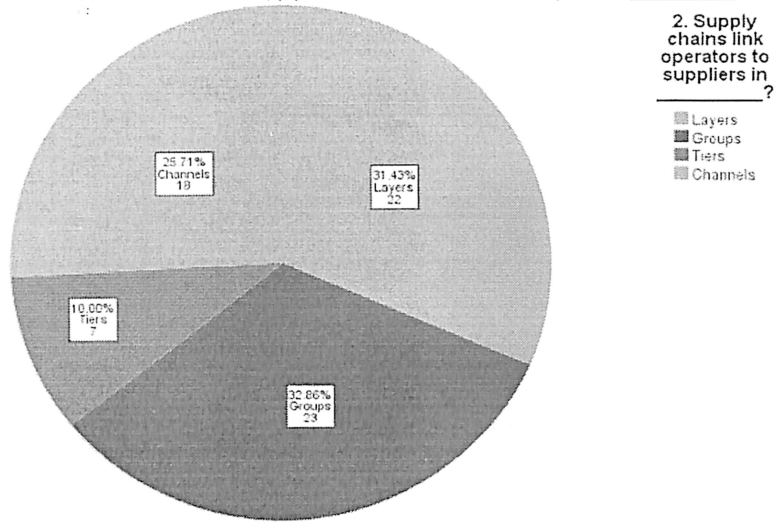


Figure No. 4.2 Chain link operators to suppliers

Analysis:

Out of 100 respondents, above response had shown as result that 31.43% of the Layers, 32.86% Groups, 10% as Tiers and 25.17% as Channels, are Supply chains link operators.

Pie Chart Count of 3. Activities which are undertaken before the final operation are termed _____ activities.

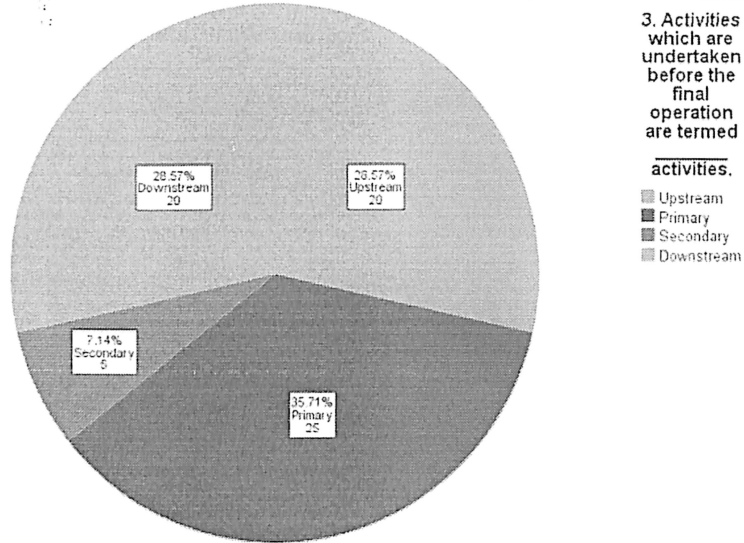


Figure No. 4.3 Operation are termed

Analysis:

Out of 100 respondent, above response had shown as result that 28.57% of the Upstream, 35.71% Primary, 7.14% as Secondary and 28.57% as Downstream, activities are undertaken before the final operation.

Pie Chart Count of 4. In the automotive supply chain information flows in which direction?

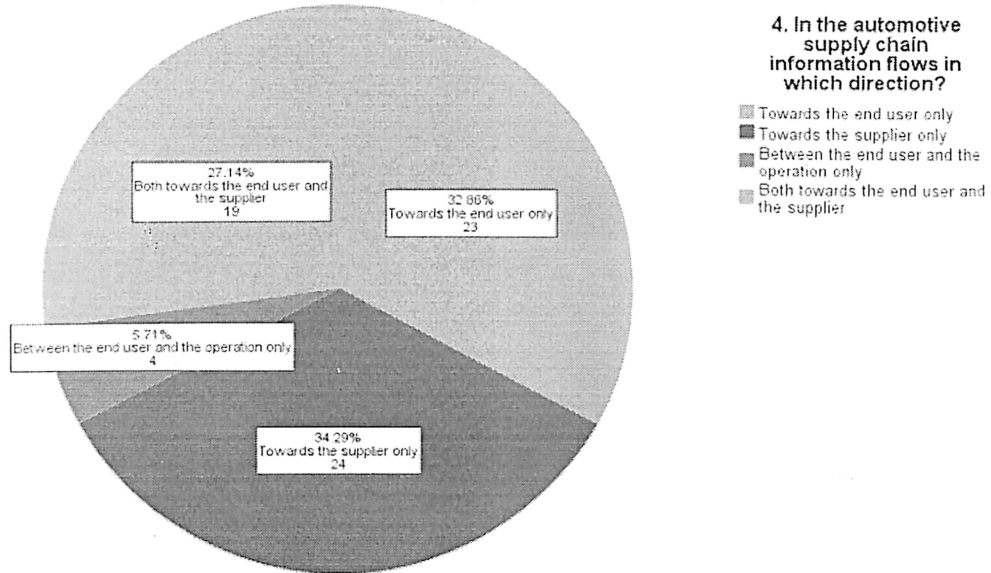


Figure No.4.4 Information flow

Analysis:

Out of 100 respondent, above response had shown as result that 32.86% of the towards the end user only, 34.29% towards the supplier only, 5.71% as between the end user and the operation only and 27.14% as shown the supply chain information direction flow.

Pie Chart Count of 5. How do automotive companies mainly sell their new products?

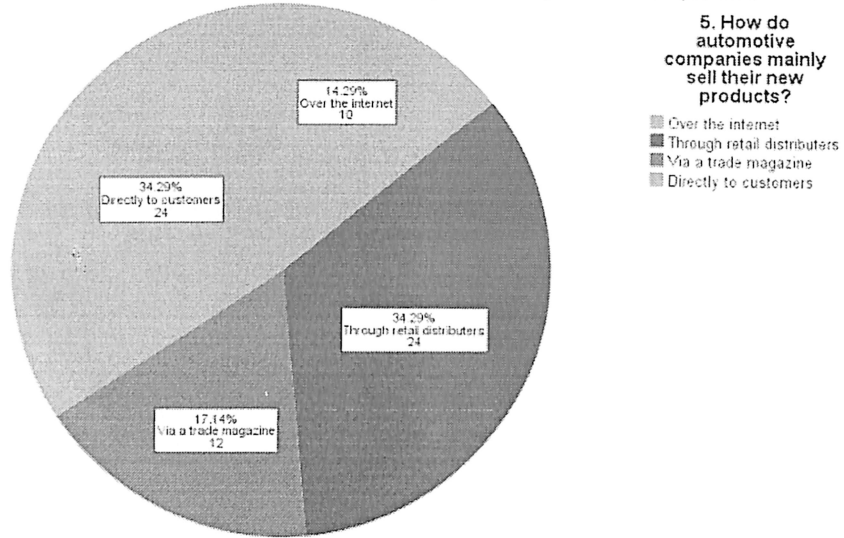


Figure No. 4.5 Companies mainly sell

Analysis:

Out of 100 respondent, above reaction had appeared as result that 14.29% of the Over the internet, 34.29 Through retail distributors, 17.14% Via a trade magazine and 34.29% Directly to customers, The propoition demonstrate the automotive companies, Who mainly sell their newproducts.

Pie Chart Count of 6. Selecting suppliers and purchasing items is called _____?

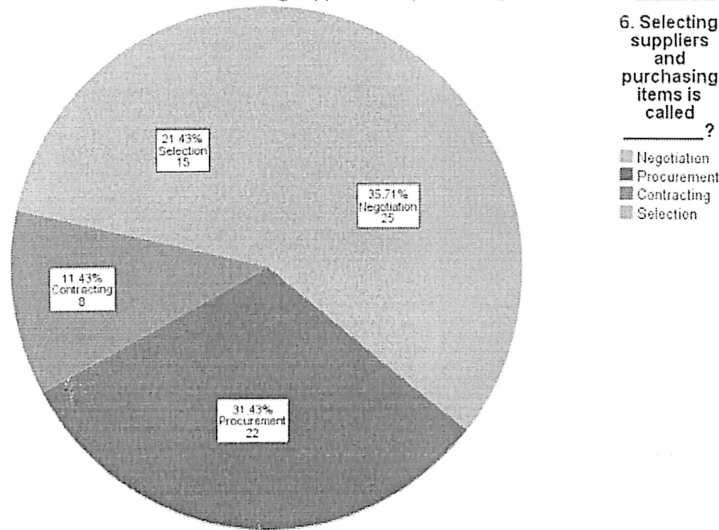


Figure No.4.6 Purchasing items is called

Analysis:

Out of 100 respondents, a above reaction had appeared as result that 35.71% of the Negotiation, 31.43 Procurement, 11.43% as Contracting and 21.43% as demonstrated the proportion of Selection, the Selecting suppliers and purchasing items.

Pie Chart Count of 7. The main benefit to an operation of having multiple sourcing is _____?

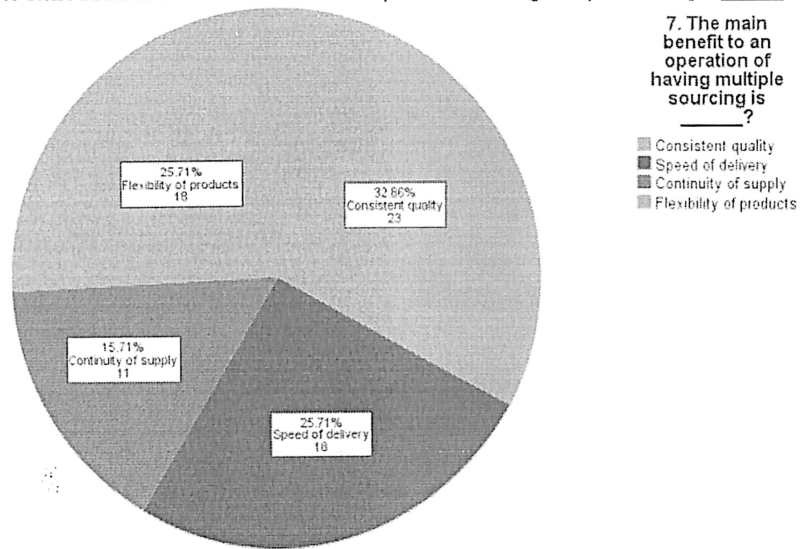


Figure No. 4.7 Multiple sourcing

Analysis:

Out of 100 respondents, above reaction had appeared as result that 32.86% of the Consistent quality, 25.71% Speed of delivery, 15.71% as Continuity of supply and 25.71% Flexibility of products, given apportion the main benefit to an operation of having multiple sourcing.

Pie Chart Count of 8. The main benefit to an operation of having multiple sourcing is _____?

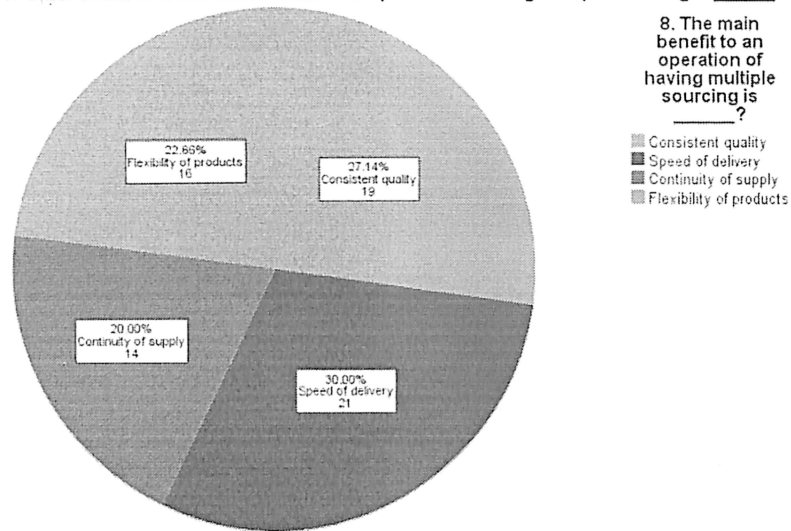


Figure No. 4.8 Multiple sourcing operation

Analysis:

Out of 100 respondent, above reaction had appeared as result that 27.14% of the Consistent quality, 30.00% Speed of delivery, 20.00% as Continuity of supply and 22.86% Flexibility of products. The main ratio of operation of having multiple sourcing.

Pie Chart Count of 9. There are 5 basic organizational forms, simple, functional, divisional, conglomerate and _____?

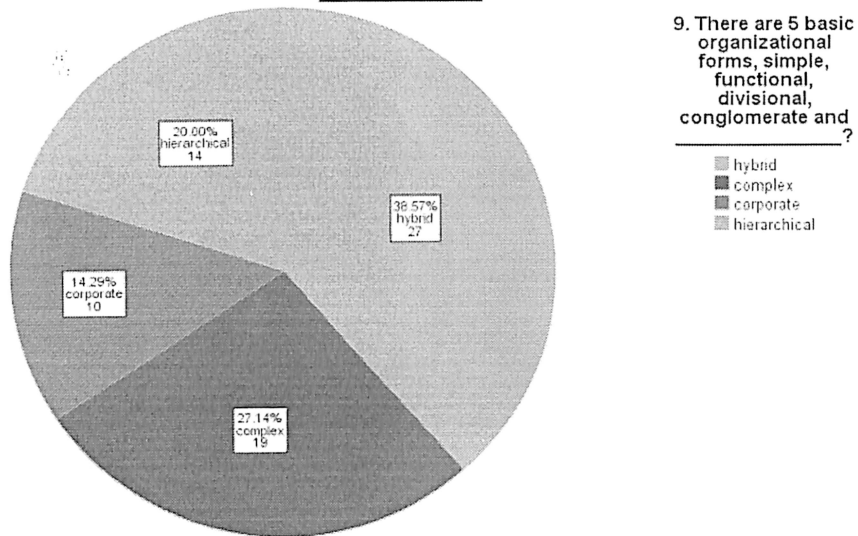


Figure No. 4.9 5 Basic organizational

Analysis:

Out of 100 respondent, above response had shown as result that 38.57% of hybrid, 27.14% complex, 14.29% as corporate and 20.00% hierarchical. The given ratio of 5 basic organizational forms, simple, functional, divisional, conglomerate and one in options.

Pie Chart Count of 10. Organizing budget hotels within a chain by geographical location is an example of which type of organizational form?

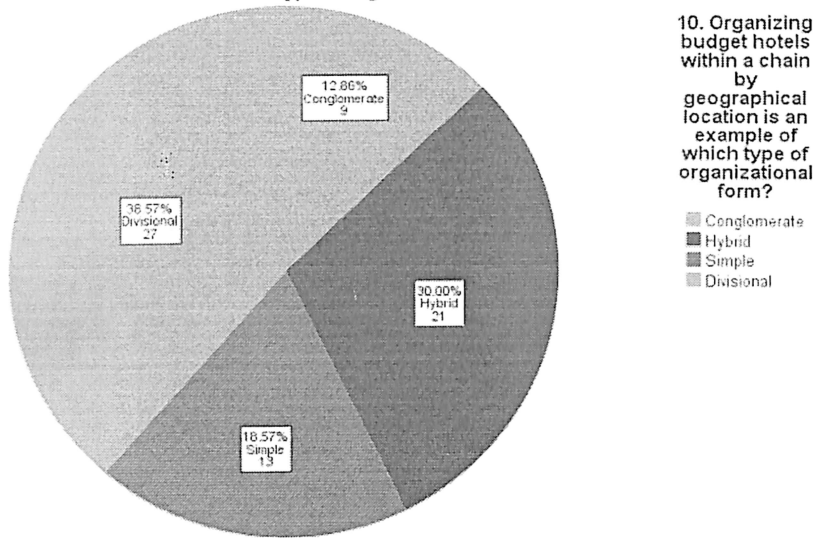


Figure No. 4.10 Type of organizational form

Analysis:

Out of 100 respondent, above response had shown as result that 12.86% of the Conglomerate, 30.00% Hybrid, 18.57% as Simple and 38.57% as Divisional. The ratio of the Organizing budget hotels chain by geographical location is an example of that type of organizational form.

Pie Chart Count of 11. Which of these would an operations manager not be responsible for?

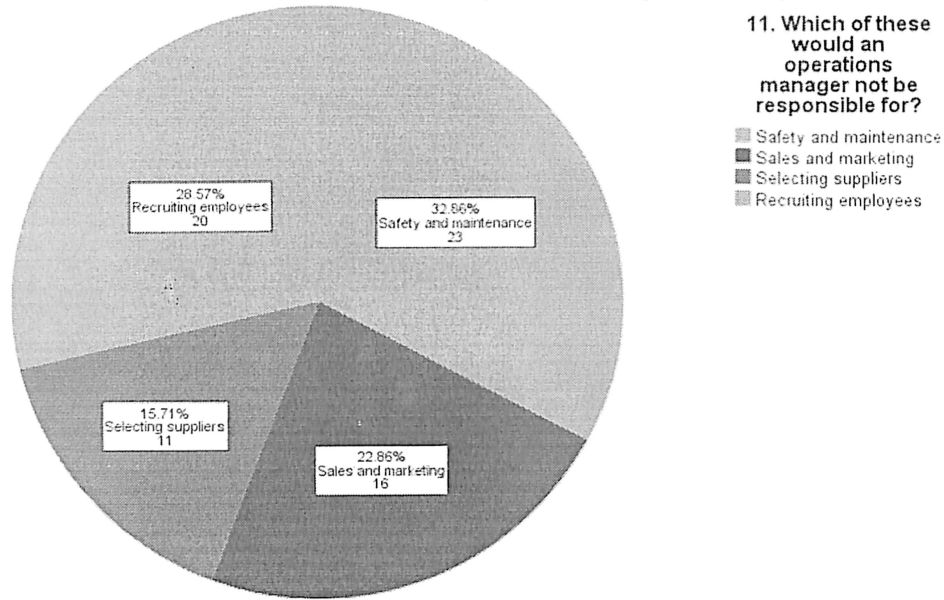


Figure No. 4.11 Manager not be responsible for

Analysis:

Out of 100 respondent, the above response had shown as result that 32.86% of the Safety and maintenance, 22.86% Sales and marketing condition, 15.71% as Selecting suppliers and 28.57% as recruiting employees of an operations manager not be responsible for.

Pie Chart Count of 12. Operations can be diagnosed by volume, variety, variation and _____?

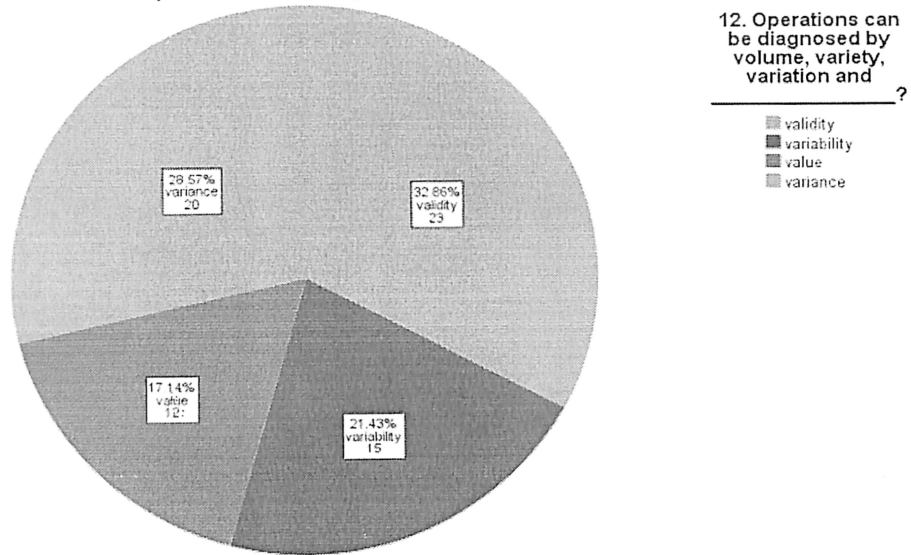


Figure No. 4.13 Volume,varierty variation

Analysis:

Out of 100 respondent, the above response had shown as result that 32.86% of validity, 21.43% variability , 17.14% as value and 28.57% as variance, shows that Operations can be diagnosed by volume, variety, variation.

Pie Chart Count of 13. The size of the product range or number of services offered is called _____?

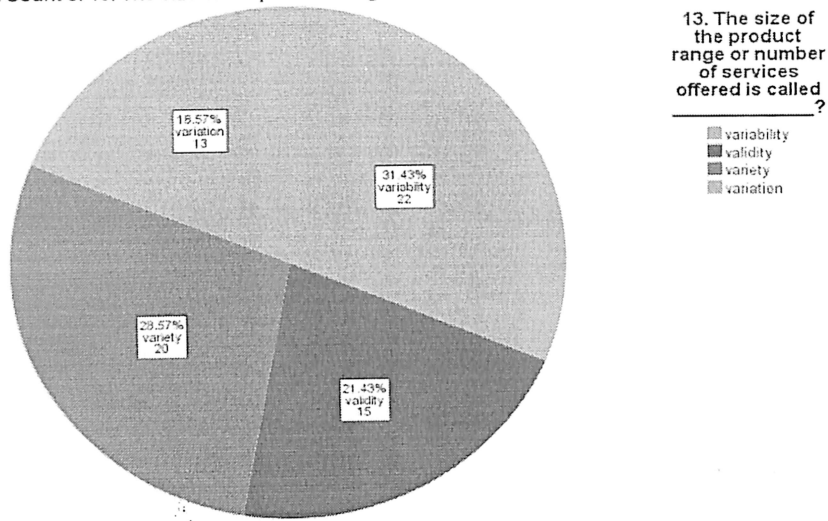


Figure No. 4.14 The product range or number

Analysis:

Out of 100 respondent, above response had shown as result that 31.43% of variability, 21.43% validity, 28.57% as variety and 18.57% as variation, is the ratio of the size of the product range or number of services offered.

Pie Chart Count of 14. The Servuction model recognizes that operations can process customers through their infrastructure or through their _____?

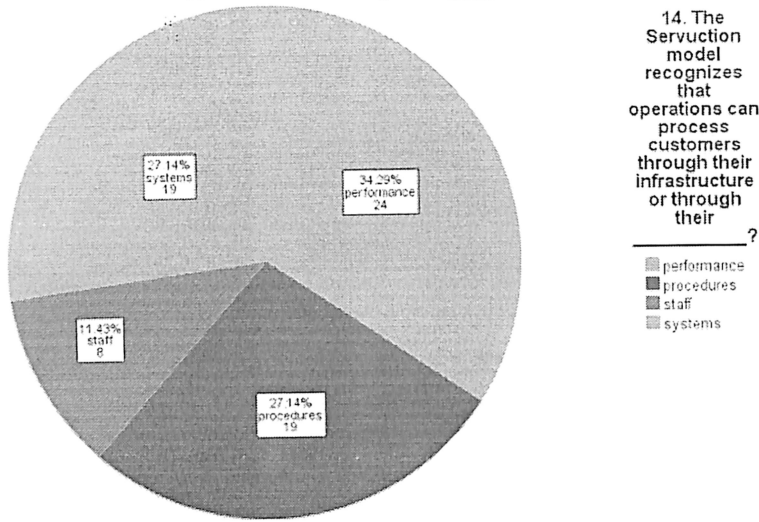


Figure No. 4.14 Their Infrastructure or though their

Analysis:

Out of 100 respondent, above response had shown as result that 34.29% of performance, 27.14% procedures, 11.43% as staff and 27.14% as systems The ratio of the Servuction model recognizes that operations can process customers through their infrastructure.

Pie Chart Count of 15. Services differ from manufactured products in four ways. Intangibility, Inseparability, Perishability and _____?

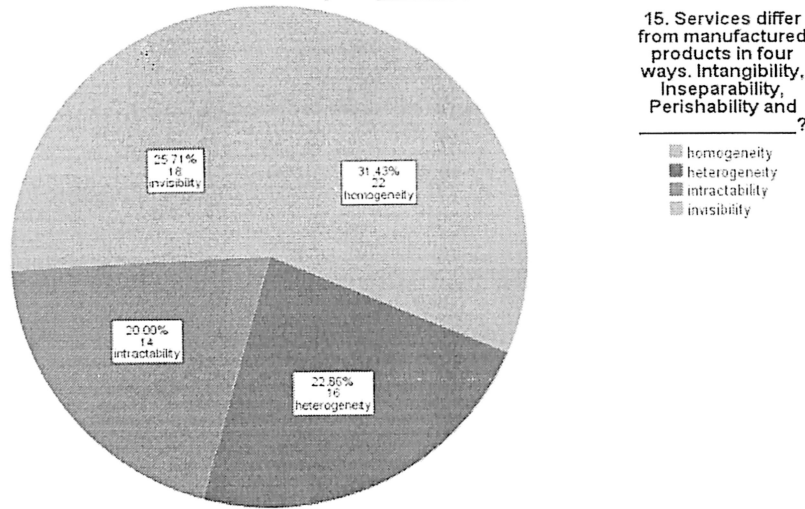


Figure No. 4.15 Intangibility, Inseparability Perishability

Analysis:

Out of 100 respondent, above response had shown as result that 31.43% of the homogeneity, 22.86% heterogeneity, 20% as intractability and 25.71% as invisibility. The ratio of the services differ from manufactured products in four ways, Intangibility, Inseparability, Perishability and Intractability.

CHAPTER: 5

INTERPRETATION OF RESULTS

Based on above findings, the study has presented following summary of analysis.

Manufacturers, suppliers, resellers, transporters and distributors are the main stakeholders in the supply chain of manufacturing companies, which ends with the delivery of the product to the customer. With an increasing emphasis on technological advances and changes in customer expectations, the need for integrated supply management has become increasingly important. For manufacturing companies to build a substantial customer base, the digitalization of business processes has become a necessity rather than a value-added proposal.

Supply chain management software is designed to manage and improve the exchange of information from various key supply chain partners in order to achieve results such as just-in-time purchases, reduced inventory, higher production efficiency and meeting needs customers in a timely manner.

The use of technology in supply chain management offers better visibility and accountability. In order to bring efficiency to the entire production process, it is important that a manufacturing company has a clear vision of the current phase of the products in production, foresees the possible problems or delays that they could encounter and can align the production programs accordingly. . The use of technology can provide the necessary transparency for the whole process. It allows manufacturing companies to have better control over the flow of products and the flow of information through the supply chain.

Maintaining optimal inventory levels is a challenge faced by all manufacturers. While excess inventory entails a risk of waste and a greater need for working capital funds, too low an inventory can lead to downtime in the production cycle and loss of activity due to lack of inventory. With the use of technology, manufacturers can create adaptive business processes that offer flexibility to handle various demand situations. Analytics will help you achieve your financial goals with predictable success by effectively managing your inventory and sales orders.

CHAPTER: 6

CONCLUSION

6.1 CONCLUSION:

Effective material and production network the executives is vital for the accomplishment of any little scale producing and creative venture and can be the central factor between a fruitful undertaking and a task loaded with deferrals and cases. Better material administration strategies and choice models are expected to improve the electrical business flow rehearses, in this manner expanding the effectiveness and limiting expenses. A successful supply the executive's framework is fundamental for overseeing proficient material administration to stay away from material deficiencies, scatterings, misfortune, and burglary which may result in increments in group inactive occasions, loss of profitability and postponement of exercises. Little-scale Electrical industry should actualize a proficient material administration framework because of the way that in the vast majority of the cases they are approached to crush their offers so as to hold the expenses of venture under spending plan. In such a case, disappointments to successfully oversee materials could result in declines in benefit or even misfortune.

The essential objective is to have the material required, in the sums required, with the quality required, and the time that they are required. Most electrical organizations have a material administration framework that serves their 205 needs, in spite of the fact that it could be improved. Institutionalization of the material administration framework could be a stage forward in improving the framework and taking out a portion of the bottlenecks. The exploration displayed in this record went for planning an incorporated arrangement of choice help apparatuses for material obtainment for the little scale industry especially an electrical industry. An integrated approach for material procurement provides better decisions on what to order, how much to order and where to deliver. Future research will be needed to develop a more complete framework integrating other decisions needed in areas such as supplier selection and preliminary material scheduling during the prefabrication phase. A fully integrated approach will better improve communication and minimize gaps in information flow among all the parties and departments involved.

6.2 SUGGESTIONS:

Today's competitive marketplace means there's less room for inefficiency, but the good news is supply chain technology can simplify and optimize your business processes. That's why it's imperative for companies to continually innovate and streamline their supply chain, and software

likely provides the greatest bang for the buck.

The right service supply chain technology enables your company to create greater visibility within your supply chain, gain more control over your inventory, reduce operating costs, and, ultimately, outpace the competition.

Here's how tech and platforms designed for the supply chain can provide your company with a more stable and efficient supply chain that enhances customer satisfaction and retention.

- **Real-time, Actionable Data**

In order to service customers, you need real-time inventory data at your fingertips that is accurate and actionable, no matter where the part is located worldwide.

Radio Frequency Identification (RFID) chips, barcodes and scanners are vital pieces of equipment that can provide innumerable benefits to your business. For example, RFID chips or barcodes can be placed on every product, which gives your company a way to easily track inventory.

With computerized product management, RFID chips and a barcode system provide increased visibility that can substantially improve your supply chain efficiency by detecting any order anomalies as they occur — enabling employees to immediately correct mistakes and reduce errors. Such technology also allows for easier, more consistent tracking throughout your supply chain, giving you maximum control and visibility over parts, whether those are motherboards or processors.

Knowing what you have and where it's located leads to supply chain efficiencies and lower operating costs.

- **Visibility Across Your Supply Chain**

Paired with RFID technology, cloud-based computerized shipping and tracking further simplifies the supply process and can dramatically reduce shipping errors.

Software like FlashTrac and its mobile version FlashLite enables savvy business owners to consolidate all aspects of their supply chain in one place. The apps enable you to digitally organize inventory data, monitor and manage shipping and tracking information, and create electronic invoices with ease.

Such supply chain management technologies make it easy to greatly reduce the time spent shipping, receiving, tracking, and compiling order data. This can save your company both time and money.

Last but not least, enhanced data availability makes it easier to produce customized reports and auto-generated reports that help your customers and you better understand where opportunities for improvement lie.

- **Simplify Your Supply Chain**

It's common sense that the more links there are in your supply chain, the more convoluted and complex that chain becomes and the more prone to errors and delays. Investing in supply chain technology helps your company simplify its supply chain, eliminate unnecessary links, improve efficiency and reduce expenditures.

Optimizing the number of links in your supply chain will also enable you to lower the risks associated with shipping and receiving. For instance, you may find you can decrease the number of vendors for a particular part to two or three companies rather than five or six, and still meet your company's service obligations and mitigate your risk around unpredictable events, such as natural disasters or a potential trade war.

Customers turn away from businesses that routinely have shipping delays, shipping errors, and products that are out of stock. Enhancing your supply chain technology can minimize risk and improve your company's reputation within the industry.

- **Enhance Customer Communication**

Creating predictability, consistency and visibility within your service supply chain enables your business to communicate faster and more efficiently with customers. Ideally, your supply chain technology will give you immediate access to all the real-time, actionable information you need, such as:

- ✓ Parts order tracking
- ✓ FSL location map
- ✓ Location of specific parts availability globally
- ✓ Location of parts nearest the customer
- ✓ Tracking field tech support personnel

6.3 SCOPE OF THE STUDY

- Monitoring and controlling the activities right from supplier's supplier to customer's customer
- The market change is the driving force which creates disturbance in Indian manufacturing industries.

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ANNEXURE

- 1) A sequence of business and information links is called a?
 - a) Logistics network
 - b) Distribution network
 - c) Sales channel
 - d) Supply chain

- 2) Supply chains link operators to suppliers in?
 - a) Layers
 - b) Groups
 - c) Tiers
 - d) Channels

- 3) Activities which are undertaken before the final operation are termed activities.
 - a) Upstream
 - b) Primary
 - c) Secondary
 - d) Downstream

- 4) In the automotive supply chain information flows in which direction?
 - a) Towards the end user only
 - b) Towards the supplier only
 - c) Between the end user and the operation only
 - d) Both towards the end user and the supplier

5. How do automotive companies mainly sell their new products?
 - a) Over the internet
 - b) Through retail distributors
 - c) Via a trademagazine
 - d) Directly to customers

- 6) Selecting suppliers and purchasing items is called?
 - a) Negotiation
 - b) Procurement
 - c) Contracting
 - d) Selection

- 7) The main benefit to an operation of having multiple sourcing is ?

- a) Consistent quality
- b) Speed of delivery
- c) Continuity of supply
- d) Flexibility of products

8) The main benefit to an operation of having multiple sourcing is ?

- a) Consistent quality
- b) Speed of delivery
- c) Continuity of supply
- d) Flexibility of products

9) There are 5 basic organizational forms, simple, functional, divisional, conglomerate and

- a) Hybrid
- b) Complex
- c) Corporate
- d) Hierarchical

10) Organizing budget hotels within a chain by geographical location is an example of which type of organizational form?

- a) Conglomerate
- b) Hybrid
- c) Simple
- d) Divisional

11) Which of these would an operations manager not be responsible for?

- a) Safety and maintenance
- b) Sales and marketing
- c) Selecting suppliers
- d) Recruiting employees

12) Operations can be diagnosed by volume, variety, variation?

- a) Validity
- b) Variability
- c) Value
- d) Variance

13) The size of the product range or number of services offered is called?

- a) Variability
- b) Validity
- c) Variety

d) Variation

14) The Servuction model recognizes that operations can process customers through their infrastructure or through their?

- a) Performance
- b) Procedures
- c) Staff
- d) Systems

15) Services differ from manufactured products in four ways, Intangibility Inseparability, Perishability and?

- a) Homogeneity
- b) Heterogeneity
- c) Intractability
- d) Invisibility