



WWJMRD 2023; 9(11): 5-8

www.wwjmr.com

International Journal

Peer Reviewed Journal

Refereed Journal

Indexed Journal

Impact Factor SJIF 2017:

5.182 2018: 5.51, (ISI) 2020-

2021: 1.361

E-ISSN: 2454-6615

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WORLD WIDE JOURNAL OF MULTIDISCIPLINARY RESEARCH AND DEVELOPMENT

The Impact of Just-in-Time Production on Supply Chain Management and Productivity: A Comparative Analysis.

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Abstract

Just-in-Time (JIT) production is a strategy that has been adopted by many businesses to boost their profitability and reduce costs. The use of JIT has a significant impact on supply chain management and productivity [1]. JIT inventory management reduces the time and resources required for manufacturing, which results in faster production and shorter production runs. This approach is popular due to its cost reduction and efficiency enhancement benefits [1]. A comparative analysis can be conducted to understand the impact of JIT on supply chain management and productivity [2]. Lower inventory levels in JIT also reduce product damage, which is an added advantage to businesses [2]. JIT positively impacts supply chain management and productivity, as it allows companies to implement product changes quickly due to less raw material stock [2]. However, the JIT strategy can be problematic when supply chains face disruption [3]. Companies must be flexible to adjust production levels quickly and efficiently to meet changing customer requirements [4]. JIT production is designed to respond to customer demand fluctuations, resulting in increased customer satisfaction and on-time deliveries [4] [2]. JIT has a positive impact on productivity, reducing bottlenecks, delays throughout the production cycle, and flow times within production systems [3] [2] [3]. JIT inventory management helps to reduce product defects and automate processes. At the same time, JIT production scheduling allows jobs to be scheduled exactly when needed, resulting in production runs that start and end just in time for shipping [2]. Furthermore, JIT can improve response times from suppliers and customers, which is essential in today's fast-paced business environment [3].

Keywords: just-in-time, production, inventory, supply chain management

Introduction

Just-in-Time (JIT) production is a strategy that has been adopted by many businesses to boost their profitability and reduce costs. The use of JIT has a significant impact on supply chain management and productivity [1]. JIT inventory management reduces the time and resources required for manufacturing, which results in faster production and shorter production runs. This approach is popular due to its cost reduction and efficiency enhancement benefits [1]. A comparative analysis can be conducted to understand the impact of JIT on supply chain management and productivity [2]. Lower inventory levels in JIT also reduce product damage, which is an added advantage to businesses [2]. JIT positively impacts supply chain management and productivity, as it allows companies to implement product changes quickly due to less raw material stock [2]. However, the JIT strategy can be problematic when supply chains face disruption [3]. Companies must be flexible to adjust production levels quickly and efficiently to meet changing customer requirements [4]. JIT production is designed to respond to customer demand fluctuations, resulting in increased customer satisfaction and on-time deliveries [4] [2]. JIT has a positive impact on productivity, reducing bottlenecks, delays throughout the production cycle, and flow times within production systems [3] [2] [3]. JIT inventory management helps to reduce product defects and automate processes. At the same time, JIT production scheduling allows jobs to be scheduled exactly when needed, resulting in production runs that start and end just in time for shipping [2]. Furthermore, JIT can improve response times from suppliers and customers, which is essential in today's fast-paced business environment [3].

Just-in-Time production systems

The Just-in-Time production system has revolutionized supply chain management and improved productivity in various industries. By adjusting the required supplies and production rate to consumer demand, Just-in-Time production has increased production efficiency, and inventory turnover, and reduced the need for excessive storage space (Aroca et al., 2020). Additionally, Just-in-Time production has several other advantages such as reducing wastage due to obsolete or damaged stock, improving quality control, and enhancing overall operational flexibility.

One of the key impacts of Just-in-Time production on supply chain management is the reduction of inventory holding costs. Traditional production systems often involved maintaining large inventories of raw materials, work-in-progress, and finished goods. These inventories tied up capital and required extensive storage space, leading to higher costs. The Just-in-Time production system, however, emphasizes on minimizing inventories and ensuring that materials are procured and utilized only when needed (Ngugi & Omondi, 2018). This approach reduces the need for excessive stockpiling of inventory, leading to significant cost savings. Furthermore, the Just-in-Time production system enables businesses to improve their response to customer demand. By producing goods only when they are needed and in the desired quantities, Just-in-Time production allows businesses to be more responsive to fluctuations in customer demand (Nuciferani et al., 2022). This not only increases customer satisfaction but also reduces the risk of overproduction and excess inventory. Just-in-time production also enhances quality control. By implementing Just-in-Time production, companies are motivated to improve the quality of inputs and processes in order to meet customer demand efficiently. This focus on quality control helps to reduce defects, improve product reliability, and enhance customer satisfaction. Moreover, Just-in-Time production promotes better collaboration and communication within the supply chain. This is achieved through closer coordination between suppliers, manufacturers, and distributors to ensure that materials and products are delivered on time and in the required quantities. Additionally, Just-in-Time production encourages leaner and more efficient processes throughout the supply chain. Implementing Just-in-Time production requires streamlining processes and minimizing waste, which leads to increased efficiency. As a result, companies can benefit from cost reductions, improved productivity, and increased competitiveness. One study conducted by Flynn et al. found that companies that implemented Just-in-Time production experienced improvements in product quality, reductions in operational costs, and increased customer satisfaction, all of which contributed to improved financial performance (Fajriah et al., 2016). In conclusion, Just-in-Time production has a significant impact on supply chain management and productivity. It enables businesses to reduce inventory costs, improve response to customer demand, enhance quality control, foster collaboration within the supply chain, and promote lean and efficient processes. Just-in-time production has revolutionized supply chain management and productivity by implementing strategies to adjust supplies and production rates according to consumer demand (Aroca et al., 2020). The implementation of Just-in-Time production has had a profound impact on supply chain management and

productivity. By eliminating buffer stocks and reducing inventory costs, Just-in-Time production forces companies to adopt employee involvement practices in quality control and process improvement (Handel & Gittleman, 2004). This involvement not only improves the overall quality of products and services produced but also increases operational efficiency and customer satisfaction. Furthermore, the implementation of Just-in-Time production allows for better allocation of financial resources. Indeed, the implementation of Just-in-Time (JIT) production has had a significant impact on supply chain management and productivity. JIT is a lean manufacturing and inventory management system that aims to reduce waste, cut costs, and improve efficiency by producing goods and services just in time to meet customer demand. Here's how JIT production has influenced these areas:

1. **Reduction of Buffer Stocks and Inventory Costs:** JIT focuses on minimizing or eliminating inventory and buffer stocks. This approach has several notable effects:
 2. **Lower Holding Costs:** Companies no longer need to invest in warehousing, storage, and maintaining large inventories, reducing holding costs.
 - **Reduced Risk of Obsolescence:** With smaller inventory levels, the risk of products becoming obsolete or damaged while in storage is minimized.
 - **Tighter Inventory Control:** JIT necessitates strict control over inventory levels and turnover, making it easier to manage and account for goods and materials.
 3. **Enhanced Supply Chain Efficiency:** JIT emphasizes a smooth and continuous flow of materials and products from suppliers to customers. This has led to improvements in supply chain efficiency by:
 - **Reducing Lead Times:** JIT systems demand shorter lead times, encouraging suppliers to be more responsive and efficient.
 - **Minimizing Transportation and Handling:** With fewer materials in transit or in storage, transportation and handling costs are reduced.
 4. **Quality Control and Process Improvement:** JIT necessitates a high level of quality control and process improvement efforts:
 - **Employee Involvement:** Employees play a crucial role in quality control and process improvement. They are empowered to identify and address issues in real-time, which can lead to higher product quality and process efficiency.
 - **Continuous Improvement:** JIT encourages organizations to continually assess and enhance their processes. This commitment to continuous improvement is a fundamental principle of JIT production.
 - **Defect Reduction:** By addressing quality issues as they arise and preventing defective products from moving downstream in the production process, JIT helps reduce defects and waste.
 5. **Faster Response to Market Changes:** JIT enables companies to be more responsive to changes in customer demand and market conditions. Since they don't hold large inventories, they can quickly adjust production to meet shifting demand patterns.
 6. **Cost Reduction:** By minimizing waste, reducing inventory carrying costs, and optimizing processes, JIT contributes to cost reduction. This, in turn, can improve

profitability.

7. **Improved Lead Time Management:** With JIT, lead times are closely monitored and managed. This leads to more reliable delivery times, which can enhance customer satisfaction.
8. **Increased Productivity:** JIT can lead to increased productivity as it focuses on reducing non-value-added activities, streamlining processes, and empowering employees to make meaningful contributions to quality and efficiency.

However, it's important to note that JIT implementation also poses certain risks and challenges, such as increased vulnerability to supply disruptions and the need for a highly reliable supply chain. Companies that successfully adopt JIT typically invest in robust supplier relationships, production flexibility, and risk mitigation strategies to overcome these challenges and reap the benefits of this production approach. While Just-in-Time (JIT) production offers several advantages, it also presents certain risks and challenges, particularly related to its reliance on a highly reliable supply chain. Here are some of the key challenges and potential risks associated with JIT implementation:

1. **Supply Chain Vulnerability:** JIT relies on a constant and reliable supply of materials and components. Any disruption in the supply chain, such as delays, quality issues, or logistical problems, can have a severe impact on production schedules. Natural disasters, geopolitical issues, and global economic events can all disrupt the supply chain and affect JIT operations.
2. **Inventory Shortages:** With minimal buffer stocks, any unexpected increase in demand or supplier issues can lead to inventory shortages. This can result in lost sales, production stoppages, or difficulties in meeting customer orders.
3. **Dependency on Key Suppliers:** JIT often involves a close relationship with a select group of suppliers. Overreliance on a small number of suppliers can be risky. If one of these suppliers encounters problems, it can disrupt the entire production process.
4. **Transportation and Logistics Risks:** JIT relies on efficient and timely transportation. Traffic, labor strikes, customs delays, and other logistical challenges can disrupt the flow of materials and finished products.
5. **Quality Control Challenges:** Maintaining high levels of quality control and process improvement requires significant attention and resources. Inconsistent quality or process breakdowns can be detrimental to JIT operations.
6. **Lead Time Management:** Accurate lead time management is crucial in JIT. Any discrepancies in lead times can lead to production delays and inefficiencies.
7. **Flexibility and Adaptability:** JIT systems are highly efficient when demand is stable, but they can be less adaptable to sudden changes in customer requirements or market conditions. This rigidity can be a challenge when dealing with unpredictable market fluctuations.
8. **Training and Employee Skills:** Employees need to be well-trained to manage JIT systems effectively. Employee turnover or a lack of skilled workers can pose challenges.
9. **Cost of Implementation:** Implementing JIT can be costly, particularly when transitioning from traditional production methods to JIT. It may require investments

in new technology, training, and process reengineering.

10. **Risk of Over-Optimization:** Over-optimizing JIT systems can lead to excessive pressure on suppliers, excessive costs in monitoring, and a lack of resilience in the face of unexpected events.

To mitigate these challenges and risks, organizations often focus on building strong relationships with suppliers, developing contingency plans, investing in risk management strategies, and continuously monitoring and improving their supply chain operations. While JIT can lead to significant benefits, it requires careful planning and a proactive approach to risk management to ensure its success.

Conclusions

The impact of Just-in-Time (JIT) production on supply chain management and productivity is a complex and multifaceted topic that has been widely studied and implemented in various industries. Based on the research and practical experiences, several key conclusions can be drawn:

1. **Efficiency and Cost Reduction:** JIT production has proven to be effective in reducing inventory holding costs, minimizing waste, and optimizing resource allocation. This results in improved supply chain efficiency and ultimately lowers operational costs.
2. **Inventory Minimization:** JIT promotes a lean inventory system by delivering materials and products exactly when needed. This reduces the risk of overstocking and eliminates the need for large warehousing facilities, which can free up capital for other investments.
3. **Quality Improvement:** By focusing on reducing defects and ensuring consistent quality, JIT encourages a culture of continuous improvement. This can lead to higher-quality products and services, reducing rework and warranty costs.
4. **Demand Responsiveness:** JIT is well-suited for industries with variable and unpredictable demand. It enables businesses to respond quickly to market fluctuations and customer demands, which can enhance customer satisfaction and competitiveness.
5. **Supplier Collaboration:** JIT relies heavily on close collaboration with suppliers. This can lead to stronger and more strategic supplier relationships, reduced lead times, and improved supply chain reliability.
6. **Challenges in Implementation:** Implementing JIT is not without challenges. It requires significant changes in processes and systems, as well as a high level of discipline. Inadequate planning or disruptions in the supply chain can lead to production stoppages and revenue losses.
7. **Risk Management:** JIT systems can be vulnerable to supply chain disruptions, such as natural disasters, political instability, or economic crises. As such, businesses need to develop contingency plans to mitigate these risks.
8. **Technology Integration:** The advent of advanced technologies like IoT, AI, and data analytics has facilitated JIT implementation by providing real-time insights into supply chain operations. Leveraging these technologies can enhance the effectiveness of JIT.
9. **Environmental Impact:** JIT can contribute to sustainability efforts by reducing waste and resource consumption. It aligns with the principles of eco-friendly manufacturing and can support corporate social

responsibility goals.

10. **Customization and Market Niche:** While JIT is effective for many industries, it may not be suitable for all business models, particularly those with long lead times or highly customized products. Companies should carefully evaluate whether JIT aligns with their specific needs.

In conclusion, Just-in-Time production can significantly impact supply chain management and productivity positively when implemented effectively. It offers a pathway to cost reduction, quality improvement, and responsiveness to changing market demands. However, its success is contingent on overcoming implementation challenges, effectively managing associated risks, and adapting to evolving technological advancements. Businesses need to carefully assess their unique circumstances to determine whether JIT is the right strategy for their supply chain and production processes.

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