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# A Study on Impact of Technology in Logistics and Supply Chain

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**ABSTRACT:** The rapid advancement of technology has profoundly revolutionized logistics and supply chain management (SCM), transforming established processes and enhancing operational efficiency. This study looks into the impact of emerging technologies including the Internet of Things (IoT), artificial intelligence (AI), blockchain, and automation on logistics and supply chain operations. The study examines case studies and industry trends to show how these technologies improve visibility, traceability, and decision-making, resulting in cost savings and increased customer satisfaction. Furthermore, the study looks into topics including cybersecurity concerns, integration problems, and the need for worker reskilling. The findings emphasize the importance of organizations adopting a strategic approach to technology implementation in order to remain competitive in an increasingly digital world. This study contributes to a better understanding of the relationship between technology and SCM, offering insights for practitioners and policymakers seeking to exploit technical improvements for long-term success.

**KEYWORDS:** Transportation, Supply Chain Administration, Automated Technology, Automatic Recognition, Radio Frequency Tags

## I. INTRODUCTION

Emerging technologies are transforming how organizations function in an increasingly complicated global environment, particularly in logistics and supply chain management (SCM). Organizations are turning to new solutions that use modern technologies to address increasing consumer demands for speed, efficiency, and transparency. The emergence of the Internet of Things (IoT) allows for real-time tracking and monitoring of commodities, allowing businesses to improve inventory management and shorten lead times. Artificial intelligence (AI) and machine learning algorithms improve predictive analytics, allowing businesses to better foresee demand and make informed decisions that boost operational efficiency. Furthermore, supply chain transparency is being revolutionized by blockchain technology, which offers an immutable database that improves traceability and lowers the possibility of fraud. Increased trust is fostered among all stakeholders, ranging from suppliers to customers. Processes related to distribution and warehousing are becoming more efficient thanks to automation and robotics, which also reduce human error and boost output. Though there are many advantages to new technologies, there are drawbacks as well, like the need for labor reskilling and cybersecurity risks. Understanding how this technological innovation affects logistics and supply chain management is crucial for firms to stay competitive as they adopt it. In a world that is changing quickly, businesses that successfully integrate these new technologies can improve customer satisfaction, innovation, and sustainability in addition to their operating capabilities. Supply chains that are more responsive, resilient, and agile will be made possible by the strategic integration of these technologies, which is where logistics and supply chain management are headed.

## II. REVIEW OF LITERATURE

**Kumar, A., Singh, R. K., Kumar, P. (2018).** It Oversees and optimizing every element of the supply chain for products and services is referred to as supply chain management, or SCM. The IoT represents a developing and expanding area that is enhancing contemporary supply chain management. By reducing operational expenses. In this process, IoT devices utilize the latest real-time tracking technologies, such as GPS, to monitor and trace shipments.

**Chae, B. (2019). Supply Chain Management: A Strategic Perspective.** By effectively managing both the demand for efficiency and the pressures of reducing costs alongside efficient methods for addressing market needs and the recognized supply chain breakdowns, strategic supply chain management companies with a competition advantage.

**Ivanov, D. Dolgui, A. (2020).** The study's findings advance the study and application of SC risk management and guarantee total visibility and continuous business operations in multinational corporations by improving proactive and reactive decisions to utilize the benefits of SC visualization, analysis of historical disturbance data, and real-time disturbance data.

**Kouhizadeh, M., Sarkis, J. (2018).** Currently, blockchain technology is gaining unprecedented popularity. A significant application of blockchain can be found in supply chains. While there are some limitations to blockchain it has the potential to promote sustainable movement of goods, particularly those that prioritize environmental considerations.

**Klaus, P., Krieger, W. (2021)** Supply chain cybersecurity focuses on overseeing critical cybersecurity aspects, including networks, software, and IT infrastructures. The management of supply chains faces considerable dangers from cyber warfare, malicious software, and information theft. To mitigate these risks, common supply chain cybersecurity practices involve isolating crucial equipment from external networks and sourcing only from reputable suppliers.

**Browne, M., et al. (2019).** Automated Warehousing Systems This detailed assessment explores the significant influence of artificial intelligence (AI) on warehouse automation, offering a thorough analysis of different AI-based systems. With businesses progressively embracing automation to enhance efficiency and optimize procedures, incorporating AI technologies into warehouse management systems has become crucial, revolutionizing this industry.

**Mena, C., et al. (2020).** Blockchain developed as a groundbreaking approach to addressing various problems in supply chain management (SCM). This article provides a comprehensive overview of the integration in SCM, emphasizing its definition, significance, key features, challenges, applications, and future trends..

**Petersen M. & Von See, K. (2017).** It views blockchain technology as capable of instigating considerable changes across various fields, there remains a gap in understanding the particular domains where blockchain can be effectively implemented and where it can bring about tangible practical effects.

**Korpela, J. K., Hallikas, & Dahlberg, T. (2017).** Digital supply chain transformation toward blockchain integration," in Proceedings of the 50th Annual Hawaii International Conference on System.

**Lindman, V. K. Tuunainen, & Rossi, M. (2017).** Opportunities and risks of blockchain technologies: A research agenda," in Proceedings of the 50th Annual Hawaii International System Sciences

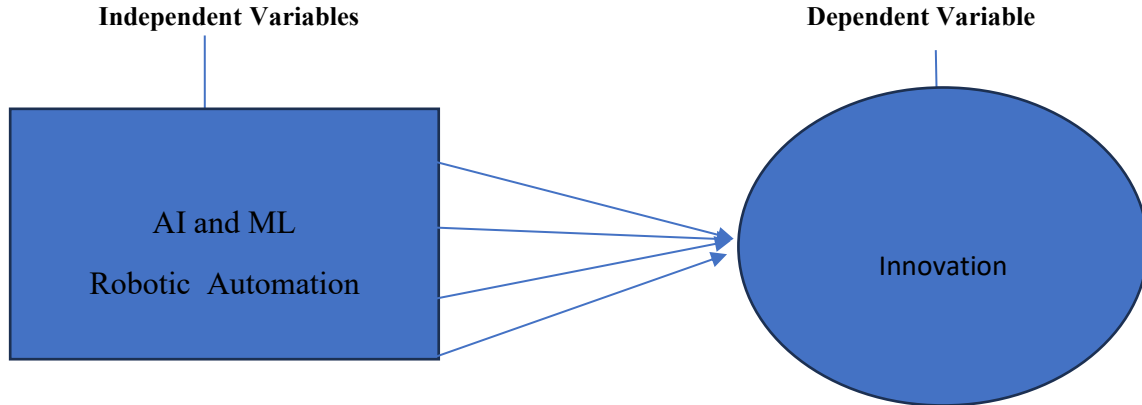
#### **OBJECTIVES:**

- To identify and evaluate the latest technological advancements (e.g., IoT, AI, blockchain) impacting logistics.
- To measure the extent to which technology improves operational efficiency.
- To investigate how technology enhances visibility across the world, enabling real-time and monitoring of products.
- To analyzes technology in identifying, assessing, and mitigating risks within supply chains.
- To explore the relationship between technological integration in logistics and customer satisfaction, focusing on delivery times and service quality.
- To predict future trends in technology that could further impact logistics & SCM over the next decade.

#### **HYPOTHESIS:**

- Null Hypothesis (H0): There is no significant difference in how various departments perceive the importance of Technology in supply chain management.
- Alternative Hypothesis (H1): A significant difference exists in how various departments perceive the importance of Technology in supply chain management..
- Null Hypothesis (H0): There is no notable difference in how various groups perceive the impact of technology on logistics factors (such as process efficiency and cost reduction).
- Alternative Hypothesis (H1): A notable difference exists in how various groups perceive the impact of technology on logistics variables.

**Technology on Logistics and Supply Chain Structure**



It enhances the clarity, effectiveness of supply chain and logistics. By enabling companies to conduct transactions directly, blockchain technology boosts the efficiency of global supply chains, removing the need for intermediaries.

**Machine Learning Technology & Logistics & Supply Chain Management**

Managing an extensive network of suppliers, storage facilities, and transportation providers can be challenging. Machine learning solutions can aid in overseeing the supply chain throughout every phase. The rise in worldwide competition has heightened need operations to be both dependable and swift.

**Automation of Robotic Processes in the Logistics & SCM**

A business model that consists of tasks executed in an defined process, supported by explicit rules, and aimed at achieving a specific goal. Conversely, a robot is a software tool that precisely replicates certain tasks carried out by humans, whether at the user interface or in the background, through automation as a part of an implemented business process . It is crucial to highlight that robotic process automation can help numerous organizations standardize and enhance their business functions.

Recent technological advancements in supply chain management and logistics can be classified into three categories:

- Automatic Identification Technology (AIT)
- Communication Technology
- Information Technology

**Automatic identification technology (AIT)**

AI, describes the method of data into a system, programmable logic, or any microprocessor device. Various technologies that fall under this category include RFID, barcoding, and voice recognition. Auto ID technologies can be used to track containers, packages, boxes, or vehicles transporting goods, ensuring timely delivery to customers.

**Radio Frequency Identification (RFID)**

Radio Frequency Identification (RFID) is a wireless communication technology that utilizes electromagnetic within the radio frequency segment of the electromagnetic spectrum to distinctly recognize an individual. RFID was initially utilized for access control and tracking purposes in 1980. RFID systems can perform scanning without needing direct contact, making them advantageous in challenging environments like industrial settings where barcodes might not withstand wear and tear.

**Communication Technology:**

Effective communication, whether verbal or written, is essential to the success of any business. These are some of the newest and most cutting-edge communication technologies that can help businesses become more competitive by facilitating excellent customer service and quick and accurate communication.

**Electronic Data Interchange (EDI)** - Business documents are transmitted between compute technology. Organizations can send documents like invoices, checks, and challans electronically using EDI. In fact, EDI signifies a move toward

paperless transaction or document exchanges. While email is manually created and read, EDI messages are produced by one application and interpreted by another

**Very Small Aperture Terminal (VSAT):**Prompt data gathering and distribution are vital for effective customer service, and satellite communication systems are essential in this process. The freight transporter is equipped with a plate antenna for tracking and tracing purposes. This setup allows the driver, receiver, and shipper to stay in touch. By utilizing real-time communication, it is possible to obtain current information about the truck's location and .

**Automated Guided Vehicle System (AGVS):** This system uses the magnetic system guides the material handling equipment with electrically charged wire that is placed on the shop floor. The AVGS of today follows a predetermined path but are directed by videos. Without the need for human intervention, AGVS is capable of managing all material handling tasks. The precise material needed for a customer order picked up by robot in conjunction with AGVS.

**Information Technology (IT):**

Information technology (IT) encompasses the tools and software that gather, examine, and disseminate data wherever necessary. According to the definition of chain management, a network of companies cannot be established without being connected through information technology (IT). IT plays a valid role in improving visibility making certain that supply chain activities align with customer needs.

**The IT tools used in logistics and supply chain management are:**

**Enterprise Resource Planning :**

It is integrated software that covers every aspect of business operations and fundamentally alters how people operate. ERP is a business tool designed to solve specific identified problems in the corporate world. ERP is an extremely costly and intricate exercise that requires a lot of planning.

**The Automated Inventory Tracking System** provides real-time information regarding the stock levels of each item across retail locations, feeder warehouses, and central warehouses. After assessing item availability at the main and feeder warehouses, information regarding the restocking of sold products is automatically transmitted to the supplier.

**III. RESEARCH METHODOLOGY**

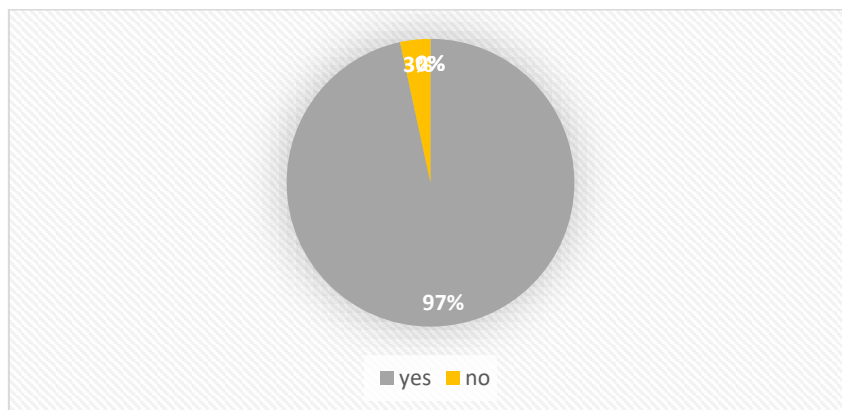
The study uses a mixed-approaches strategy, integrating quantitative and qualitative research techniques. A thorough grasp of how technology affects logistics supply chain management is made possible by this method.

Employees will receive structured surveys to gather quantifiable information about how they view technology's influence on supply chain management. Both closed-ended and Likert-scale questions will be included in the surveys.

**DATA ANALYSIS**

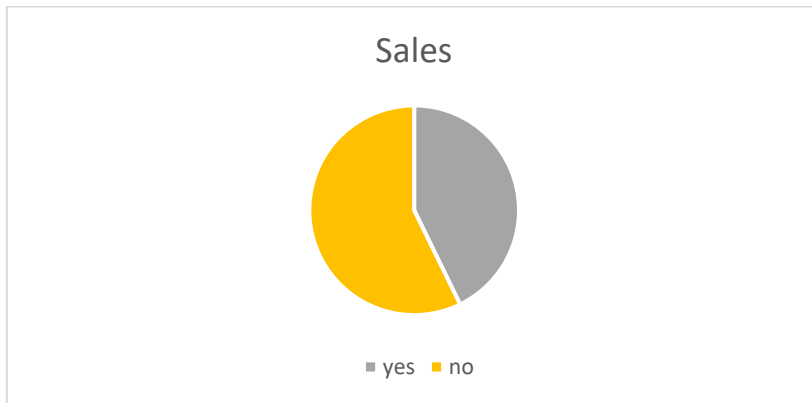
technology's use in supply chain management improves the organization

| Particular | No.of participants | Percentage % |
|------------|--------------------|--------------|
| Yes        | 56                 | 96.6 %       |
| No         | 3                  | 3.4 %        |



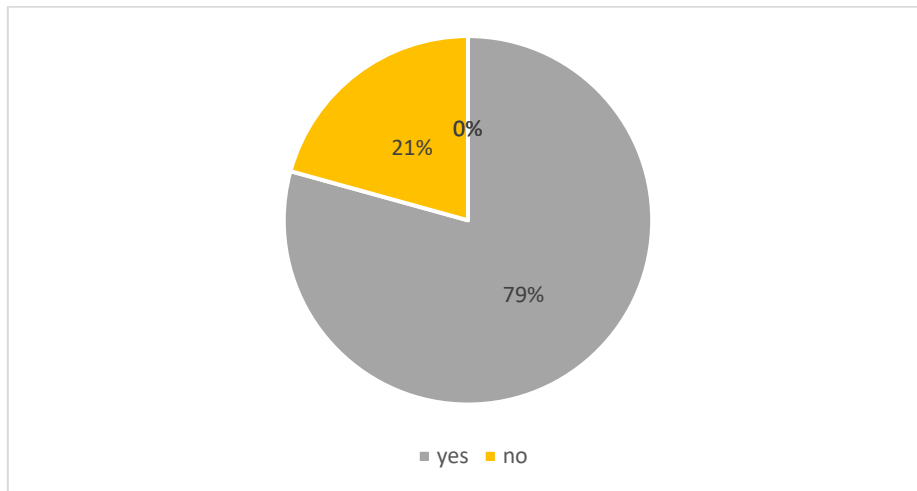
The system promotes task effectiveness & efficiency.

| Particular | No.of participants | Percentage % |
|------------|--------------------|--------------|
| yes        | 52                 | 89.7%        |
| no         | 6                  | 10.3%        |



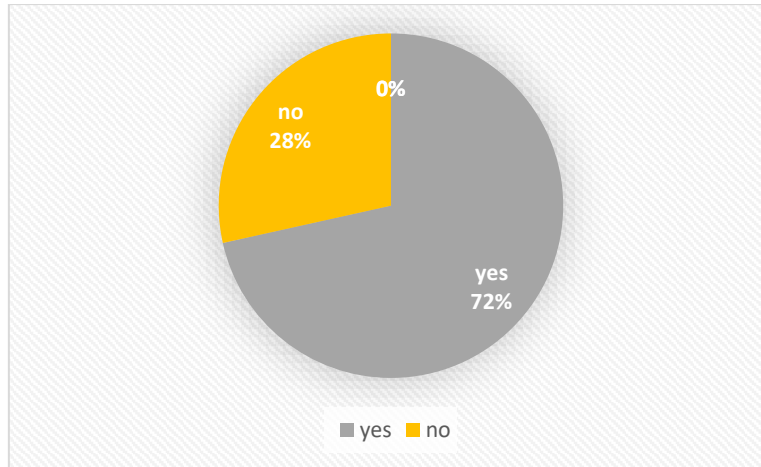
The preparation of orders is aided by the use of information technology in supply chain operations.

| Particular | No.of participants | Percentage % |
|------------|--------------------|--------------|
| yes        | 46                 | 79.3%        |
| no         | 12                 | 20.7%        |



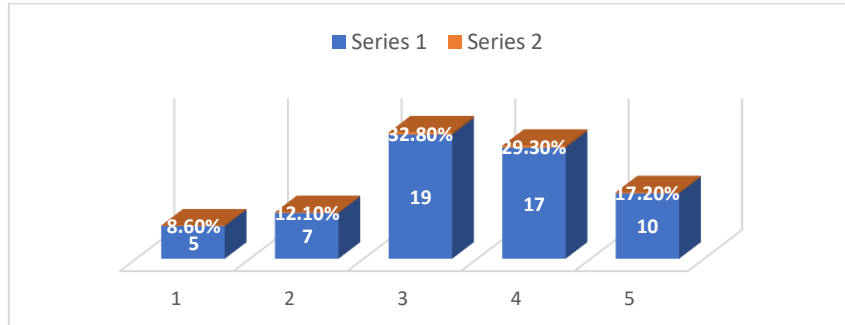
technology has decreased serving time & cost in the supply chain.

| Particular | No.of participants | Percentage % |
|------------|--------------------|--------------|
| yes        | 43                 | 74.1%        |
| no         | 15                 | 29.5%        |



The organization's capacity to use Technology applications has affected how well it coordinates with its suppliers

| Particular | No.of participants | Percentage % |
|------------|--------------------|--------------|
| 1          | 5                  | 8.6%         |
| 2          | 7                  | 12.1%        |
| 3          | 19                 | 32.8%        |
| 4          | 17                 | 29.3%        |
| 5          | 10                 | 17.2%        |



#### IV. FINDINGS

- 79.3% of respondents favor integrating Technology into the company.
- Eighty-four percent of people need their work to be precise and finished on time.
- 89.7% of respondents claim that IT offers an efficient and productive work procedure.
- 74% of respondents claim that it reduces servicing time and expenses.
- IT enhances operational effectiveness in SCM by 76.4%.
- In their organization, 87.9% of people use computerized software.
- According to 81% of the public, quality work has gotten easier.
- 93.1% of people agree that keeping an eye on inventories and market conditions is important.
- 79.3% of people believe that material handling has been easier and faster.
- Decision-making has gotten easier, according to 96.6% of the population.
- It facilitates improved communication between customers and partners.
- The crucial impact of Technology implementation in SCM is helping with fundamental decision-making based on data available in the framework.

## V. CONCLUSION

Technology has a huge and diverse impact on supply chain management and logistics, radically changing how companies function and provide value. By implementing breakthroughs like blockchain, enterprises are attaining previously unheard-of levels of efficiency, transparency, and responsiveness. This study shows that through streamlining procedures, cutting expenses, and increasing accuracy, technology improves operational efficiency. Expanded visibility across the supply chain is facilitated by real-time tracking and monitoring capabilities, which enable businesses to react quickly to changes and client requests. Technology is also very important for risk management since it helps companies to plan ahead and take proactive measures in response to obstacles. Technology improvements have also significantly increased customer satisfaction because customers now want better service and faster delivery times. Greener logistics are also being made possible by the technological integration of sustainable practices, which is in line with global sustainability objectives. The switch to supply chains that are driven by technology is not without its difficulties, though. Barriers such as exorbitant implementation costs, opposition to change, and the requirement for worker reskilling must be overcome by organizations.

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