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Role of Technology in Improving Supply Chain Efficiency in the Coimbatore Textile Sector

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Abstract: ***The textile industry is one of India's most prominent industrial sectors, contributing significantly to exports, employment, and national GDP. Coimbatore, a leading textile hub, comprises spinning mills, weaving units, dyeing houses, and garment manufacturers that play a vital role in the regional economy. Traditionally, supply chain operations in these firms were managed manually, resulting in delays, inventory mismatches, limited coordination, and increased operational costs. With the emergence of advanced technologies such as Enterprise Resource Planning (ERP), Internet of Things (IoT), Artificial Intelligence (AI), automation, blockchain, and data analytics, textile firms are increasingly modernizing their supply chain processes to enhance real-time visibility, operational efficiency, and decision-making speed. However, technology adoption remains uneven, particularly among Micro, Small, and Medium Enterprises (MSMEs), due to financial and technical constraints. This study investigates the extent of technology adoption and examines its impact on key supply chain performance indicators, including cost efficiency, lead time, inventory management, and customer satisfaction in the textile industry of Coimbatore. The findings aim to provide insights for industry stakeholders and policymakers to strengthen technology-driven supply chain practices.***

Keywords: Textile Industry, Coimbatore, Supply Chain, Technology Adoption , ERP , IoT, AI, Supply Chain Efficiency, MSMEs.

I. INTRODUCTION

The textile industry is one of India's oldest industrial sectors, contributing significantly to exports, employment, and GDP. Coimbatore, a major textile hub, hosts spinning mills, weaving units, dyeing houses, and garment manufacturers. Traditionally, supply chain activities were managed manually, causing delays, inventory mismatches, and cost inefficiencies.

With the advent of ERP, IoT, AI, automation, blockchain, and data analytics, textile firms are transforming their supply chains to gain real-time visibility and faster decision-making. However, technology adoption remains uneven, particularly among MSMEs. This study investigates the extent and impact of technology adoption on supply chain efficiency in Coimbatore.

II. OBJECTIVES

1) To examine the extent of technology adoption (such as ERP, IoT, AI, Block chain and Automation) in the textile supply chain operations.

2) To assess the impact of technology on key supply chain performance indicators including cost efficiency, lead time, inventory management, and customer satisfaction.

III. REVIEW OF LITERATURE

A. Christopher Lee (2004)

In their study "Supply Chain Confidence and IT Integration", Christopher and Lee (2004) reviewed 40 supply chain –related papers using a qualitative literature analysis method. Their findings show that information technology improves supply chain visibility and reduces uncertainty across production stages.

B. Gunasekaran &Ngai (2004)

Gunasekaran and Ngai (2004), in their work "Information Systems in Supply Chain Integration", analyzed 82 research studies through a systematic review approach. Findings revealed that ERP and IT systems enhance purchasing, production planning, and logistics efficiency. They suggest that textile firms should prioritize ERP adoption for better supplier– manufacturer integration.

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IV. RESEARCH METHODOLOGY

This study adopted a descriptive research design to examine the level of technology adoption and its impact on supply chain efficiency in the Coimbatore textile sector. The population included textile mills, garment units, dyeing and processing houses, and logistics firms in Coimbatore. Respondents were selected using a purposive sampling technique, as only employees with direct involvement in supply chain and technology usage were suitable for the study. A total of 154 respondents participated. Primary data were collected through a structured questionnaire covering demographic details, technology usage, supply chain practices, performance indicators, and future outlook. Secondary data were gathered from academic journals, government publications, industry reports, and company websites. The collected data were analysed using percentage analysis and ranking analysis, and the findings were presented through tables, charts, and interpretive explanations.4. Results and Discussion

A. Table Analysis

Table 1: Technology Adoption Levels

Technology Level	% of Firms
Basic Digital Tools	13.6
ERP / Automation	35.7
Advanced (IoT, AI, Blockchain)	50.6

Interpretation: Majority of firms use advanced technologies, showing strong digital penetration.

Table 2: Ranking of Supply Chain Performance Improved by Technology

Factor	Mean Score	Rank
Cost Efficiency	94	1
Lead Time	73	2
Inventory Management	58	3
Customer Satisfaction	43	4

Interpretation: Cost Efficiency (Mean = 94) ranks first, showing that technology has the greatest impact on reducing costs and improving efficiency.

Table 3: Ranking of Operational Areas Impacted

Area	Mean Score	Rank
Production Efficiency	85	1
Order Accuracy	73	2
Inventory Control	54	3
Delivery Speed	51	4

Interpretation: Lead Time, Inventory Management, and Customer Satisfaction show comparatively lower improvement, with customer satisfaction ranked last.

B. Key Findings

- Majority (50.6%) use advanced technologies.
- 63% agree technology improves customer satisfaction.
- 59.1% believe technology is essential for future growth.
- Production efficiency and cost reduction are the most impacted.
- Fully digital quality control remains limited (16.9%).

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V. SUGGESTIONS

Textile firms in Coimbatore should enhance employee training and awareness programs to ensure the effective utilization of supply chain technologies, while companies operating under traditional models are encouraged to gradually transition toward agile and hybrid systems to improve flexibility and responsiveness. Firms with limited financial resources may adopt a phased approach to digital investment to reduce risk and ensure sustainable implementation. Greater use of digital tools is necessary to enhance customer satisfaction and delivery speed, and the adoption of fully digital quality control systems along with advanced technologies such as IoT, AI, and blockchain should be expanded. Regular evaluation of technological performance and continuous digital upgrading are essential to achieve long-term supply chain efficiency and maintain competitive advantage. In addition, collaboration between supply chain partners through integrated digital platforms can improve transparency, coordination, and information sharing across all stages of production and distribution. Government support in the form of subsidies, training programs, and infrastructure development can further encourage technology adoption among MSMEs. Firms should also focus on data-driven decision-making by leveraging analytics to forecast demand accurately and optimize inventory levels. Strengthening cybersecurity measures is equally important to protect digital supply chain systems from potential risks. Ultimately, sustained commitment to digital transformation will enable textile firms to enhance operational resilience, reduce costs, and achieve long-term growth in an increasingly competitive market environment.

VI. CONCLUSION

This study confirms that technology plays a crucial role in improving supply chain efficiency in the Coimbatore textile sector. Digital tools significantly enhance cost efficiency, production performance, inventory management, and order accuracy. Although traditional practices still exist, firms are increasingly adopting advanced technologies to remain competitive. Continuous technological investment and strategic digital transformation are necessary for sustainable growth and global competitiveness.

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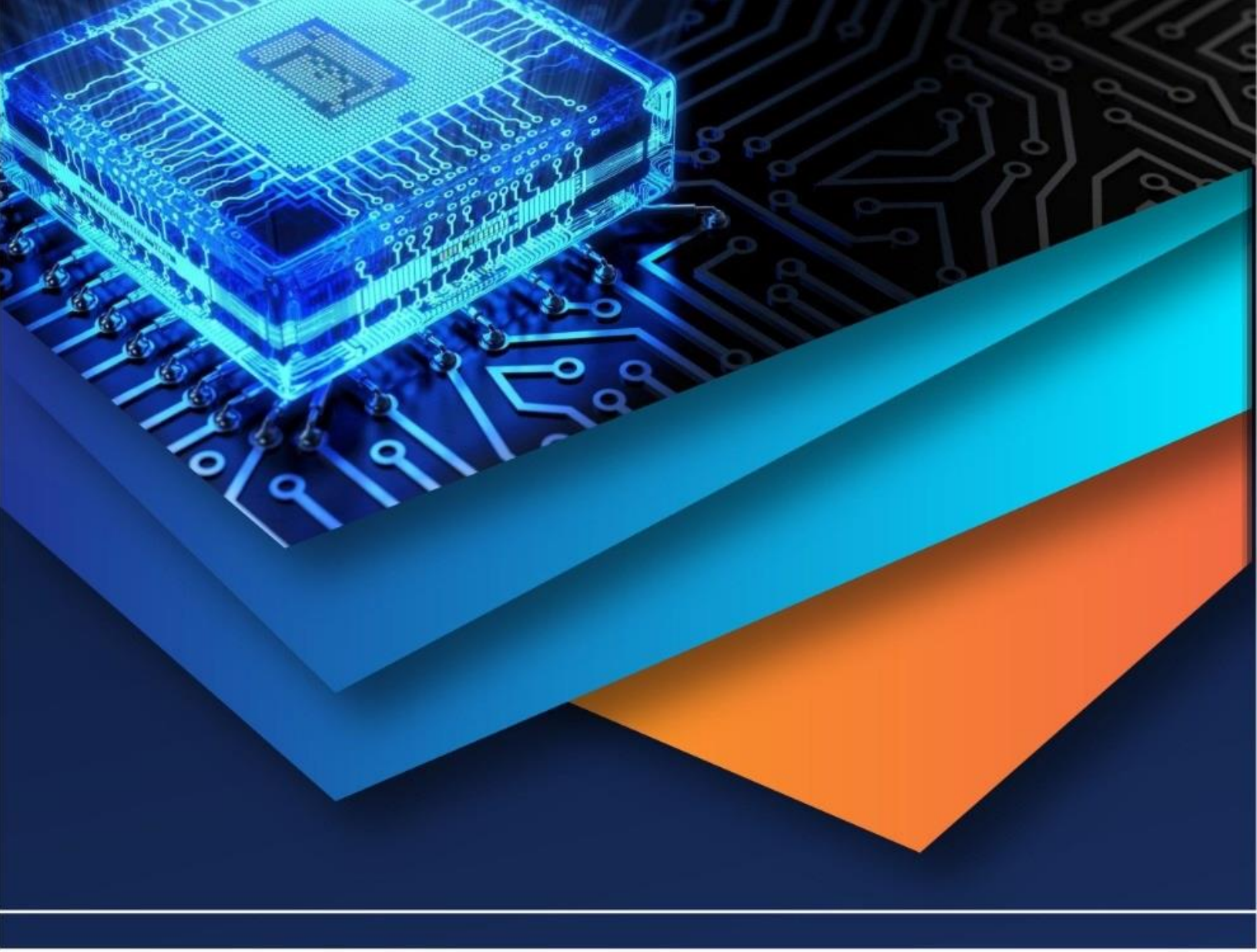

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