

# **A STUDY ON IMPACT OF TECHNOLOGY IN SUPPLY CHAIN**

## **PROJECT REPORT**

*Submitted to the Indian Maritime University in partial  
fulfillment of their requirements for the award of degree,*

### **Master of Business Administration in INTERNATIONAL TRANSPORTATION AND LOGISTICS MANAGEMENT**

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**SCHOOL OF MARITIME MANAGEMENT  
INDIAN MARITIME UNIVERSITY  
(A Central University, Government of India)**

# INDIAN MARITIME UNIVERSITY

*(A Central University, Government of India)*

## COCHIN CAMPUS



## CERTIFICATE

This is to certify that this project report entitled “A STUDY ON IMPACT OF TECHNOLOGY IN SUPPLY CHAIN” submitted to Indian Maritime University in partial fulfillment of the requirement for the award of the degree; MBA in international transportation and logistics management is bonafide work of **BOBBILI JAYANTH KALYAN (Reg.No.195305012)** under my supervision. I Certify further that to the best of my knowledge, the work reported herein does not form part of any other project or dissertation on the basis of which a degree/diploma or award was conferred on an earlier occasion on this or any other candidate.

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# **CHAPTER-1**

## **INTRODUCTION**

### **1.1 BACKGROUND**

“Supply Chain 4.0 - the application of the Internet of Things, the use of advanced robotics, and the application of advanced analytics of big data in supply chain management: place sensors in everything, create networks everywhere, automate anything, and analyze everything to significantly improve performance and customer satisfaction”

Logistics has evolved dramatically over the last thirty years, from a purely operational function reporting to sales or manufacturing and focused on ensuring the supply of production lines and delivery to customers, to an independent supply chain management function led by a CSO (Chief Supply Chain Officer) in some companies. Advanced planning procedures, such as analytical demand planning or integrated S&OP, have become established business processes in many firms, whereas operational logistics is frequently outsourced to third-party LSPs. From customers to suppliers, the supply chain function enables seamless operations.

Industry 4.0 causes upheaval and forces businesses to reconsider their supply chain strategy. A number of new technologies have arisen that are disrupting traditional working practises. Furthermore, megatrends and customer expectations alter the playing field. Aside from the necessity to adapt, supply chains have the chance to advance to the next level of operational efficiency, to take advantage of emerging digital supply chain business models, and to turn their organization into a digital supply chain.

Several megatrends have a significant impact on supply chain management: there is continued growth of rural areas around the world, with wealth transferring into previously unserved areas. The pressure to reduce carbon emissions, as well as traffic limitations for socioeconomic reasons, add to the logistical issues. However, as the workforce ages, changing demographics result in decreasing labour supply as well as increased ergonomic requirements.

At the same time, consumer expectations are rising: the recent online trend has resulted in higher service demands as well as a much tighter granularization of orders. The substantial growth and constant modifications in the SKU portfolio are also driven by a clear trend toward greater individualization and customization. Supply chain competitiveness is fueled by online-enabled openness and simple access to a multitude of options for where to shop and what to buy.

To capitalize on these developments and meet changing demands, supply chains must become considerably faster, more granular, and precise.

## **1.2. PROBLEM IDENTIFICATION**

The research intends to address the impact of emerging and the future technologies in supply chain along with identifying some of the technologies which will have a great impact on the industry. It is need of the hour to understand the technological growth in the supply chain because many firms are lacking to adapt the new technologies while some are lacking to identify them and some are failing in the implementation of the technology due to various reasons.

## **1.3. REASEARCH OBJECTIVE**

The main objective of the research is to bring up emerging and the future technologies in the supply chain which show a great impact on the industry and also to address the various challenges facing by the firms in implementing a new technology and various approachs to implement a new technology successfully. The goals that are set to achieve these objectives are follows:-

- To identify the emerging and future technologies in supply chain
- To analyze the challenges faced in implementing a new technology in the firm
- To identify the approach to implement a new technology

With the above goals achieved, this study will bring a vast idea on how the technology will affect the supply chain and a way to adapt to the changes in the industry.

## **1.4. SCOPE OF THE STUDY**

The study focus on the impact of emerging and future technologies in the supply chain, adapting and implementing them. The technological advancement and booming digital population made a way to number of technological changes in the supply chain. Customers today are expecting just in time delivery in order to meet there expectations the firms need to modify there business model with adapting to the new technological changes.

## **CHAPTER-2**

### **History of logistics technology**

Over the last 100 years, the global supply chain has changed dramatically. Every aspect of the way we procure, manufacture, and move commodities has changed. Global supply chains are more sophisticated and efficient than they've ever been, thanks to innovative handling processes, reliance on ocean-going vessels, and containerization and computerization.

Here we will take a look back at how supply chains worked and the key innovations that have driven things forward.

#### **2.1. The supply chain before 1900's**

Prior to the industrial revolutions in Europe and the United States, the great majority of supply chains were regional and local in nature. For example in an agrarian supply chain, a farmer would cut the wheat, send it to a mill for grinding into flour, then send it to a baker to make into bread, and finally it would be sold at a local market.

Things began to change as a result of the industrial revolutions. With the construction of railroads, it became faster, easier, and less expensive to carry goods over longer distances, yet supply chains remained mostly country-based. Rudimentary hand trucks and other equipment made it easier to handle cargo in the 19<sup>th</sup> century. Because the international ocean trade was inefficient, the loose commodities were retained in ship hulls and loading and unloading took a lot of effort.

#### **2.2 The supply chain in early 20<sup>th</sup> century**

Pioneers began designing trucks to enable for quicker road delivery of commodities with the development of the internal combustion engine and automobiles in the late nineteenth century. Mack Trucks was created in 1900, and the first semi-truck was invented near the end of the 19<sup>th</sup> century. Diesel engines were first introduced in the mid-1920s and ran on gasoline. The forklift truck was first founded in the early 20<sup>th</sup> century, with significant development taking place prior to 1930.

Pallets were first utilised in warehouses in 1925, which was a significant advancement in supply chain storage. This allowed commodities to be packed into pallets, which could then be stacked vertically to save space and improve the efficiency of products handling.

### **2.3 The supply chain in from 1930s to 1940s**

During World War II, logistics became extremely crucial, as military organisations required efficient supply lines both at home and in Europe. Supply networks were required at home to manufacture military gear and supplies, while supplies and support to troops abroad had to be delivered as rapidly as possible. Industrial engineering and operations research were merged into supply chain engineering in the 1940s.

Pallets, pallet handling, and pallet storage systems were all developed during the next few decades. The goal was to make better use of warehousing storage space by optimising racking and layout. These adjustments will streamline commodities loading, unloading, consolidation, and handling, resulting in quicker delivery and distribution.

### **2.4 The supply chain in the 1950's**

The advent of the shipping container, as well as all the logistics and modes of transportation required to support it, was the largest transformation in global supply chains. The most significant aspect of a shipping container is that it is intermodal, meaning that it can be moved using a variety of modes of transportation. Whether a container is transported by truck, railway, or container ship, standardization makes transporting and managing these containers quick and uncomplicated. This results to cost and efficiency gains across the supply chain. Every minute saved leads to faster products transit, less waste and environmental impact, and higher profit margins.

The first shipping containers were invented in the mid-1950s, however they wouldn't be fully standardized until the late 1960s. Move manufacturers began developing vehicles that could transport these containers around the same time. One of the key forces in making global trade cheaper and more efficient was the introduction of containerization.

### **2.5 The supply chain from 1960s to 1980s**

Goods distribution evolved away from railroads and toward trucking in the 1960s. Freight transportation became more reliable as pallets, handling equipment, containerization, and other factors evolved. As a result, even across longer distances, time-sensitive raw materials, parts, and products may be transported efficiently.

In the mid-1960s, computerization began to gain momentum, and IBM released the first computerized inventory management and forecasting system in 1967. Paper was used to gather, send, and report logistical records and data prior to the 1960s. Data computerization began to streamline logistics, allowing for improvements in a variety of sectors, including

more accurate forecasting, improved warehouse storage, truck routing, and inventory management.

In 1975, the first real-time warehouse management system was implemented, making it easier to handle orders, inventory, and distribution while also increasing efficiencies. Around the same time, barcodes made scanning products more easier, indicating the beginning of the migration away from manual SKU and product code entry.

## **2.6 The supply chain in 1980s and 1990s**

Supply chain stakeholders, transportation manufacturers, and others built on their achievements in the 1980s. The word "supply chain management" was coined in 1983, and personal computing transformed the supply chain even more. New tools, such as flexible spreadsheets, mapping, and route planning, made tracking costs and maximizing revenues much easier. Other developments included air freight optimization, supply chain distribution networks, and the implementation of Enterprise Resource Planning (ERP) systems. MIT also developed RFID(Radio frequency identification ) tags, which were pioneers of today's Internet of Things devices, to make it easier to track commodities and shipments electronically.

## **2.7 Supply chain now- 21th century and beyond**

Globalization, computer technology advancements, and expanding internet access have dominated logistics innovations in the twenty-first century. The word "supply chain management" has come to mean the strategy, planning, and execution of the movement of goods, services, and information, with logistics playing a key role.

All of this history has led us to the present, where global supply chains are still evolving. The growth of manufacturing in Asia, with China, Japan, and Korea emerging as major providers and exporters of goods, has been one of the most significant factors. Simultaneously, AI and machine learning integrate with predictive and prescriptive analytics to improve forecasting, order management, and other functions. Furthermore, the supply chain is transforming into a more data-driven, network-driven, and collaborative supply chain ecosystem that generates actual value and growth for all stakeholders.

## **CHAPTER-3**

### **Emerging technologies in supply chain management**

Thanks to cutting-edge technology like artificial intelligence, neural networks, and machine learning, logistics has changed dramatically in the last ten years. It's a revolution in the business prompted by consumer demand for faster delivery times, lower product prices, and better corporate environmental practices.

#### **3.1. Innovative supply chain technology tools**

Here are some of the emerging technological trends, tools, and innovations used in supply chain management:

##### **3.1.1. Big Data:**

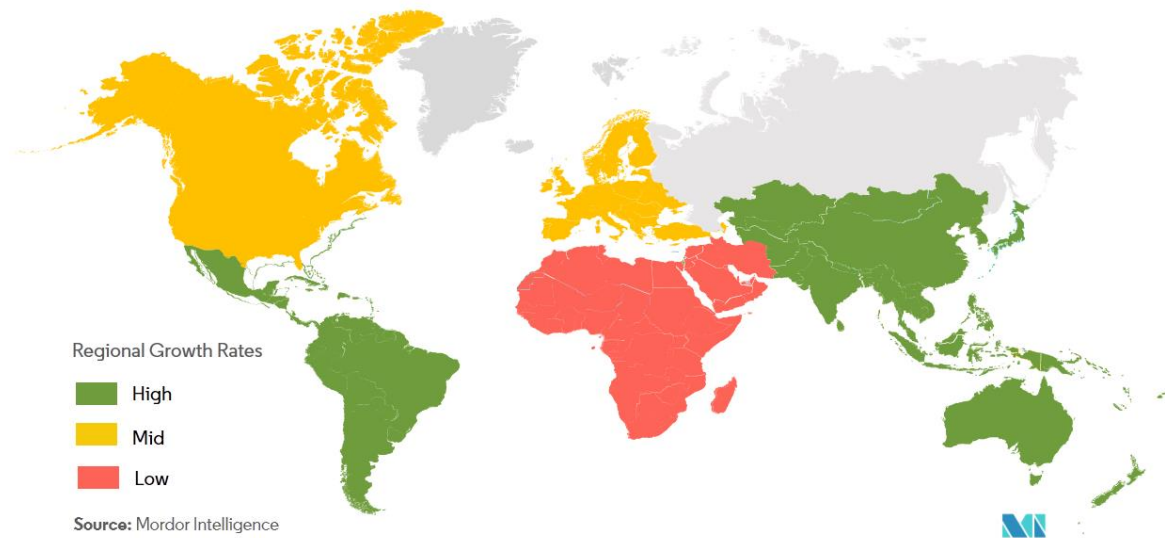
Every day, massive amounts of data are generated. 4.5 million searches are made on Google every minute, 18.1 million text messages are sent, and 188 million emails are sent.

Wearables, smartphones, and tablets account for a considerable portion of total data usage on a daily basis. With so much data at our disposal, gathering, sorting, cleaning, and analyzing such big data sets necessitates advanced computing techniques. Companies may utilize data science and analytics to gather important insights and transform supply chain management.

Big data brings value and assistance to the following areas in supply chain management:

- Quality control
- Cash flow
- Real-time deployment
- Warehouse efficiency
- Weather patterns
- Predictive strategies and
- Inventory, supply, and demand.

Supply Chain Big Data Analytics Market - Growth Rate by Region (2019-2024)



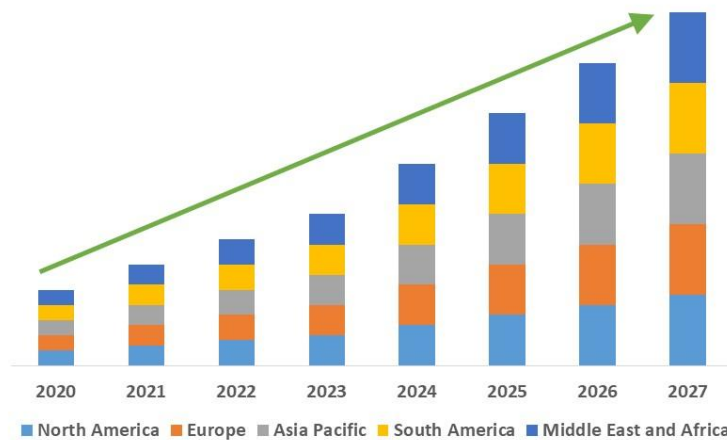
The Supply Chain Big Data Analytics Market was valued at USD 3.55 billion in 2020, and is predicted to grow at a CAGR of 17.31% from 2021 to 2026, to reach USD 9.28 billion. Firms can now access, store, and process huge amounts of data thanks to advances in information technology. Organizations are analyzing data sets and generating significant insights to apply to their operations, demonstrating the importance of Big Data in any industry. Analytics are being used in a variety of industries, from food and beverage distribution to high tech.

### 3.1.2. Artificial Intelligence and Machine Learning:

For supply chain optimization, AI and machine learning produce completely or semi-automated processes and procedures. By integrating AI and machine learning to imitate human performance and expertise, optimization enhances forecasts, planning, implementation, and maintenance in logistics. AI and machine learning boost the end-to-end supply chain by:

- Tightening data security;
- Applying predictive modeling to third-party logistics;
- Providing full supply chain visibility to improve management of key performance indicators (KPI);
- Automating inventory management, shipping transactions, and delivery routing; and
- Improving customer service.

Global Artificial Intelligence in Supply Chain Market is Expected to Account for USD 46.22 Million by 2027



Global Artificial Intelligence in Supply Chain Market, By Regions, 2020 to 2027



DATA BRIDGE MARKET RESEARCH



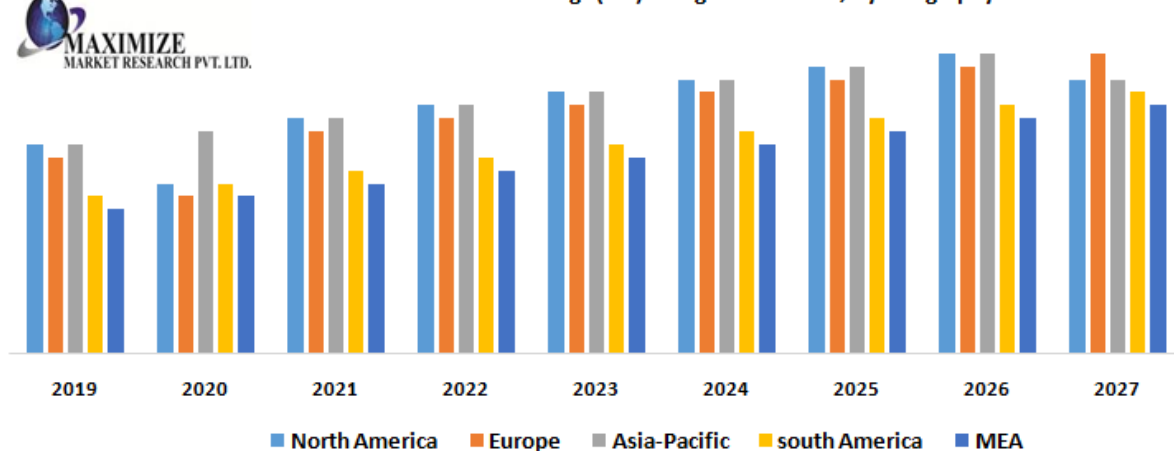
In the projected period of 2020 to 2027, the artificial intelligence in supply chain market is estimated to reach USD 46.22 million, growing at a CAGR of 8.1 percent. The artificial intelligence in supply chain market research from Data Bridge Market Research provides analysis and insights into the numerous aspects that are predicted to be prevalent during the forecasted period, as well as their implications on the market's growth.

### 3.1.3. Internet Of Things (IOT):

The Internet of Things (IoT), or the simplified linking of multiple devices, improves visibility and connectivity while lowering expenses. In warehouses, wearables and mobile devices like Apple Watches, Fitbits, and smartphones are extremely valuable. Wearables, in particular, enable a "touchless" supply chain, which eliminates the labor-intensive process of selecting things from inventory to fulfil a client request, commonly known as "picking." Other IoTs help warehouse and logistics managers keep track of goods and monitor equipment in a secure manner. Other advantages include:

- Improved asset utilization;
- Better customer service;
- Streamlined inventory and supply availability; and
- Safer and more reliable work environments.

Global Internet of Things (IoT) in Logistics Market , By Geography 2020-2027



The global internet of things (IoT) in logistics market was \$34,504.8 million in 2019, with a CAGR of 13.2 percent expected between 2020 and 2030. (forecast period). The rising e-commerce business around the world, combined with an increase in demand for more efficient logistics operations, is driving industry expansion.

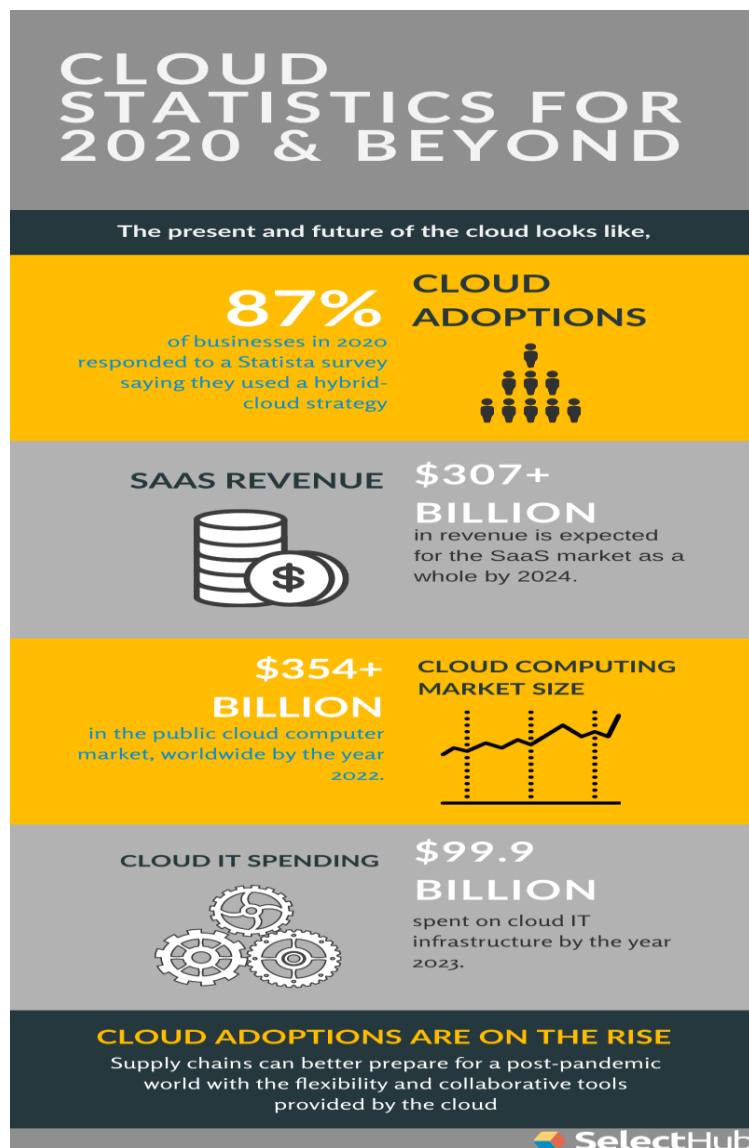
### 3.1.4. 5Gs:

Qualcomm claims that 5G is essential for continued innovation, which is absolutely true when it comes to supply chain management. When suppliers aren't connected, getting real-time data is tough. Without 5G, supply chain visibility becomes inconsistent. Third-party logistics is made possible by 5G's multi-Gb per second peak rates, ultra-low latency, and vast data capacity, which elevate mobile networks. When 5G connects people, machines, objects, and devices, high-level performance, enhanced efficiency, and new user experiences become available. 5G also gives the ability to:

- Larger volumes of data on location, temperature, pressure, and other vital information in the end-to-end supply chain are extracted;
- Ensure uniformity of information sharing with all stakeholders;
- Resolve issues that would otherwise be aggravated with time delays; and
- Understand exactly where raw materials come from.

### 3.1.5. The Cloud:

Companies track materials and goods, receive real-time updates, and notify customers of order progress at any point along the end-to-end supply chain. All of this is made feasible by cloud computing. Cloud-based solutions improve data storage capacity, integration, security, and information sharing, among other things. Multiple devices and an enterprise of software users work together to streamline activities and procedures.



Cloud-based supply chain management software solutions are set to surpass \$11B by 2023, In 2021, the market for cloud supply chain management software is predicted to grow by 24% or more. By 2024, total SaaS revenue is estimated to reach \$307 billion. Gartner expects that by 2021, over 90% of spending on supply chain execution systems will be for cloud supply chain solutions.

### 3.1.6. **Advanced Supply Chain Software:**

The whole supply chain business has been impacted by advanced software. In order to stay competitive, logistics businesses strive to incorporate technology into their supply chain systems. Because of consumer demands for pricing and delivery speed, as well as the growing popularity of customer rating measures, businesses feel obligated to keep up with the latest technologies in the market. Supply chain software gets more complex as technology progresses, allowing businesses to stay ahead of problems, make changes to orders, communicate across several media channels, and automate shipments. Here are some the examples of leading advance software:

- Logility voyager solutions

The Logility platform uses AI(artificial intelligence), ML(machine learning), and automation to continually sense, analyze, and update activities in your digital supply chain, assuring peak operational performance at all times.

- AIMMS Prescriptive Analytics

AIMMS enables you to define your business logic through a business modeling process while defining the input as well as the required output, variable decisions, and objective(s). Using advanced mathematical programming optimization engines, AIMMS provides recommendations against a (combined) objective such as maximal revenue, minimal cost, optimal service etc. They do this in such a way that regular business users can analyze various options (scenarios) through a highly interactive user interface

- SAP Integrated Business Planning

This is a demand planning software this cloud-based solution combines sales and operations planning (S&OP), forecasting and demand, response and supply, demand-driven replenishment, and inventory planning. Take advantage of powerful supply chain analytics, what-if simulations, alerts, and more to stay ahead of change and improve responsiveness

- Blue Yonder Inventory Optimization

Blue Yonder Inventory Optimization is a demand planning software which See potential problems in advance, get ML-based recommendations and pivot your plan to deliver

- Verizon Connect

Verizon connect is distribution software and an advanced and advanced fleet management software solutions which Track vehicles in the field, improve fleet operations, increase worker productivity and encourage safer driving with Verizon

Connect fleet management solutions. Choose from a range of customizable GPS tracking solutions that offer dashboards, reports and alerts.

- Geopointe

Geopointe can locate any Salesforce data, anywhere in the world. These searches could be anything from a view of all accounts, clustered by concentrations, to a small neighborhood search for local leads and prospects. Geopointe will give you the big picture using advanced visualization and filtering capabilities to identify trends and patterns you never knew existed

- DiCentral EDI & Supply Chain

This is a inventory management which Deliver fast, efficient control with your trading partners through our EDI Digital Supply Chain Management solutions. DiCentral offers cloud-based supply solutions that can improve connectivity and deliver quick access to data for better decision making.

## **Chapter-4**

### **Future technologies projected to have an impact on supply chain management**

Any emerging technology that assist efficiency and automation will continue to be included in supply chain management in the future. Here are a few more software trends that experts believe will emerge in the near future:

#### **4.1. Autonomous mobile robots (AMR):**

Amazon and other supply chain conglomerates have considered the use of AMRs in the past, but they have yet to catch on with the rest of the industry. AMRs may emerge as a tool to optimize the picking process, but warehouse management systems will continue to arrange things like scheduling loading and unloading.

Here are some of the examples of the autonomous mobile robots

- **STARSHIP:**

Starship Technologies' six-wheeled ground drone. The robot can deliver products within a 6km radius thanks to a sensor suite that includes cameras, GPS, and inertial measurement units. It includes a big compartment that can accommodate deliveries that are the size of two supermarket bags and weigh up to 10kg. The container is opened using a unique code obtained after placing the purchase through a smartphone app once the robot has arrived at the customer.



- **KIWI:**

Kiwi is a self-driving delivery robot that picks up and delivers food and personal care goods in a 1.6-square-kilometer radius around campus. Deep Learning is used by the robot to correctly analyze data from its sensors and make intelligent judgments that ensure a quick, safe, and cost-effective delivery. It can correctly identify traffic lights so that it may cross streets safely and reliably, as well as detect objects and obstructions to avoid crashes.



- **ROBOMART:**

Robomart is a miniature supermarket on wheels. It has cutting-edge technology such as driverless technology for autonomy and teleoperations, an RFID and computer vision-based checkout-free system, and custom refrigeration and temperature control. Stop & Shop, a grocery store business, is now using bots to deliver groceries to its customers. Customers merely hit a button on a smartphone app to order the nearest robomart when they need groceries. Customers will go outside, unlock the doors, and select the things they want once it arrives. Robomart uses patent-pending "grab and go" checkout-free technology to track what consumers have taken and charges them and sends a receipt.



- **TELERETAAIL ROBOT:**

TeleRetail intends to assist Main Street stores and small businesses compete with major e-commerce corporations like Amazon by using artificial intelligence to automate local logistics and reduce transportation's environmental imprint. The robot was created by Torsten Scholl's Swiss startup TeleRetail, which was launched in 2014 with the goal of solving local businesses' logistical challenges. The robot, which has an 84-centimeter breadth and can carry up to 35 kilos of cargo, is designed to travel on sidewalks and travel distances of up to 80 kilometres.



- **AMAZON SCOUT:**

Amazon, the e-commerce giant, has entered the autonomous delivery robot competition. Amazon Scout is a self-driving delivery vehicle with six wheels that is "the size of a small cooler." Scout utilizes self-driving technology to travel around neighbourhoods and deliver products to Amazon Prime customers while walking at a human pace. The vehicle appears to be large enough to transport small and medium-sized packages, but no details on what's under the hood have been released.



- **FEDEX SAMEDAY BOT**

FedEx SameDay Bot is the newest in a long line of last-mile delivery robots that deliver small products straight to customers from shops or local distribution hubs. FedEx claims it would fine-tune it before deploying it as soon as its engineers are pleased with its performance. FedEx is working on the bot alongside DEKA Development & Research Corp., the firm that created the iBot mobility gadget. It has pedestrian-safe technology, several cameras, LiDAR, and machine learning to assist it detect and avoid obstructions, as well as navigate uneven ground.



#### **4.2. Truck collaboration:**

Truck manufacturers and shippers should invest in manufacturing and collaboration software systems as they prepare for a recession. Trucking firms can improve their market monitoring, automate procedures, and save expenses by using more complex technology.

### **4.3. Distributed inventory:**

Current inventory software lacks the analysis required to keep up with distributed inventory, making it difficult for businesses to meet evolving shipping expectations. Distributed inventory flow forecasting (DIFF) is a technique that anticipates the movement of commodities, allowing firms to maximize order fill rates while keeping inventory low.

### **4.4. Driverless vehicles and drone delivery:**

Companies can use driverless and drone delivery methods to solve a range of problems. Not only does this reduce expenses by reducing the amount of human intervention, but it also improves access to rural areas that are isolated and difficult to reach. While some people have been skeptical of this technology in the past, it could be a good option in the future, especially given the growing shortage of human drivers.

Drones and other UAVs (unmanned aerial vehicles) are expected to generate \$82 billion in economic growth and 100,000 jobs by 2025, according to the White House which was estimated in year 2016.

### **4.5. 3D printing:**

For some industries, 3D printing is a game changer. 3D printing may be used to duplicate and manufacture replacement components for metal and plastic products. Companies can contract with local 3D printing firms to create and deliver things in a matter of days, rather than warehousing them in a vast warehouse to be delivered all over the world. Customer satisfaction is improved as a result of the inventory and space management benefits.

Because of the technology's 'portability,' enterprises will be able to get their products to local markets or customers faster. As a result, we should expect to see a shift away from mass production in low-cost countries and toward more local assembly centres. 3D printing technology allows producers unparalleled ability to customize solutions to clients' exact requirements and improve the consumer experience because it is a toolless process.

The number of components and processes required for manufacturing are reduced thanks to 3D printing technology. This will have a major impact on global supply chains, reducing complexities, lowering production costs, shortening lead times, and increasing time-to-market.

Finally, The global 3D-printing market is predicted to reach \$11,223.6Bn in 2019 and \$41,587.1Bn by 2027”

#### **4.6. Blockchain:**

There is frequently a lack of transparency when goods are exchanged between countries. Processing invoices and shipments can take months, let alone the complexities of processing large volumes across multiple firms. By enabling increased traceability and security, blockchain has the potential to change the supply chain industry. The blockchain, which is well-known for its cryptocurrency capabilities, can also help businesses manage contracts and agreements, as well as monitor financial transactions and products.

Furthermore, organizations might have more control over contract manufacturing that is outsourced. Blockchain allows all participants in a supply chain to have access to the same data, potentially minimizing communication and data transfer problems. Less time can be spent confirming data and more time can be spent delivering goods and services improving quality, lowering costs, or doing both.

## **CHAPTER-5**

### **Challenges in implementation of new technologies**

There are studies that contest the good impacts of CRMs (Customer Relationship Management), claiming that they did not generate the desired results, in some cases even causing long-term customer relationships to suffer. The failure of such a system to be implemented could be due to a lack of understanding of it. On the other hand, the costs and risks of implementing a system and integrating it with existing programs in a business are high.

The following are some of the issues that have been encountered in the operation of SCM systems:

- Inaccurate data from other enterprise systems
- Malfunction collaboration with suppliers, customers or distributors;
- There is a lack of communication across company departments;
- Oldfashioned business judgement;
- Difficult to implement software tools.

Hershey Foods, for example, failed to adopt a new order management, supply chain planning, and inventory management system in 1999, CRM system malfunctioned, resulting in the loss of higher-value orders. 150 million dollars in value.

In addition, in 2001, WebVan, an online grocer, Significant investments in automated warehouses have been made, yet demand has not justified them for products.

According to a research conducted in 2001, 51% of organizations that used an ERP solution did not get the anticipated results. It might take several years to implement an Enterprise Resource Planning ERP system, and updates and maintenance are required on a regular basis. Furthermore, expenses might reach tens of millions of dollars, preventing many businesses from gaining access to such integrated systems. The rate of successful deployment of such a system is still very low, at around 33%.

Failures can be caused by a variety of factors, including:

- Inadequate staff training, motivation, or understanding of the new systems;
- Differences between existing systems and new systems;
- Channel characteristics and logistical requirements of various participants in the logistic chain;
- Underestimation of the complexity of planning;
- Unjustified investment compared with the existing and potential demand

- An insufficient understanding of the processes and the operation of each component of logistics channel and its assembly by the software processes;
- Dimensions and specifics of each company;
- Lack of involvement of employees who will use the system in planning, systems development and change;
- Training and development for the implementation of such a system.

When the system is implemented, it can come with a variety of drawbacks:

- Decrease in income;
- Reduction in market share;
- Loss of orders;
- Incorrect registration of inventories;
- Failure of operation of information systems

A challenge that should not be overlooked is employee resistance to change, particularly in instances where old systems have been in place for a long time or where new systems are being implemented. Employees believe the system puts them at risk of losing their jobs.

Their fears are understandable, as such a system lowers human intervention across the production chain. One of the country's largest wholesale pharmaceutical distributors Foxmeyer of the United States attempted to adopt a new ERP system and distribution automation centre in 1986. Which resulted a numerous issues with both the warehouse management system, and the order processing system management. But losses were incurred also by the anticipated contraction of orders based on estimates of cost reduction for the company given that the estimated high efficiency. Ten years later, Tri-Valley Growers has invested millions in a new ERP and supply chain planning system that did not work and required replacement with another.

Using RFID technology has its own set of challenges: -

- RF signals are affected by interference and reflection metal and electrical systems;
- absorption of radio frequency signals in fluids;
- low rates of tag receptivity
- existing barcode systems implemented recently and with relatively high cost which have not yet been amortized;
- high investment costs to implement RFID: equipment costs, expenses for integration with pre-existing systems and staff training in order to use this kind of systems
- problems of compatibility with existing applications;
- data overload and data noise;
- existence of a large number of RFID hardware and software vendors and the lack of standardization of these components;
- lack of qualified personnel in the management and use of RFID systems.

Implementing software generated by a service provider in the supply chain requires also the clarification of legal problems concerning the security of the confidential data.

There are also disadvantages, such as cost and data control loss. Because there are opportunities to use open source software and various options for application development, developing software is risky. The existence of many, interconnected systems for managing departments or groups of operations can result in errors, redundant data, and increased expenses.

## CHAPTER-6

### **New technology implementation approach in supply chain**

Consumers and businesses all around the world have embraced the use of smart technology. For every new technology implemented, the associated cost of implementation and change brings a new set of challenges for supply chains. An organization need to be considered these three key aspects before new technology implementation:

#### **1. Identify the scope of change**

Understanding the impact of new technology on supply chain transformation is critical because it allows for the identification of supply chain scope and the identification of which supply chain business units will be affected. According to research, businesses with several functions or departments frequently adopt incompatible systems and objectives, requiring different levels of investment and training. The identification of supply chain scope has an impact on resources at the business unit level in this situation.

#### **2. Speed of change**

The speed of transformation and its implementation (fast versus gradual) may be difficult to determine and define depending on the nature of change. According to research, the scope of an eBusiness supply chain might range from a one-time effort to a series of waves lasting 5-10 years.

#### **3. Get early support**

Getting site-wide support is essential for any system, especially in an extended supply chain network. If there isn't a standardized and streamlined supply chain support system in place, it can hamper e-business technology integration and, in certain situations, site-wide integration.

A study of supplier-buyer relationships during the implementation of B2B technological innovations found that suppliers were hesitant to accept the changes because of the possible cost and value, as well as the ability to serve every buyer who may utilize a variety of systems.

As a result, when a company invests in new eBusiness technology, it's useful to determine the top three criteria that will influence implementation. Companies can begin to analyze the potential economic benefit of introducing new e-business technology once they have an understanding of potential costs, timeframes, and departmental difficulties.

## CHAPTER-7

### 7.1. SUMMARY

Supply chain is a type of industry which requires day-by-day improvement to keep up with the rapidly changing business environment. The growth of a more digitalized world, where value chains are networked and distribution systems are increasingly intelligent, autonomous, and automated, is transforming the future of supply chains globally. These innovations are expected to result in significant increases in distribution flexibility, efficiency, and automation. Suppliers who are constantly seeking to 'eliminate needless production expenses; improve goods and service transportation and business performance; increase throughput; reduce cycle times and maintain quality,' in order to operate in changing supply chain networks.

In the twenty-first century, given the current circumstances and the importance of freight movements, information and communication technologies are necessary to operate across the entire logistics network, encompassing all participants.

However, there may be certain challenges in embracing new technology, including the use of the Internet, at the organizational level. Barriers can affect both personnel who are hesitant to change and management at various levels. To be successful, the right channel technology and logistic software packages must be chosen. It is critical to examine new systems or technologies before deciding whether or not they can be adapted to the organization's procedures. Standardization of technology is one of the criteria for flexibility and easy accessibility. It becomes difficult to update or change systems if this is not done.

The majority of expenditures are accounted for by design and reconfiguration processes, data retrieval and processing from legacy systems, and staff training to operate the new systems, rather than software and hardware.

## **CHAPTER-8**

### **REFERENCE AND BIBLIOGRAPHY**

- <https://supplychainmanagement.utk.edu/blog/emerging-technology-in-supply-chain-management/>
- Blumeglobal.com
- Logmore.com
- Terkrecoms.com
- Americanexpress.com
- Mordorintelligence.com
- Databridge.com