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Impact of Implementation of Just-In-Time Inventory on Customer Satisfaction and Operational Efficiency

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ABSTRACT

The study explores the impact of implementing Just-In-Time (JIT) inventory systems on customer satisfaction and operational efficiency within organizations. The research is guided by four primary objectives: analyzing the influence of JIT inventory on customer satisfaction, assessing its effect on operational efficiency, examining the correlation between customer satisfaction, operational efficiency and JIT inventory. The findings of the study reveal notable differences based on organizational size and employee experience. Smaller organizations tend to report higher levels of customer satisfaction and operational efficiency following the implementation of JIT practices. In contrast, larger organizations encounter more challenges, with greater variability in JIT performance and lower overall satisfaction. Employees with less experience report higher satisfaction and efficiency, whereas more experienced staff show lower satisfaction and more diverse views on JIT practices.

The study underscores the need for tailored JIT strategies that consider organizational size and employee experience to optimize performance. Regression analysis confirms a significant positive impact of customer satisfaction and operational efficiency on JIT implementation, highlighting the potential for substantial improvements in inventory management and overall organizational performance. The reliability of these findings is supported by high internal consistency in the measurement scales, emphasizing the interconnectedness of customer satisfaction, operational efficiency, and JIT practices. The research sample includes 53 participants, providing insights into the practical implications of JIT inventory systems.

Keywords: Operational Efficiency, Just in time, Customer Satisfaction, Inventory System, Service Quality

INTRODUCTION

In today's competitive business environment, companies constantly strive to enhance their operational efficiency and improve customer satisfaction. One strategic approach that has gained prominence in achieving these goals is the Just-In-Time (JIT) inventory management system. Originating from the manufacturing practices of Toyota in the mid-20th century, JIT has evolved into a widely adopted methodology across various industries. The fundamental principle of JIT is to produce and deliver products in the exact quantities needed at the precise time they are required, thereby minimizing waste and reducing inventory costs. This intricate balancing act of efficiency and responsiveness is not merely a logistical challenge but a strategic imperative that influences multiple facets of an organization's performance.

The implementation of JIT inventory management profoundly impacts customer satisfaction and operational efficiency. This impact can be assessed through various interconnected factors. On the operational side, JIT emphasizes continuous improvement, waste elimination, and cost reduction. These principles drive a streamlined production process, which, in turn, lowers inventory levels and shortens lead times. On the customer satisfaction front, the effects of JIT are seen in the quality of service, trust and commitment

between the company and its customers, product quality, and reliability. The intricate interplay between these factors underscores the multifaceted benefits and challenges associated with JIT implementation.

STATEMENT OF THE PROBLEM

This study addresses the problem of understanding how the implementation of JIT inventory management influences customer satisfaction and operational efficiency. Specifically, it seeks to explore the direct and indirect effects of JIT on various dimensions of customer satisfaction and operational performance. Furthermore, it aims to unravel the correlations between JIT practices and key performance metrics to provide a comprehensive understanding of its efficacy and implications.

RESEARCH GAP

Despite the widespread adoption and recognized benefits of Just-In-Time (JIT) inventory management in various industries, there remains a significant research gap in comprehensively understanding its nuanced impact on customer satisfaction and operational efficiency. Existing studies predominantly focus on the operational advantages of JIT, such as reduced inventory costs and improved production workflows. However, there is limited empirical evidence linking these operational improvements directly to enhanced customer satisfaction, particularly in terms of service quality, trust, commitment, product quality, and reliability.

RESEARCH QUESTIONS

- How does the implementation of Just-In-Time (JIT) inventory affect the service quality and product reliability perceived by customers?
- What impact does JIT inventory have on customer trust, commitment and overall satisfaction with the company?
- In what ways does JIT inventory contribute to the reduction of lead times and improvement in operational efficiency within production processes?

OBJECTIVES OF THE STUDY

1. To analyze the impact of JIT inventory on customer satisfaction.
2. To assess the effect of JIT inventory on operational efficiency.
3. To determine the correlation between customer satisfaction and just in time inventory.
4. To determine the correlation between operational efficiency and just in time inventory.

HYPOTHESIS OF THE STUDY

- **H1:** There is a significant correlation between customer satisfaction and just in time inventory.
- **H2:** There is a significant correlation between operational efficiency just in time inventory.

Review of Literature

1. Dr. GhazalaYasmin (2024): In the article titled "Supply Chain Management: Ensuring Seamless Operations", this study underscores the critical role of supply chain management (SCM) in modern business operations, focusing on the coordination and integration of processes from suppliers to customers. It emphasizes the significance of efficient SCM in meeting customer demands, reducing costs, and enhancing competitiveness. By implementing effective strategies, technologies, and best practices, businesses can optimize their supply chains to achieve operational excellence. The research highlights the complexities of the global marketplace and the necessity of streamlined operations and efficient logistics management for organizational success. The findings advocate for robust SCM practices as fundamental to achieving seamless business operations and sustained competitive advantage.

2. J.B. Munyaka& V.S.S. Yadavalli (2022): In the research paper named "Inventory management concepts and implementations: a systematic review", this research explores the critical role of inventory management in supply chain and logistics, particularly in meeting customer and humanitarian demands. It examines how demand variability, whether deterministic or stochastic, and its dependency affect inventory strategies. Using a review methodology, the study highlights the implications of these demand characteristics on operational success and organizational performance, emphasizing the need for adaptive inventory control systems tailored to different demand scenarios.

3. Nguyen Hoang Tien, et.al (2021): In the study entitled "Factors affecting customer satisfaction on service quality at joint stock commercial banks in Vietnam", the study conducted at Bac A Bank aims to enhance customer attraction, market dominance, and satisfaction. Using a sample of 200 customers via convenient sampling, the research employs a Likert scale and SPSS for data analysis. It investigates reliability, responsiveness, service capacity, empathy, and tangibility as factors influencing customer satisfaction. Additionally, the study explores demographic variations in satisfaction, proposing strategic improvements aligned with the bank's objectives to boost overall service quality and customer experience.

4. Jie Yang, et.al (2021): In the research paper titled" Achieving a just–in–time supply chain: The role of supply chain intelligence", this study investigates the impact of demand-driven supply chain intelligence, focusing on customer knowledge management capability, knowledge sharing, and cooperation, on JIT supply chain operations—specifically in production planning, sourcing, and logistics. Using path analysis on data from manufacturing firms, it empirically demonstrates the significant role of these factors in facilitating a JIT supply chain and improving operational performance. The findings underscore the theoretical and practical contributions of integrating demand-driven strategies to enhance supply chain efficiency and responsiveness, crucial for achieving competitive advantage in dynamic markets

5. Bikash KoliDey, et.al (2021): In the article titled "Involvement of controllable lead time and variable demand for a smart manufacturing system under a supply chain management", this study investigates the impact of reducing controllable lead time and variance in smart supply chain management, focusing on production rate and demand variability. It develops an exact total cost equation considering on-hand inventory and backorders, demonstrating through marginal value analysis that cost savings from lead time and variance reduction diminish with longer lead times. The research employs analytical methods and validates global optimality through classical optimization, supported by numerical examples and sensitivity analysis, offering insights into optimizing supply chain costs under stochastic demand and varying production rates.

6. Nguyen Hoang Tien, et.al (2021): In the research paper named"Factors impacting customer satisfaction at Vietcombank in Vietnam", this study examines customer service quality satisfaction factors at Vietcombank in Ho Chi Minh City, focusing on 347 valid customer questionnaires. Utilizing exploratory factor analysis (EFA) and linear regression, the research identifies reliability, system efficiency, guarantees, interest rates, and costs as key drivers of customer satisfaction. Specifically, interest rates, service fees, and system effectiveness significantly enhance satisfaction and loyalty. The study underscores the importance of customer relationship management (CRM) in achieving organizational goals through targeted customer engagement strategies.

7. Harcourt, Horsfall, Ali, Faith Odage(2021): In the study entitled **"**Just-in-time inventory management imports on sales performance of paint manufacturing firms in rivers state, Nigeria", this study explores the impact of just-in-time (JIT) inventory management on sales performance in paint manufacturing firms in Rivers State, Nigeria. Employing an explanatory research design with causal investigation, it utilized primary data collected via questionnaires from 90 top management staff across 30 registered firms. Statistical analysis using Pearson's correlation indicated a significant and positive relationship between JIT inventory management and sales performance. The findings support JIT adoption as a strategy to enhance inventory efficiency and improve overall sales performance in the paint manufacturing sector.

8. Poi, Elizabeth Ledisi, et.al (2021): In the article titled "Inventory optimization and customer satisfaction of petroleum marketing firms in Rivers State", this study explores the correlation between inventory optimization techniques—specifically Just-in-Time (JIT) and ABC Technique—and customer satisfaction in petroleum marketing firms in Rivers State, Nigeria. Utilizing a cross-sectional survey design with data from eleven quoted firms, the Pearson correlation coefficient was employed. Results indicate a significant positive relationship, suggesting that JIT and ABC Technique enhance customer satisfaction. The study recommends adopting these techniques for competitive advantage and customer satisfaction in the petroleum marketing sector

9. Daniel Barberato Henrique, et.al (2020): In the research paper named "A framework to assess sustaining continuous improvement in lean healthcare",this research focuses on sustaining lean performance in healthcare by developing a framework to assess lean maturity. It identifies 22 critical success factors through literature analysis and validates them with a comparative case study, adding three additional factors. Hospitals that sustain lean over 18 months show structured change processes and foundational strategies. This study pioneers in consolidating factors crucial for long-term lean success in healthcare, benefiting both practitioners and academics.

10. Song Ying, et.al (2021): In the study entitled "Managing big data in the retail industry of Singapore: Examining the impact on customer satisfaction and organizational performance", this study addresses the gap in research on big data analytics within the retail sector, particularly in Singapore, focusing on its impact on customer satisfaction and organizational performance. Employing a quantitative approach with 500 participants from the Singapore retail industry, the study found that social media analytics were prominently utilized. The findings underscore the potential of big data management in retail for enhancing customer insights and operational strategies, suggesting avenues for future research on evolving retail trends and resilience amid economic fluctuations

11. Jopinus Saragih, et.al (2020): In the research paper named "Supply chain operational capability and supply chain operational performance: Does the supply chain management and supply chain integration matters",this study aims to explore the interactive relationship between supply chain (SC) operational capability and corporate competitive capability to enhance overall performance. It particularly investigates the impact of SC integration as a strategic tool on this interactive relationship. Using SEM-PLS for data analysis, the research collected data via a questionnaire designed from prior studies, emphasizing alignment between SCM decisions and corporate strategy. The findings extend existing frameworks by integrating SC integration practices in a developing country context, focusing on manufacturing firms in Indonesia.

12. Luana Sposito Valamede, Alessandra Cristina Santos Akkari (2020): In the study entitled "Lean 4.0: A new holistic approach for the integration of lean manufacturing tools and digital technologies",this paper explores the integration of Lean Manufacturing (LM) principles with Industry 4.0 technologies to enhance competitiveness in manufacturing. Using a three-step methodology involving technological and industrial mapping, it identifies 25 synergy points between LM tools and technologies like Big Data Analytics, The Cloud, Virtual Simulation, and Augmented Reality. It introduces concepts such as Just in Time 4.0, Kaizen 4.0, and Total Productive Maintenance 4.0, highlighting attributes such as waste minimization and autonomous processes, crucial for organizational gains in the digital era.

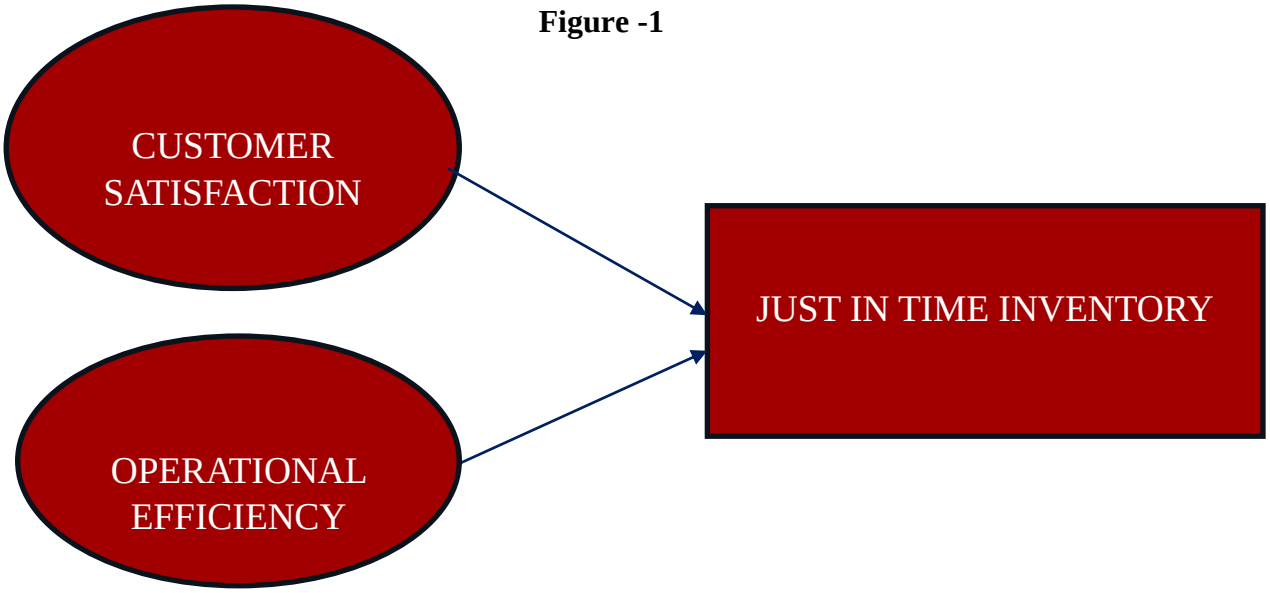
13. Laetitia Radder, Marle van Eyk, RynoLaubscher (2019): In the article named "Drivers of Customer Satisfaction in a Business-toBusiness Market: A Survey within the South African Stainless-Steel Industry", this study examines customer satisfaction drivers in the South African stainless-steel stockist and distributor market, crucial for competing effectively amid intense competition. It identifies five key drivers and analyzes 320 survey responses to assess their impact on overall satisfaction. Findings reveal strong positive relationships between satisfaction and drivers like reliability and product quality, with significant gaps noted in reliability, service quality, and commercial aspects. The research emphasizes prioritizing these drivers to enhance overall customer satisfaction, suggesting management focus on bridging satisfaction gaps and improving critical areas for competitive advantage in the market.

14. Sihle Mankazana and Sambil Charles Mukwakungu (2018): In the research paper named "The impact of just-in-time (JIT) in inventory management system and the supplier overall performance of South African's bed mattress manufacturing companies", this study explores the impact of the Just-in-Time (JIT) inventory management approach on South African inventory systems and overall organizational performance by comparing two companies producing bed mattresses with different suppliers and inventory management systems. Company X has not adopted JIT, whereas Company Y has implemented it. Through a mixed-methods research design, incorporating descriptive statistics for data analysis, the study highlights the benefits and challenges of JIT implementation. The findings suggest that Company Y, which uses JIT, demonstrates higher performance rates compared to Company X, indicating that not adopting JIT contributes to lower performance. The study concludes that JIT provides a strategic framework for enhancing inventory management and overall company performance, recommending its adoption for manufacturing organizations to optimize their operations.

15. Ivy DammaIvionna Shajema(2018): In the study entitled "Effect of inventory control practices on performance of retail chain stores in Nairobi County, Kenya", this study explores the impact of inventory control practices on the performance of retail chain stores in Nairobi County, Kenya. Using a descriptive survey design, data was gathered from 144 retail stores. Findings indicate that vendor management inventory systems, lean practices, inventory stock taking, and strategic supplier management practices significantly enhance retail performance. The study recommends investments in ICT integration for VMI systems, improved demand forecasting for lean practices, enhanced inventory auditing, and strategic supplier management to optimize operational efficiency and performance in retail chains.

CONCEPTUAL FRAMEWORK

Figure -1



Research Methodology

Primary Data

This study used a structured questionnaire to assess the impact of Just-In-Time (JIT) inventory management on customer satisfaction and operational efficiency. The questionnaire included demographic factors and questions aimed at understanding how JIT practices influence Just-in-Time dimensions like continuous improvement, waste elimination, cost reduction, customer satisfaction, and operational efficiency. The questionnaire was distributed to 53 respondents, including those directly involved in JIT practices, ensuring relevant and practical data.

Sample Size

The sample size of the study is 200 and the sample respondents are the customers of the standard minerals processing unit.

Sampling Technique

In this study, a convenience sampling technique was used to ensure diverse perspectives from various companies. The sample included balanced insights from each subgroup. Random selection within these groups and using Google Forms for distribution ensured 53 relevant responses capturing a wide range of experiences with Just-In-Time practices and their impact on customer satisfaction and operational efficiency.

Analysis

Regression Statistics

Multiple regression analysis was a key tool used in this study to explore the relationships between JIT inventory management and the dependent variables of customer satisfaction and operational efficiency.

Results and Discussions

Cronbach Alpha

Coeff of Cronbach alpha	Reliability
>= 0.9	Excellent
>=0.8	Good
>=0.7	Acceptable
>=0.6	Questionable
>=0.5	Poor
<=0.5	Unacceptable

Variables	Number of Items	Cronbach Alpha
Customer Satisfaction	12	0.887
Operational Efficiency	6	0.745
Just-In-Time Inventory	8	0.759

Table 1: Reliability testing using Cronbach Alpha

Interpretation

The Cronbach Alpha coefficients for the examined variables demonstrate good to acceptable levels of internal consistency. Specifically, the scales measuring Customer Satisfaction, Operational Efficiency and Just-In-Time exhibit Cronbach Alpha values of 0.887,0.745 and 0.759 respectively. Based on these findings, we may be concluded that each variable's sets of items accurately measure the corresponding components. In this case, all coefficients are higher than the standard criterion of 0.7, showing acceptable internal consistency. The higher the Cronbach Alpha, the more reliable the scale. This suggests that the tools used to evaluate the intended components of each construct- customer satisfaction, operational efficiency, Just-In-Time inventory- are reliable

Hypothesis Testing by Regression

H1: Customer Satisfaction and JIT

R	R Square	Adjusted R Square	Std. Error of the Estimate	P- Value
.667[a]	.44	.43	3.38	0.00

Interpretation

The regression analysis results indicate a significant relationship between customer satisfaction and just-in-time (JIT) practices. The model summary shows an R value of 0.667, suggesting a strong positive correlation. The R Square value of .0445 indicates that approximately 44.5% of the variability in JIT practices can be explained by customer satisfaction alone. The adjusted R Square, slightly lower at 0.43, accounts for the number of predictors in the model and confirms the model's robustness.

In the coefficients table, the unstandardized coefficient (□) for customer satisfaction is 0.39, indicating that for each unit increase in customer satisfaction, JIT practices improve by 0.39 units. The standardized coefficient (□) of 0.66 reinforces the strong impact of customer satisfaction on JIT, while the t-value of 6.39 and the significance level of 0.000 confirm that this relationship is statistically significant.

Overall, the analysis underscores the importance of customer satisfaction in influencing JIT practices. Organizations can enhance their JIT systems by focusing on improving customer satisfaction, as it significantly contributes to the efficiency and effectiveness of inventory management. This strong relationship highlights the interconnectedness of operational performance and customer satisfaction in achieving optimal outcomes.

H2: Operational Efficiency and JIT

R	R Square	Adjusted R Square	Std. Error of the Estimate	P-Value
.775[a]	.60	.59	2.87	0.00

Interpretation

The regression analysis demonstrates a significant relationship between operational efficiency and just-in-time (JIT) practices. The model summary shows an R value of 0.775, indicating a strong positive correlation between operational efficiency and JIT. The R Square value of 0.600 suggests that 60% of the variability in JIT practices can be explained by operational efficiency alone, while the adjusted R Square of 0.592 confirms the model's robustness after accounting for the number of predictors.

In the coefficients table, the unstandardized coefficient (□) for operational efficiency is 0.94, indicating that for each unit increase in operational efficiency, JIT practices improve by 0.94 units. The standardized coefficient (□) of 0.77 reflects the strong impact of operational efficiency on JIT. The t-value of 8.74 and the significance level of 0.000 confirm that this relationship is statistically significant.

Overall, the analysis highlights the critical role of operational efficiency in enhancing JIT practices. Organizations can significantly improve their JIT systems by focusing on operational efficiency, as it has a substantial impact on inventory management and overall performance. This strong relationship underscores the importance of streamlining operations to achieve optimal JIT outcomes

Discussion

The dataset analysis, comprising 53 responses, provides a comprehensive look at the impact of Just-In-Time (JIT) inventory management on customer satisfaction and operational efficiency. The results show overall positive perceptions towards JIT principles, with mean values ranging from 1.81 to 2.58, indicating a general agreement with the effectiveness of JIT strategies.

Regression Analysis Findings:

Customer Satisfaction and JIT:

The regression model shows a significant relationship between customer satisfaction and JIT, with an R value of 0.667 and an R Square value of 0.445. This suggests that customer satisfaction accounts for approximately 44.5% of the variability in JIT practices. The unstandardized coefficient (B) for customer satisfaction is 0.39, indicating that each unit increase in customer satisfaction improves JIT practices by 0.39 units. The standardized coefficient (Beta) of 0.66 reinforces this strong impact. The model's significance is confirmed by an F-value of 40.953 and a p-value of 0.000, indicating a robust predictive capability.

Operational Efficiency and JIT:

A significant relationship is also found between operational efficiency and JIT, with an R value of 0.775 and an R Square value of 0.600, indicating that operational efficiency explains 60% of the variability in JIT practices.

The unstandardized coefficient (B) for operational efficiency is 0.94, showing that each unit increase in operational efficiency improves JIT practices by 0.94 units. The standardized coefficient (Beta) of 0.77 highlights this strong impact. The model's robustness is supported by an F-value of 76.529 and a p-value of 0.000, confirming its statistical significance.

By focusing on these tailored strategies, organizations can effectively enhance their JIT practices, leading to streamlined operations, increased customer trust, and improved product reliability. These efforts will ultimately contribute to a competitive advantage in the market.

5.3 Conclusion

The analysis of Just-In-Time (JIT) implementation reveals that smaller organizations report higher customer satisfaction and operational efficiency, whereas larger organizations face more challenges in these areas. Companies with fewer employees have consistent views on JIT practices, leading to higher satisfaction and efficiency. Conversely, organizations with more employees exhibit more variability in their JIT scores and lower satisfaction levels. Employees' experience also plays a critical role; those with less experience report higher satisfaction and efficiency, while more experienced staff show lower satisfaction and more diverse views on JIT practices. The findings from the dataset of 53 responses demonstrate a robust positive influence of Just-In-Time (JIT) inventory management on both customer satisfaction and operational efficiency. With mean values indicating favorable perceptions and low standard deviations signifying consistent views, it's evident that respondents strongly agree with the principles of continuous improvement and waste elimination, which are essential for effective JIT outcomes. Cronbach Alpha coefficients above 0.7 for customer satisfaction (0.887), operational efficiency (0.745), and JIT (0.759) confirm the internal consistency and reliability of the measurement scales used. Regression analysis reveals significant relationships: customer satisfaction and operational efficiency explain 44.5% and 60% of the variability in JIT practices, respectively, highlighting their critical roles. The strong correlations between these variables underscore their interconnectedness, suggesting that enhancing customer satisfaction and operational efficiency can lead to more effective JIT implementation. This integrated approach fosters streamlined operations, reduced costs, and improved service reliability, ultimately boosting organizational performance and competitive advantage.The study highlights the importance of tailoring JIT strategies to different organizational sizes and employee experience levels to enhance performance. Regression analysis underscores the significant positive impact of customer satisfaction and operational efficiency on JIT implementation, suggesting that focusing on these areas can lead to substantial improvements in inventory management and overall organizational performance. High internal consistency in the measurement scales confirms the reliability of these findings, emphasizing the interconnectedness of customer satisfaction, operational efficiency, and JIT practices.

5.4 Further Scope of the Research

This study was conducted on the specific factors such as Just-in-Time inventory, Customer Satisfaction and Operational Efficiency in a ceramics powder manufacturing company. In future research other inventory models can be studied with various factors. Examining the impact of JIT in various industries can help identify sector-specific benefits and challenges, providing more tailored recommendations for different types of businesses. Studying how different customer segments respond to JIT implementation can help businesses tailor their strategies to meet diverse customer needs more effectively.

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