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ASSESSING THE ROLE OF INVENTORY MANAGEMENT TECHNOLOGIES IN ENHANCING OPERATIONAL EFFICIENCY

Ansiya S[1], Dr. C. Rajalakshmi[2], Mr.M. Selva Kumar[3]
[1]*MBA Student, Sakthi Institute of Information and Management Studies Pollachi*
[2]*Associate Professor, Sakthi Institute of Information and Management Studies Pollachi*
[3] *Assistant Professor, Sakthi Institute of Information Management Studies, Pollachi.*

ABSTRACT
In today's competitive business environment, efficient inventory management is critical for sustaining operational performance, minimizing costs, and meeting customer demands. This study aims to investigate the role of inventory management tools and their impact on the operational performance, a reputed company in the textile manufacturing sector. The research focuses on key inventory management tools such as Economic Order Quantity (EOQ), Just-In-Time (JIT), ABC analysis, and inventory tracking systems used by the company. Through a structured questionnaire and interviews with employees across different departments, data were collected to evaluate the effectiveness of these tools in reducing stockouts, controlling inventory costs, improving lead times, and ensuring smoother production processes. A quantitative research methodology was adopted to analyze the data and assess the correlation between inventory practices and operational efficiency. The findings reveal that the strategic use of inventory management tools significantly enhances productivity, reduces waste, and supports timely order fulfillment. The study also highlights challenges in implementation and offers recommendations to optimize inventory practices. Overall, the research emphasizes the importance of adopting advanced inventory management strategies to strengthen the company's operational performance and achieve long-term competitiveness in the textile industry.

KEYWORDS: *Inventory Management, Operational Performance, Economic Order Quantity (EOQ), Just-In-Time (JIT), ABC Analysis, Inventory Control, Textile Industry*

INTRODUCTION

In the current era of globalization and rapid industrial advancement, efficient inventory management has emerged as a cornerstone for achieving operational excellence and sustaining a competitive edge, particularly within the manufacturing sector. Inventory, often representing a substantial portion of a company's working capital, requires precise and strategic control to optimize productivity, manage costs effectively, and ensure high levels of customer satisfaction. In this context, the textile industry, known for its intricate production cycles, fluctuating demand, and seasonal variations, faces unique inventory challenges that demand robust and adaptive management approaches. A growing enterprise operating in the textile manufacturing space must continually strive to strike a balance between maintaining adequate stock levels to meet production requirements and minimizing both holding and shortage costs. This balancing act becomes even more critical in light of increasing market competition, evolving customer expectations, and the constant pressure to reduce operational inefficiencies. To meet these challenges, organizations have increasingly turned to structured inventory control methods such as Economic Order Quantity (EOQ), Just-In-Time (JIT), and ABC analysis. These tools offer valuable frameworks for optimizing stock levels, streamlining procurement and storage processes, minimizing waste, and improving overall supply chain responsiveness. The implementation of these methodologies not only aids in reducing excess inventory and associated carrying costs but also supports timely production and delivery schedules, which are essential for maintaining market relevance and customer trust. This study aims to explore and evaluate the effectiveness of these inventory management tools in enhancing the operational performance of a textile manufacturing firm. It focuses on understanding how the integration of EOQ, JIT, and ABC analysis influences key performance indicators such as production continuity, inventory turnover, lead times, and cost efficiency. Furthermore, the research seeks to uncover existing challenges and areas for improvement in the current inventory practices, thereby offering actionable insights and recommendations for refining inventory strategies. By delving into both the theoretical frameworks and practical applications of inventory management in the textile industry, this study contributes to the growing body of knowledge on supply chain optimization. It also serves as a valuable reference for decision-makers seeking to implement data-driven and performance-oriented inventory solutions that align with their operational goals and industry demands.

OBJECTIVES

- To Identify inventory management tools and techniques used
- To Analyze the impact of inventory management on operational performance
- To Assess challenges in implementing inventory techniques and their effects on supply chain and production.
- To Evaluate the role of technology and automation in inventory control for efficiency improvement.

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REVIEW OF LITERATURE

- **George L. Hodge et al. (2024)**: In their study "Improving the Operational Efficiency at A Manufacturing Facility by Adapting Lean Manufacturing Principles," the authors evaluated the application of lean manufacturing principles in the textile industry. They identified that implementing lean tools, such as Kanban systems and Value Stream Mapping (VSM), led to significant improvements in operational efficiency by reducing waste and enhancing productivity.
- **Juan Camilo Gutierrez et al. (2024)**: The article "Benefits, Challenges, and Limitations of Inventory Control Using Machine Learning Algorithms: Literature Review" presents a comprehensive review of the benefits, challenges, and limitations of using machine learning (ML) algorithms in inventory control. The study highlights that ML algorithms can transform inventory management and improve operational efficiency in supply chains.
- **R.R. Panigrahi et al. (2024)**: Their study "Impact of Inventory Management on SME Performance: A Systematic Review" explores how inventory management practices influence the performance of emerging SMEs in the context of Industry 5.0. The research highlights the importance of technical, technological, and behavioural know-how in inventory management practices and their effects on operational performance.
- **Cin7 (2024)**: The article "17 Effective Inventory Management Techniques" discusses various inventory management methods, including Economic Order Quantity (EOQ), Just-in-Time (JIT), and ABC analysis. These techniques are essential for businesses looking to optimize inventory management and improve operational performance.
- **Carlos Barraza (2024)**: In the "Inventory Management Guide: Tools and Techniques for 2024," the author emphasizes the role of advanced digital tools, such as AI, cloud storage, and IoT, in revolutionizing inventory management. These technologies offer precision, efficiency, and real-time insights, leading to improved operational performance.
- **J.B. Munyaka and V.S.S. Yadavalli (2022)**: Their systematic review, "Inventory Management Concepts and Implementations," emphasizes the importance of effective inventory control in achieving operational success. The study highlights that proper inventory management is crucial for meeting customer demands and maintaining organizational performance in the textile industry.
- **M. Sundar et al. (2021)**: In the article "A Review on Lean Manufacturing Implementation Techniques," the authors discuss various lean manufacturing tools, including 5S methodology and Kanban systems. They conclude that these techniques are essential for reducing waste and improving operational efficiency in textile manufacturing.

SOURCES OF DATA

Data collection is the term used to describe a process of preparing and collecting data.

• **Primary Data –** Questionnaire given to 110 respondents

• **Secondary Data -** Websites and online journals, Published reports & Review of literature from published article

TOOLS FOR ANALYSIS

To understand the role and effectiveness of inventory management tools in improving operational performance, descriptive statistics were employed. This method helps summarize and interpret the collected responses, offering insights into how respondents perceive various aspects of inventory practices, technological involvement, and implementation challenges.

1. DESCRIPTIVE STATICS

S. No	Particulars	Valid	Missing	Mean	Median	Mode	Std. Deviation
1	Inventory Tools and Techniques	132	0	9.4091	7.0000	7.00	4.5899
2	Impact Of Inventory Management on Operational Performance	132	0	9.2576	7.0000	7.00	4.47320
3	Impact Of Inventory Management on Operational Performance	132	0	9.4318	7.0000	7.00	4.78259
4	Challenge In Implementing Inventory Techniques	132	0	9.4318	7.0000	7.00	78259
5	Role Of Technology and Automation	132	0	7.0000	6.0000	6.00	3.79942

INTERPRETATION

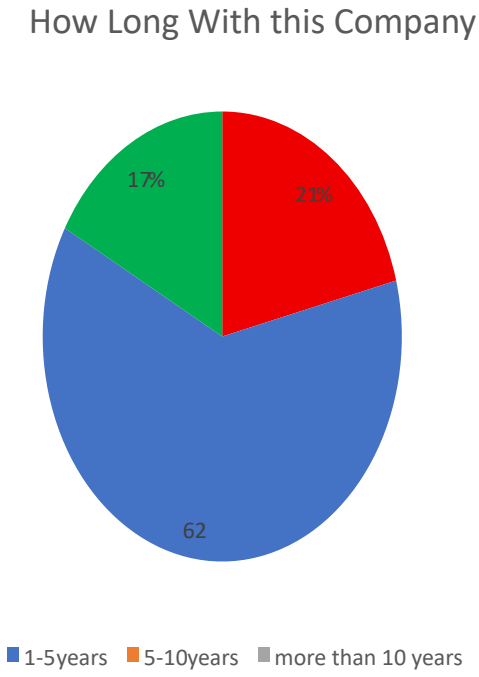
The analysis shows all variables had complete responses (N=132), ensuring data reliability. Mean scores ranged from 7.0 to 9.43, indicating generally positive perceptions of inventory management practices. Inventory Tools and Techniques and their impact on performance were rated highest. Standard deviations (3.8–4.78) suggest moderate variation in responses. Technology and automation received the lowest mean, indicating a potential area for further development.

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2. PERCENTAGE ANALYSIS

How Long Have you been with this company

S NO	Particulars	No. of Respondents	Percentage
1.	1-5 years	28	21
2.	5-10 years	82	62
3.	More than 10 years	22	17
TOTAL		132	100



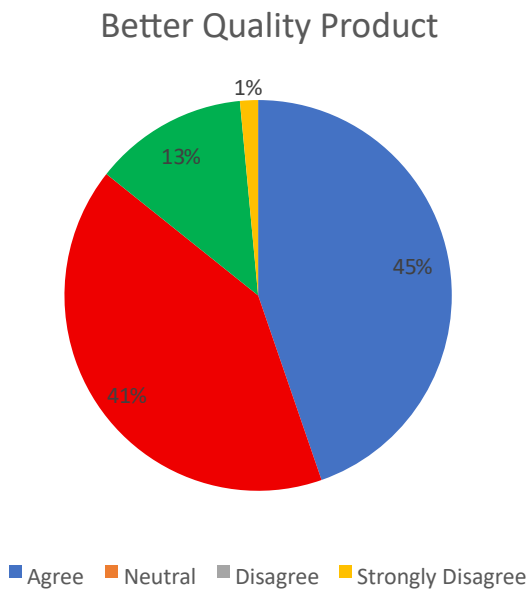
INTERPRETATION

The majority of respondents, 62% (82 individuals), have 5–10 years of work experience. This is followed by 21% (28 respondents) with 1–5 years of experience. Only 17% (22 respondents) have more than 10 years of experience. This shows that most participants are in the mid-level stage of their careers. The overall experience profile suggests a workforce with substantial professional exposure.

Inventory Management Facilitates Better Quality of product

S NO	Particulars	No. of Respondents	Percentage
1.	Agree	59	45
2.	Neutral	54	41
3.	Disagree	17	13
4.	Strongly Disagree	2	1
TOTAL		132	100

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INTERPRETATION

A significant portion of respondents, 45% (59 individuals), agree that inventory management facilitates better product quality.41% (54 respondents) remain neutral, indicating uncertainty or lack of strong opinion on the matter. Only 13% (17 respondents) disagree, while a very small 1% (2 respondents) strongly disagree. This shows that while many see a positive link between inventory management and product quality, a large neutral group suggests mixed perceptions. The data implies a need for greater awareness or evidence of how inventory practices directly impact quality

3. HYPOTHESIS FOR ANOVA

Null Hypothesis (H_0): There is no significant difference in inventory performance among employees with different years of service.

Alternative Hypothesis (H_1): There is a significant difference in inventory performance among employees with different years of service.

ANOVA TABLE

Inventory	Sum of Square	df	Mean Square	f	Sig.
Between Groups	160.809	1	160.809	8.043	.005
Within Groups	2599.100	130	19.993		
Total	2759.909	131			

INTERPRETATION

The ANOVA test examines the impact of employee experience on inventory performance.

The significance value (p = 0.005) is less than 0.05, showing statistical significance.

This means there is a meaningful difference between groups based on years of service.

Employees' length of service influences how they handle inventory tasks.

FINDINGS

- Adoption of Key Inventory Tools: The company effectively uses EOQ, JIT, and ABC analysis to manage inventory. These tools have helped streamline procurement and reduce excess stock.
- Positive Impact on Performance: Descriptive statistics revealed high mean values (ranging from 7.0 to 9.43) indicating that employees perceive inventory tools as effective in improving operational performance.
- Moderate Technological Integration: Among all variables, technology and automation received the lowest mean score (7.0), suggesting that there is room for enhancement in adopting advanced inventory technologies.
- Employee Experience Matters: The ANOVA test showed a statistically significant difference (p = 0.005) in inventory performance based on years of service. Experienced employees tend to handle inventory more efficiently.
- Educational Qualification of Respondents: Most respondents (97%) hold at least a Bachelor's degree, indicating that responses are informed by a reasonably educated workforce.
- Product Quality Perception: 45% of respondents believe inventory management improves product quality, while 41% remain neutral, indicating the need for clearer evidence of the impact.

SUGGESTIONS

- Invest in Technology and Automation: Introduce or upgrade ERP systems, barcode tracking, and AI-driven

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demand forecasting to boost real-time visibility and control.

- Conduct Regular Training: Since employee experience influences performance, periodic training and development programs should be introduced for newer staff.
- Enhance Awareness of Quality Links: Educate employees on how inventory management impacts product quality to reduce neutrality in perception and improve engagement.
- Implement Lean Tools Widely: Broaden the use of Kanban, 5S, and other lean manufacturing techniques to further minimize waste and enhance workflow efficiency.
- Monitor and Evaluate Tools Regularly: Establish KPIs to continuously assess the performance of inventory tools and make timely improvements.

CONCLUSION

This study demonstrates the significant role inventory management tools play in improving the operational performance of a textile manufacturing company. EOQ, JIT, and ABC analysis are effective in reducing stockouts, controlling costs, and ensuring production continuity. However, the relatively low score for technological integration indicates a need for more automation. Employee experience positively influences inventory performance, suggesting that targeted training can yield better outcomes. While many respondents agree on the link between inventory and product quality, a considerable percentage remain neutral, which calls for improved communication and demonstration of results. Overall, strategic adoption and continuous evaluation of inventory tools are essential for competitive advantage in the dynamic textile sector.

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