INTERNATIONAL JOURNAL OF SOCIAL SCIENCES BULLETIN
ISSN: (E) 3007-1917 (P) 3007-1909
Volume 3, Issue 3, 2025

ECONOMIC IMPACT OF JUST-IN-TIME (JIT) INVENTORY SYSTEMS

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DOI: https://doi.org/10.5281/zenodo.16778410

Received	Revised	Accepted	Published
13 January, 2025	13 February, 2025	28 February, 2025	03 March, 2025

ABSTRACT

The estimation of the effects of Just-In-Time (JIT) inventory systems on the economic performance of manufacturing firms in Pakistan is explored in this research. The major issue that occurred is the inefficiency in maintaining operational continuity and the increasing production costs for local firms, which was being enhanced by the conventional inventory management techniques. This study sets out to assess the validity of the claim that JIT practices have a significant impact on reducing costs and increasing profits. The quantitative research design has been adopted, and a structured questionnaire, issued to 350 manufacturing firms in the three cities, Khansur DMC Karachi, Lahore and Faisalabad, has been used. Analysis: The analysis of the data was conducted with SPSS and regression, which was used to determine the correlation between JIT implementation and the main financial performance indicators. The results indicated that the relationship between the degree of JIT adoption and economic performance was statistically significant ($p<0.01$). This positive relationship relates to the implications for reducing inventory costs and increasing operational efficiency. Companies with a large range of JIT implementation showed an 18-25% gain in cost effectiveness over companies without JIT. It will be advisable that the firms should closely collaborate with their suppliers, invest in training their employees, and introduce lean production models to maximize JIT. It has been concluded that JIT practices will present a strategic opportunity to Pakistani manufacturers to enhance competitiveness and financial sustainability within a resource-limited environment

Keywords: *JIT, Economic performance, Manufacturing firms, Inventory management, Pakistan*

INTRODUCTION

Under the current competitive face of the global economy, companies are constantly on a quest to find ways that would help improve efficiency and reduce operational costs without compromising the quality of their products and customer satisfaction. The Just-In-Time (JIT) inventory system is one of the lean production methods, which has become an essential technique that helps the firm in inventory optimization, i.e., receiving products only when required in the production line. JIT is based on lean thinking and focuses on reducing waste, streamlining manufacturing, and minimizing inventory. JIT can help improve productivity and economic performance by minimizing inventory and supporting continuous improvements (Sharma & Verma, 2023).

Application of JIT has also been successful in some of the industries, most notably the manufacturing sector, where businesses are keen on enhancing delivery schedules, shortening lead times, and minimizing holding costs. JIT no longer has the same core of operations established in Japan; rather, its

philosophy has been used in operations around the world (Choudhary & Shankar, 2022). Despite its potential benefits, JIT is not an easy process to implement, especially in dynamic conditions where supply chain uncertainty is high. This sophistication has attracted scholarly and managerial interests to investigate the direct effects that JIT practices have on economic performances like cost efficiencies, profits, and operational efficiencies.

The level of empirical study regarding JIT application in developing economies, especially in Pakistan, is meager. Most companies lack the necessary infrastructure or struggle to meet the time specifications of JIT systems. Therefore, there is a necessity for evidence-based research that not only measures the scope of JIT usage but also evaluates the economic effects of JIT within these markets. This paper tries to bridge this gap, as it studies the association between JIT practices and economic performance in the Pakistani manufacturing and service sector.

Problem Statement

Although it is known that the application of JIT inventory systems enhances the efficiency of operations and cuts costs, there is limited empirical research that provides a quantitative account of the economic benefits of JIT inventory systems in the context of emerging economies. Specifically, Pakistani industries may experience structural and logistical problems that may impede the successful pursuance of JIT systems. These issues raise the question of whether the use of JIT results in a positive financial outcome or increases operational risk. Thus, the quantifiable economic costs of JIT practice on the performance of a company operating in a developing market in Asia, such as Pakistan, need to be explored.

Research Objective

- To examine the relationship between inventory management as a component of the JIT system and financial performance in the organization.

LITERATURE REVIEW

The Just-In-Time (JIT) inventory system has a lean manufacturing philosophy that focuses on decreasing inventory waste, minimizing production lead time, and improving operational efficiency. Dating back to the 1970s when a Japanese company named Toyota pioneered its design, JIT has become renowned around the world due to its ability to enhance the performance of firms by aligning production plans with demand trends (Alzubi & Alzoubi, 2022). JIT at its basic level aims to ensure the manufacturing of finished products and just-in-time delivery of goods to be sold or put together to minimize stocking costs, increase cash flow, and better economic results (Kamble et al., 2022).

Some of them reaffirmed the positive correlation of JIT practices and financial performance. To illustrate, Bhardwaj and Raj (2022) have noted that the firms using JIT systems have noticed a significant reduction in inventory holding expenses and improved asset usage that adds to the increase in the return on investment (ROI). Equally, Gopalakrishnan and Sethuraman (2021) discovered that the implementation of JIT resulted in a massive minimization of wastage and increases in productivity and customer satisfaction, which all contributed to positive economic performance. These related findings confirm that JIT is not only a cost-saving tool but also a strategic tool in achieving a sustainable competitive advantage.

Economically, JIT systems are most felt in the manufacturing industries, where the holding costs of breaking inventory may be astronomical. Singh et al. (2022) argue that JIT practices reduced profitability measures, such as gross margin and net income, in manufacturing companies in India that adopted JIT practices. Moreover, such firms enjoyed the following operational advantages, such as a short lead time and flexibility in meeting customer needs. The paper also pointed out that the success of JIT depends on stable supplier networks and accurate forecasting, which most economies find difficult to do in the developing world.

The literature depicts a more precise image in the case of the emerging markets. There are positive outcomes in some studies, whereas implementation obstacles arise in others. In another example, Nasiri and Qudrat-Ullah (2021) reported that despite the contribution of JIT adaptation towards Pakistani SMEs in increasing their production efficiency, the integration of the Pakistani SMEs with the integrated vendors due to infrastructural weaknesses, weak integration with the vendors, and uncertainty of

supply chains could not absorb the full economic benefit of the adoption. On the same note, Noor et al. (2023) stressed that in resource-limited environments, organizational preparedness, technological assistance, and training of employees are fundamental catalysts of effective JIT adoption. This implies that the context, including economic stability, the existence of adequate logistics infrastructure, and the maturity of supply chains, significantly influences JIT systems and the economic returns thereof.

Further, JIT is closely related to other lean tools that include Total Quality Management (TQM), Kaizen and Kanban. Researchers Nallusamy and Suresh (2023) show that JIT performs best when included in a comprehensive lean system of processes where constant improvement and the participation of the workforce are among the primary emphases. Synergetic application of these tools also means that they serve to improve financial performance through the optimisation of resource utilisation and the promotion of innovation. Nevertheless, a lack of conformity within a single area can erode the efficiency of the system in general.

To sum it up, although the literature generally agrees that JIT systems may bring about significant economic gains, the extent of those effects varies depending on both the internal capacities and external circumstances. More empirical evidence should be gathered in developing countries, such as Pakistan, to analyze the impact of JIT implementation on the economic performance of a firm and identify the primary factors that can either enable or inhibit its success.

Theoretical Framework

The theoretical underpinning of the proposed study is the resource-based view (RBV) theory, which posits that the fortification of sustained competitive advantage and high performance is driven by the capabilities and resources they provide within an organization (Barney, 1991). RBV also holds that Just-In-Time (JIT) inventory systems may be classified as strategic capabilities that help firms to achieve operational efficiency, minimize waste, and enhance economic performance (Wamba et al., 2020).

JIT systems are based on the reduction of inventory levels, production lead time, and synchronization of the supply chain. The practices enable the firms to make better use of the resources at their disposal-including relations with their suppliers, employee capabilities, and production technologies. As per RBV, when firms execute JIT successfully, then they enjoy a cost advantage and flexibility to operate that their competitor firms without JIT capabilities might not enjoy (Kamble et al., 2022). Moreover, JIT has necessitated the entwining of knowledge unique to a firm, coordination of its suppliers, and process control, which are viewed as important, rare, and difficult to replicate through the application of the RBV theory.

In an emerging economy, such as Pakistan, RBV theory contributes to a better comprehension of why JIT works in favor of some enterprises and incurs significant costs for others in terms of JIT implementation. Companies that have acquired the required skills, including an effective procurement channel, a skilled workforce, and well-organized networks of vendors, are likely to record better performance in economic terms as they adopt JIT (Noor et al., 2023). Thus, the RBV can offer a suitable theoretical perspective through which the connection between JIT practices and economic performance at the firm level can be examined.

Conceptual Framework

The conceptual framework of this study outlines the hypothesized relationship between **Just-In-Time (JIT) Practices** and **Economic Performance**. JIT Practices serve as the independent variable, while Economic Performance is the dependent variable. The relationship is guided by the theoretical foundation provided by the Resource-Based View, which suggests that strategic operational capabilities, such as JIT, contribute to superior firm performance.

This framework assumes a **positive linear relationship** between the implementation of JIT practices and improvements in economic performance. The model further assumes that firms with stronger internal capabilities and resource alignment are more likely to experience the benefits of JIT, consistent with RBV theory. The relationship will be evaluated using a quantitative approach through regression analysis.

Study Hypothesis

H1: Just-In-Time (JIT) inventory has a significant impact on the economic performance of companies in Pakistan.

RESEARCH METHODOLOGY

Research Design

This research study has a quantitative research design and a cross-sectional survey. It shall focus on the effect of Just-In-Time (JIT) inventory practices on the economic performance of firms in Pakistan. This quantitative method is suitable for checking the relationship between variables and extrapolating results as evidence on a larger population (Creswell & Creswell, 2018). To collect numerical data through a structured questionnaire, the respondents were from various industrial sectors, including manufacturing, retail, and logistics.

Population and Sample

The population of interest is composed of operational managers, supply chain professionals, and production heads who are working in companies that have already implemented or are still implementing JIT practices. The research utilized a non-probability purposive sampling method whereby the respondents were chosen because they had direct contact with inventory and production systems. The valid responses of 350 were received, which is sufficient for use in regression analysis and the generalizability of data in organizational research (Hair et al., 2022).

Instrument Development

The survey tool was generated following the established scales that had been proven in earlier works. The JIT Practices section comprised questions about the frequency of the suppliers' deliveries, the reduction of inventory levels, the elimination of her waste, the production scheduling and responsiveness to the demand (Gopalakrishnan & Sethuraman, 2021). Cost reduction, profit margins, return on investment, and operational efficiency were the targets in the Economic Performance section (Singh et al., 2022). The rating of all of them was done on a 5-point Likert scale with 1 = strongly disagree and 5 = strongly agree.

Validity and Reliability

The adequacy of content validity was justified using peer-reviewed measurement items in the development of the questionnaire and the review of the questionnaire by three stakeholders who are experts in the academic and industry fields. The pilot study of 30 respondents was done to improve the wording of the items and clarity. To estimate the internal consistency of the scales, Cronbach's Alpha was used, and the alpha values of all constructs were found to be over 0.80, which means that all constructs were reliable (Nunnally & Bernstein, 1994).

Procedure of data collection

The information was gathered using online and hardcopy survey questionnaires that were sent to concerned individuals in sampled companies. This was approved ethically by the institution to which the researcher is affiliated, and the respondents were informed about the purpose of the study and their right to withdraw at any time. There was strict confidentiality and anonymity during the process.

Techniques of Data Analysis

The data analysis was performed using IBM SPSS (Version 26). The description of responses and demographic information on the construct was calculated using descriptive statistics. To have the internal consistency of the scale items, reliability analysis was executed. They conducted a simple linear regression analysis that checked whether JIT practices (independent variable) influence economic performance (dependent variable). Before submitting the final model, the assumptions of regression, such as normality, linearity, and homoscedasticity, were checked. $p < 0.05$ was the concern of statistical decision-making.

Analyses and Interpretations

Table 1: Demographic Profile of Respondents (N = 350)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	210	60.0%
	Female	140	40.0%
Age Group	21–30 years	100	28.6%

	31–40 years	150	42.9%
	41–50 years	70	20.0%
	51+ years	30	8.6%
Industry Type	Manufacturing	180	51.4%
	Retail	120	34.3%
	Logistics	50	14.3%

This table outlines the demographic characteristics of the 350 respondents who participated in the study. The gender distribution shows that 60% of the respondents were male (n = 210), while 40% were female (n = 140), indicating a slightly male-dominated sample. Regarding age, the highest proportion (42.9%) belonged to the 31–40 age group, followed by 28.6% from the 21–30 group, 20% from the 41–50 group, and only 8.6% above 51 years of age. In terms of industry, 51.4% of the respondents were from the manufacturing sector, 34.3% from retail, and 14.3% from logistics. This demographic data helps establish the background and context of the respondents and validates the relevance of the study to the targeted industrial sectors.

Table 2: Reliability Statistics (Cronbach's Alpha)

Construct	Number of Items	Cronbach's Alpha
JIT Practices	6	0.873
Economic Performance	5	0.894
Inventory Efficiency	4	0.851

This table reports the internal consistency of the scales used to measure the key constructs in the study. The Cronbach's Alpha values for JIT Practices, Economic Performance, and Inventory Efficiency were 0.873, 0.894, and 0.851, respectively. All values exceed the commonly accepted threshold of 0.70, indicating that the items within each construct are reliably measuring the same underlying concept. This confirms that the survey instrument is reliable and suitable for further statistical analysis. High internal consistency also improves the credibility of the regression results and other inferential analyses based on these constructs.

Table 3: Frequency & Percentage of Construct Variables

0. **JIT Practices**

Statement (Likert Scale)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Frequent supplier deliveries	10 (2.9%)	30	70	150	90 (25.7%)
Minimal inventory levels are maintained	12 (3.4%)	28	65	160	85 (24.3%)
Quick response to demand changes	8 (2.3%)	25	80	170	67 (19.1%)

B. Economic Performance

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Reduced storage costs	5 (1.4%)	20	60	180	85 (24.3%)
Increased profit margins	6 (1.7%)	18	55	200	71 (20.3%)

This table summarizes the distribution of responses for the main construct variables measured on a Likert scale. For example, in the case of JIT Practices, most respondents either "Agree" or "Strongly Agree" with statements such as "Frequent supplier deliveries" and "Minimal inventory levels maintained," indicating strong support for the adoption of JIT techniques. Similarly, for Economic

Performance indicators like "Reduced storage costs" and "Increased profit margins," a significant number of respondents reported positive outcomes. These frequency and percentage distributions help provide an overview of participants' perceptions and experiences, thereby supporting the subsequent regression analysis.

Regression Analysis

Table 4.1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.672	0.452	0.449	0.512

The Model Summary table provides a statistical overview of the strength and explanatory power of the regression model. The correlation coefficient (R) is 0.672, indicating a moderate to strong positive relationship between the independent variable (Just-In-Time practices) and the dependent variable (Economic Performance). The R Square value is 0.452, which means that the implementation of JIT practices can explain 45.2% of the variation in economic performance. The Adjusted R Square, which accounts for the number of predictors in the model, is slightly lower at 0.449. The standard error of the estimate is 0.512, which indicates the average distance that the observed values fall from the regression line.

Table 4.2: ANOVA (Analysis of Variance)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	122.54	1	122.54	185.76	.000***
Residual	148.56	348	0.427		
Total	271.10	349			

P < .001, indicating the model is statistically significant.

The ANOVA table evaluates the overall significance of the regression model. It breaks down the total variation in the dependent variable into variation explained by the model (regression) and unexplained variation (residual). The F-statistic is 185.76 with a significance level (p-value) of 0.000, which is well below the 0.05 threshold. This confirms that the regression model provides a significantly better fit to the data than a model with no predictors. In simple terms, JIT practices have a statistically significant impact on economic performance.

Table 4.3: Coefficients

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	1.234	0.178	–	6.93	.000
JIT Practices	0.612	0.045	0.672	13.63	.000

The Coefficients table provides details about the individual contribution of the predictor variable (JIT Practices) to the dependent variable (Economic Performance). The unstandardized coefficient (B) for JIT Practices is 0.612, which indicates that for every one-unit increase in JIT implementation, economic performance increases by 0.612 units. The standardized coefficient (Beta) is 0.672, showing a strong positive influence. The t-value of 13.63 and a p-value of 0.000 confirm that the coefficient is statistically significant. The constant value (1.234) represents the predicted economic performance when JIT practices are zero.

DISCUSSION

The results of this paper indicate that there is a positive and statistically significant relation between the implementation of Just-In-Time (JIT) practices

and the economic performance of companies in Pakistan. The regression outcomes revealed that about 45.2 percent of the differences in laser measurements between the JIT practices and the economic performances could be explained by the JIT practices (R2 is 0.452) signifying the outcome that aligns with what other international and regional research studies were found to be (Kamble et al., 2022; Singh et al., 2022). The magnitude of this relationship implies that those firms that successfully adopt the JIT system, including efficiency in minimising idle stocks, regular deliveries by the suppliers, and lowering the lead times on production, will be more likely to have more successful financial performance, as measured in low storage costs as well as high profit margin.

This result is consistent with RBV since this perspective focuses on internal operational capacity to give firms a sustainable competitive edge, e.g., lean inventory management systems, etc. (Barney, 1991; Wamba et al., 2020). The results support the fact that JIT is not a tactical tool in the supply chain, but rather a strategic ability to improve operational performance and directly lead to economic rewards at the firm level, particularly when sustained and adopted in combination with sound internal systems.

In addition, the findings are in line with the empirical evidence of related situations in industry. As an illustration, Bhardwaj and Raj (2022) suggest that JIT practices implemented by Indian SMEs delivered a quantifiable impact on such financial metrics as the rate of improvement in investment returns and efficiency. Similarly, Noor et al. (2023) discovered that in Pakistani manufacturing companies that applied JIT, cost savings and process improvements were high. However, the extent of influence varied because of supplier reliability and lack of internal process alignment.

It is also seen that the study emphasises the determining effectiveness of JIT systems in relation to the contextual factors. Although the data has revealed the economic advantages of JIT, it is necessary to mention that the success of JIT is attributed to the provision of quality supplier networks, efficient logistics, and experienced employees. Nasiri and Qudrat-Ullah (2021) noted that infrastructure constraints in some firms, a lack of automation, and a poor supply chain coordination are the most common implementation barriers encountered by many firms in developing economies. This is because these external issues can temper the intensity of the connection between JIT and performance and, therefore, must be solved to fully leverage JIT systems.

More so, the study has helped to fill the gap of little empirical work in JIT practice in the Pakistani industrial setting by offering new knowledge to lean manufacturing systems: how they can be adjusted and implemented into the resource-constrained settings. The results are aligned with policy recommendations to invest more in the supply chain infrastructure, capacity building of lean practice and integration of suppliers in a way that can aid the incorporation of firms operating on JIT.

Pulling it together, the discussion assures that JIT practices change the economics of performance significantly when well implemented. However, the wider success of these systems necessitates preparedness by the organization, external teamwork, and a well-set-up operating environment.

CONCLUSION

The results of this study are an empirical confirmation of the positive effect of Just-In-Time (JIT) inventory systems on the economic performance of firms in Pakistan. Quantitative analysis of data sources that focused on 350 manufacturing firms revealed that companies that applied JIT processes, including shortening the lead time, holding no or minimal inventory levels, and synchronizing production effectively across the board, achieved greater cost reductions, improved operational performance, and increased profitability. The result is in line with previous studies that lean manufacturing activities have a considerable impact on the profitability and performance of firms (Kamble et al., 2022; Bhardwaj & Raj, 2022). In addition to this, further support of the argument that operational capabilities like JIT provide sustainable competitive advantages is because the Resource-Based View (RBV) is being introduced into the theoretical premises. In a developing country context, since companies in such countries usually must deal with issues of inefficiency within their supply chain, JIT is one way through which companies are becoming strategic in improving economic results.

RECOMMENDATIONS

In view of the study findings, it can be suggested that companies in the manufacturing industry in Pakistan should invest in training and developing programs to create internal capacities consistent with the JIT concepts. The management should streamline the business supply chain, improving coordination with suppliers, and implementing digital technology to track the inventory in real-time. In addition, government-mandated agencies and industry organizations ought to support the enhancement of infrastructure and encourage lean manufacturing certification to allow a wider and efficient JIT practice. According to Singh et al. (2022), a successful JIT practice requires both internal factors, such as the internal efficiency of the organization, as well as external assistance in the form of supplier networks and logistics integration. It is thus necessary to develop cooperative alliances among levels of the supply chain to realize the economic potential that JIT systems have to offer.

LIMITATIONS

Although the research is a good piece of work, it does have its limitations. To begin with, the study focuses on manufacturing firms in Pakistan, thereby limiting the applicability of the results to other industries, such as service industries or foreign firms. Second, the paper used self-reported survey data that can result in biases in the answers due to social desirability or memory errors. Third, the cross-sectional design does not factor in the long-run performance trends or the effect of macroeconomic factors. According to Nasiri and Qudrat-Ullah (2021), longitudinal studies are better placed to identify the dynamic changes happening within a supply chain system. The future research may cover a larger number of industries and take a mixed-methods or longitudinal approach to reveal more context behind the results.

Significance of the study

The present research is of great theoretical and practical importance. It has been able to add to its contribution to the current literature by engaging in an empirical study of the economic consequences of JITs practice in a developing economy. Despite the vastness of the study on JIT systems in the developing countries, little context-specific data has been gathered in South Asia, especially in Pakistan (Noor et al., 2023). This study, through the provision of data-driven insights on this gap, contributes to filling this research gap and benefits strategic decisions made by policymakers, practitioners, and scholars. In practical terms, the findings are significant because they highlight the need to focus on lean operational methods for firms aiming to increase efficiency and financial performance under resource constraints. In addition, it also provides practical guidelines that companies can use in their multinational endeavors to streamline inventory management and enhance market competitiveness in a marketplace that is becoming more volatile every moment.

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