

## **JUST IN TIME (JIT): A LITERATURE REVIEW**

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**Abstract:** JIT, or just-in-time, inventory management, involves only ordering products from vendors when they are actually needed. This approach's primary goals are to lower the cost of keeping inventory and boost inventory turnover. In order to execute the complete process till delivery, just in time demands meticulous supply chain planning and the use of superior software. This boosts efficiency and reduces the possibility of error because each phase is monitored. Therefore, by citing the journals, we will highlight the adjustments that JIT implements throughout this review study.

**Keywords:** JIT, EOQ, CFA, SEM, OP, TQM

### **I. INTRODUCTION**

When using the just-in-time (JIT) inventory management strategy, suppliers are only contacted for the products that are actually required. Increasing inventory turnover and lowering the cost of inventory keeping are the key goals of this strategy. To execute the complete process till delivery, just-in-time demands meticulous supply chain planning and the use of superior software. This method boosts efficiency and reduces the possibility of error because each phase is closely monitored. When the market's supply of a good outpaces its demand, an accumulation of unsalable stocks results. Overproduction, which results from this situation, is eliminated by a just-in-time strategy. These unsaleable goods become inventory dead stock, which increases waste and takes up space in the warehouse. Order only what is required in a just-in-time system to avoid the risk of building up useless inventory.

### **II. DIFFERENT AVAILABLE PRACTICES**

A paper by Yaw Agyabeng-Mensah et al. (2020) reveals that businesses have adopted a number of practises in an effort to achieve a competitive edge and enhance performance. Just-in-time (JIT), total quality management (TQM), and green supply chain practises (GSCPs) are some of the techniques used by enterprises to improve business performance (BP) and operational performance (OP). This study examines the direct effects of GSCPs, TQM, and JIT on operational performance, OP and BP. The impact of JIT, GSCPs and TQM synergy on BP and

OP is further examined in the study. Utilising a quantitative methodology, this study uses a questionnaire for collecting information from the production managers and supply chain executives of 140 factories in Ghana. The survey data are analysed using partial least square structural equation modelling (PLS-SEM) in this study. The analysis in this paper's findings demonstrates that GSCPs, TQM, and JIT have a beneficial impact on OP and BP. The results show that GSCPs greatly enhance OP and BP when used with JIT and TQM. However, the TQM and green supply chain offer greater value for both BP and OP than the collaboration between JIT and GSCPs. This study adds to the body of existing knowledge in supply chain and operational management by showing the synergy of JIT, TQM, and GSCPs on OP and BP. A complicated model that integrates GSCPs, JIT, TQM, OP and BP is also proposed in the study from the viewpoint of a developing nation, striking a balance amongst literature studies. Additionally, since GSCPs have not been treated as an antecedent of TQM and JIT in the existing literature, no research has been done on the mediating impacts of TQM and JIT on connections GSCPs-BP. Additionally, studying the connections between TQM, GSCPs, OP and BP is a significant contribution to our understanding of supply chains and production.

### **III. EOQ & JIT**

In a study published by Shijin Wang et al. (2017) in the school of economics management at Tongji University in China, distinctions among Economic Order Quantity (EOQ) and Just in Time (JIT) in the context of sustainability were made by adding emissions of carbon into the total expense, which is in compliance with the requirements of sustainable development but has not yet been studied. It is well known that EOQ and JIT are two popular inventory management strategies in the supply chain. Transportation and inventory are usually included in the cost estimates of JIT and EOQ. Two functional elements of the supply chain that are mutually exclusive are transportation and inventory. Stated differently, lowering inventory costs will result in higher transportation costs, and vice versa. In order to strike a compromise between transportation and inventory, JIT and EOQ modes are fundamental. It is crucial to evaluate inventory and transportation costs from a variety of practical perspectives since they can significantly affect business decisions. The cost in difference points is determined as the boundaries separating the JIT and EOQ implementation ranges. Numerical examples are used to provide data for stock decisions for merchants and the manufacturer. Instead of making judgements based just on experience, businesses should have a comprehensive perspective and cooperative awareness, according to manufacturers and retailers. Finding the right occasion, encouraging bargaining, and then switching between the two modes are all crucial. From the standpoint of the environment, explicitly taking carbon emissions into account across a supply chain may result in lower real carbon emissions than in the absence of such considerations.

### **IV. DEMAND DRIVEN SUPPLY CHAIN**

A study from the School of Business Administration at the University of Houston-Victoria, USA, was reported by Jie Yang et al. in 2021. This investigation examines how three demand-driven supply chain intelligence factors, which are implemented through planning for production, sourcing, and transportation, affect a JIT supplier network. These elements include teamwork, knowledge sharing, and

the ability to manage consumer knowledge. Suppliers in a JIT supply chain are accountable for knowing their clients and final users of their goods. Changes in consumer demand serve as the catalyst for JIT operations, which move operations in the supply chain upstream from the final consumer through retailers and producers to suppliers. Lack of research on supply chain intelligence's impact on JIT logistics necessitates further investigation. This study intends to look into the relationship between a demand-driven supply chain insight and JIT supply chains as well as the effect of supply chain intellect on the operational effectiveness of supply chains by addressing the two research questions, "What are the driving forces of a successful JIT supply chain?" Do JIT supply chains increase the operational effectiveness of a business? The three motivating factors are compatible with JIT supply chains and the resulting performance, as evidenced by the crucial role that demand-driven supply chain information plays in establishing one. The findings imply that supply chain companies develop marketing expertise, disseminate pertinent consumer knowledge, and include customer data from various supply chain partners. Knowledge sharing might benefit from cooperative training programmes offered to supply chain partners' personnel. To create a productive JIT supply chain, they must additionally exchange data with exchange partners regarding product development and managing client relationships. Adopting JIT supply chain operations would also be simpler if exchange partners participated in strategic decision-making and had a collaborative mindset. Supply chain professionals are recommended to select suppliers using expert techniques, like the mathematical ladder approach. The results of this research are consistent with those of other studies in terms of JIT's advantages, which include lower production costs, better product quality, faster cycle times, and less inventory.

## **V. IOT BASED PLANNING & SCHEDULING**

A framework based on the Internet of Things is presented in an article by Yuchun Xu et al. (2017) to aid with just-in-time manufacturing's reactive operational strategy and timetable. The implementation of just-in-time manufacturing presents a number of obstacles, and one Internet of Things-based approach is then suggested to overcome these issues. According to an instance study on the manufacturing of automobile harness parts, a framework for implementing the suggested Internet of Things solution is created. By leveraging the Internet of Things for enhanced production chain connection and flexible production scheduling capabilities, this study makes a contribution to the discipline of just-in-time manufacturing. The study presented in this article focuses on creating an internet of things-based framework to improve JIT manufacturing by solving certain scheduling process difficulties. Overall, the goal of the research was to pinpoint unique scheduling issues in a JIT production setting. to develop a JIT manufacturing problem solution based on the internet of things that have been highlighted in a chosen instance study. to create a dynamic framework for planning production based on the intended internet of things-based solution. Based on a case study on the production of car harnesses, an internet of things for JIT environments in manufacturing, a technology-based variable manufacturing planning system has been developed. There are particular scheduling difficulties with JIT manufacturing. The dynamic scheduling framework was built by adding the live resource condition monitoring module and the flexible scheduling module to the original local manufacturing execution system (MES) system. The system that

has been built can respond to dynamic changes in client orders, production status, and the availability of necessary resources, enabling manufacturers to modify planned production schedules in order to maximise production outputs with restricted resources.

## **VI. CRITICAL ELEMENTS OF JIT**

In a paper published in the IJBMER in 2017, Uma Bhushan and colleagues revealed the crucial components and approach for evaluating JIT success as well as the effects of JIT deployment on the inventory system, organisation, financial impact, and employee attitudes. This study then went on to discuss the advantages and disadvantages of JIT sourcing. The study's goals included investigating potential risks that businesses using the JIT process might be subject to. And to bring to light the potential countervailing hazards that could be avoided as well as the risk mitigation strategies. The operational processes and characteristics of the system, deployment techniques, and benefits including increased productivity, cost savings, improved quality, and changes to the supplier/producer relationship are typical themes covered in this context. According to this study, managers who adopted JIT practises saw significant gains in all of the categories that were examined, including quality, time-based answers, employee flexibility, accounting simplification, company profitability, and inventory savings. Furthermore, this study offers strong proof that the overall returns are higher when JIT adoption is more extensive (both in breadth and depth). When attention is limited to JIT production practises, both low and high adopters profit equally, but quality maintenance yields bigger gains. Most likely, JIT practises can be found in businesses that have made a stronger commitment to the JIT idea.

## **VII. SEM MODELING OF JIT ELEMENTS**

Sandeep Phogat et al. suggested a model (structural equation modelling, or SEM) from the Sixteen just-in-time (JIT) components that may be used to implement JIT in maintenance in a paper that was published in 2018. In India, 421 manufacturing and automotive service firms were contacted with questionnaires, and 133 meaningful responses were obtained. After exploratory factor analysis (EFA) to uncover the component structure, confirmatory factor analysis (CFA) is used to confirm the factor structure of a set of identified JIT elements. An SEM statistical technique accepts CFA. In this work, the EFA approach is used to extract the JIT implementation components using the statistical package for social sciences (SPSS 24) software, and the CFA method is utilised to corroborate these elements using the analysis of moment structures (AMOS 18) programme. Only 16 of the 18 JIT components identified through research and consultation with experts were used in the study; two JIT components were dropped due to the low correlation item-total correlation (CITC) value. Three parameters that were recovered by EFA have an impact on three benefits of JIT implementation in maintenance: quality improvement, productivity improvement, and process control. SEM with AMOS 18.0 was used to calculate the initial-order three-factor structure of the JIT implementation in maintenance (quality enhancement, production enhancement, and workflow control). This essay has given readers insight into the JIT components that may be identified and used to deploy JIT in the upkeep of organisations. In this study, 133 comments from various sectors were gathered regarding the relative

significance of 16 JIT components that are pertinent to the maintenance industry. It served as the foundation for the creation of this model. An EFA is broken down into three components with an Eigen value larger than one, which explains the overall variance. The implementation of the suggested work in the maintenance sector, such as factor extraction and later factor confirmation, has significant JIT significance. Therefore, with knowledge of the applications of various JIT elements in the maintenance sector, the appropriate maintenance professional may take some excellent decisions and precautions to handle these aspects that affect the implementation of JIT in the maintenance sector. Organisations can take proactive measures to successfully adopt JIT in the maintenance sector by knowing in advance the strengths of the aspects that would be useful.

### **VIII. PURCHASING IN JIT/LEAN SYSTEM**

Atour Taghipour et al.'s (2020) study aims to examine procurement within the framework of the JIT/Lean approach. With the goal of learning more about the JIT/Lean purchasing methodology and identifying potential future study areas, a comprehensive literature evaluation has emerged. The analysis made it possible to build JIT/Lean purchasing models and identify how both JIT/Lean principles affect the integration of vendors into the supply chain and the function of purchasing. Medium-sized organisations may find it difficult to adopt Lean or JIT purchasing techniques despite the previously described benefits and advantages because of the size of their organisation, supplier setting and lack of adoption of modern technologies and systems. JIT/Lean purchasing is more likely to be successful for larger companies. Since it is more probable that they have the means and power to aggressively engage suppliers and apply JIT/Lean principles. But it's crucial to discuss the benefits of JIT/lean purchasing with the academics from the perspective of small and medium-sized enterprises. Additional research is needed, especially to determine the most effective methods to create and enhance JIT/Lean purchasing for medium in size organisations, as well as to identify potential opportunities and obstacles to the implementation of the JIT/Lean framework in overall, and JIT/Lean buying in specific.

### **IX. ROLE OF MANAGEMENT STRATEGY**

An article by Rouhollah Barkhordari et al. (2017) was published in the Specialty Journal of Knowledge Management. The relationship between organisational success and supply chain management strategy is examined in this paper. Just-in-time manufacturing, supply chain skills, and envisioned organisational performances are all positively impacted by management of supply chains strategies, according to the study's findings, which included 219 managers, experts, and technical and nontechnical members of the tile and ceramic industry. Designing and maintaining supply chain flows (items, information, and finances) is closely tied to the success of the chain, with electronic commerce failures typically being attributed to issues with these tasks. Because of the intricacy of the financial and social components of companies as well as the supply chain's autonomy, organisations had to exchange information with other organisations, the majority of which were suppliers of goods and services, in order to foster reciprocal partnerships. Total just-in-time production is a new mentality born out of the growing information trade. The findings of this study demonstrate that effective

supply chain management strategies and supply chain capabilities are necessary. Total just-in-time was also discovered to be a suitable supply chain management method.

## **X. MAINTENANCE IN JIT**

Sandeep et al. (2018) published research that looked at the predicted maintenance elimination advantages in the maintenance of companies following the implementation of the just-in-time (JIT) management approach. An organised questionnaire was created for this and distributed to India's 421 industries. To make data interpretation easier, the planned questionnaire was split into sections A and B. Section A's objective was to gather general data about those involved, the kind of organisation, the total number of staff members, the annual revenue of the organisation, etc. For Section B, a structured questionnaire with a Likert scale with five points was also created. In order to determine the benefits of maintenance waste reduction in the upkeep of organisations, the identified important JIT components were included in the questionnaire. The 133 answers served as the basis for the results, which were based on the testing of hypotheses using the Z-test. It was found that by applying the JIT mindset, one can reduce an extensive stock of spare parts and also decrease the wasteful operations related to maintenance. All four types of waste—processing waste, rejects/rework/scrap from shoddy maintenance, transport waste for spare parts, and motion waste—have roughly comparable weight ages in their decline. Waste of waiting for spares came in last, indicating that after the JIT philosophy was implemented in maintenance, there may be some prospect of a slight decrease in waiting for spares. This survey study has demonstrated that, in the modern world, which is filled with new on par challenges, all organisations rely heavily on maintenance for the effective operation of their own organisations. It has also demonstrated that there is a significant opportunity for the introduction of JIT theology in maintenance of businesses. Regarding the anticipated advantages of reducing maintenance waste, we determine that the department's substantial stock of replacement components and high investment in capital; If we maintain a stock of spares that is in line with our needs, we can use the money we save on maintenance inventory for other advantageous purposes, and our maintenance experts can deal with major exorbitant problems with maintenance like a dysfunctional job order system, laborious reporting forms, as well as inadequate training. If we effectively incorporate JIT components into maintenance, we reduce it entirely. Processing waste, waste of the movement of spare parts, motion waste, and reject/rework/scrap waste in cases of poor upkeep all have roughly equal weight ages in their reduction following the application of JIT philosophy in maintenance, indicating that if we successfully implement JIT elements in maintenance, then we can reduce all four maintenance wastes to a level that is close to being high. The waste associated with waiting for spare parts, the seventh type of waste, is listed last.

## **XI. RISK MANAGEMENT**

In the research published in the Journal of Industrial and Production Engineering in 2020, Fatima-Ezzahra Sebtaoui et al. explain how JIT deployment already lowers total costs and wastes, but increases complexity and hazards. Recognising and addressing major risks associated with JIT implementation is one

of top management's most crucial responsibilities. In order to examine the risk management-related activities involved in the adoption of JIT and their relationship to critical success factors (CSFs) or the main operations used during JIT execution as well as the benefits of JIT adoption process, a poll of 100 companies in the Moroccan motor vehicle industry was conducted. The primary objective of this research is to present the survey's findings. Through the use of structural equation modelling (SEM), the research model was assessed. The data analysis shows that risk treatment, one of the most important components, is necessary for the deployment of JIT to succeed. Communication across the organization's multiple levels of governance is a key component of risk management. To determine the effect of risk administration on the success of JIT execution, a conceptual framework is developed to quantify the impact of risk management practises on the success factors of JIT implementation and the benefits realised. Being the most productive is important for a company's survival in the current global market. This is the fundamental tenet controlling the industrial sector, and the Moroccan automotive industry cannot ignore it. Due to the fact that these businesses import, receive, and export finished goods, JIT is a manufacturing technique that is still in use today, especially in the automotive industry. On the one hand, this study provides a preliminary overview of the cutting-edge of numerous studies on JIT deployment, the essential success factors, the benefits obtained, and the risk management requirements. On the other side, a model based on structural equations is given to show how the key success variables for JIT implementation interact with the benefits obtained. Companies will be able to have a repository of the most crucial practises to set up during the implementation of JIT to properly manage the project and obtain the desired benefits thanks to the study of JIT practises and the development of a structural model measuring the impact of risk management on the success of JIT implementation.

## **XI. CONCLUSION**

The phrase "just-in-time manufacturing" describes a comprehensive supply chain approach that blends "just-in-time production new factor of information" that can be used to "increase achievement and improve competency of supply chain" with the predefined components of "just-in-time manufacturing," such as "just-in-time manufacturing purchases" and "just-in-time manufacturing sales." JIT is regarded as a methodology that can be used in a variety of industries and that, when successfully implemented, produces a long list of advantages. In order to determine the advantages, we conduct a methodological evaluation of the prior research. Many big process and manufacturing businesses who have adopted the JIT Enterprise perspective utilise a method that involves establishing all of the systems and infrastructure throughout the organisation in order to increase production and lower costs. Although JIT is a relatively new term for maintenance that just became popular in the latter part of the 20th century, the concept of total productive maintenance is widely established. Just-in-time production is a crucial method of production utilised to increase company productivity by lowering inventory and lead times. When implementing just-in-time manufacturing, there are many challenges to overcome, including efficient, consistent, and actual time exchange of data between various departments of operation and quick reaction for modifying the production timetable in response to the constantly shifting manufacturing environment. Because the Just-In-Time system was not integrated

with the inventory management system, companies may have lower performance rates. It is also evident that JIT has an impact on how the business performs overall and on the inventory management system. Since results showed that Company Y performs better and incurs lower production costs as a result of implementing the JIT method, their staff is aware of this system and is aware of its advantages. Employee collaboration with management to effectively apply this strategy is facilitated by this. The organisation can enhance its inventory management system with the aforementioned suggestions. Therefore, implementing the Just-In-Time strategy in inventory management systems is highly advised for businesses in the industrial sector. Due to the fact that JIT heavily depends on the performance of your suppliers, it is necessary for businesses to maintain a positive relationship with their consumers. The process implementation is significantly simpler and more effective when providers are close by and dependable.

**Conflicts of Interest:** “The authors declare that they have no conflicts of interest to report regarding the present study.”

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