Optimising Inventory Management Strategies for Cost Reduction in Supply Chains: A Systematic Review

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Abstract
This systematic review investigates and synthesises the complexities of optimising inventory management strategies for cost reduction in supply chains. The research utilised a systematic review methodology to comprehensively analyse inventory management strategies for cost reduction in supply chains, employing key search terms across databases such as PubMed, Scopus, and IEEE Xplore. It adopted Economic Order Quantity (EOQ) theory and the Just-In-Time (JIT) inventory management system to further explain the study. A total of 50 journals were initially identified, followed by a rigorous screening process based on pre-defined criteria, including 23 relevant published articles written in English. Examining global supply chain dynamics and sector-specific challenges in local inventory management, the review proposes three key strategies: Just-in-Time (JIT) and lean inventory practices, advanced analytics and predictive modelling, and collaborative supply chain partnerships. Drawing on empirical evidence and sector-specific examples, the review demonstrates the effectiveness of these strategies in mitigating costs and enhancing overall supply chain efficiency. The policy implications underscore aligning business practices with proposed strategies, offering policymakers insights for formulating guidelines and incentives. Contributions to knowledge include a comprehensive framework for businesses to navigate contemporary supply chain challenges. At the same time, suggestions for further studies advocate for deeper explorations into emerging technologies and regional variations to refine and expand inventory management strategies.

Keywords: Cost Reduction, Inventory Management, Optimisation, Supply Chains.

INTRODUCTION

Inventory management is critical in the overall efficiency and cost-effectiveness of supply chains across various sectors worldwide (Becerra, Mula & Sanchis, 2022; Kumar & Ozdamar, 2019; Yu, Hou & Li, 2019). Mirabelli and Solina (2022) argued that effective inventory management ensures that companies can meet customer demands while minimising costs associated with holding, storing, and managing inventory. As globalisation and technological advancements continue to reshape supply chain dynamics, optimising inventory management strategies becomes even more imperative for businesses striving to remain competitive. Prior studies have indicated that manufacturing industries face challenges related to raw material availability, production lead times, and the need to balance inventory levels at different stages of the production process (Aqlan & Lam, 2016; Lummus, et al. 2019). Just-in-time (JIT) manufacturing practices, while efficient, can be vulnerable to disruptions in the supply chain (Sharma, Srinivasan & Kanda, 2018; Abu-Zwaida, et al. 2021).

In the global context, one of the significant challenges in inventory management is the increased complexity of supply chains. With the expansion of international trade, companies often deal with extended lead times, diverse cultural and regulatory environments, and complex transportation networks (Oláh, Lakner, Hollósi & Popp, 2017; Zhang, Chai & Ma, 2021). These factors contribute to uncertainties in demand forecasting and supply chain disruptions, making it challenging to maintain optimal inventory levels. Bose, Chen and Chatterjee (2018) contended that inefficiencies in global supply chains can lead to increased holding costs, stockouts, and missed business opportunities. Leaven, et al. (2017) affirmed that maintaining optimal levels of medical supplies and pharmaceuticals is crucial in the healthcare sector. This aligns with Vanany, Mahidin and Syafrudie’s (2017) submission that demand spikes, expiration dates, and stringent regulatory requirements make effective inventory management a critical factor in patient care and cost containment.

At the local level, companies face challenges such as fluctuating demand patterns, supplier reliability issues, and regional economic variations. In some sectors, like retail and fashion, rapid changes in consumer preferences and short product lifecycles add another layer of complexity to inventory management (Ali et al., 2016; Pratami and Pratama, 2018). Additionally, businesses operating in regions with poor infrastructure may need help with transportation and logistics challenges, affecting inventory flow and efficiency. In the retail sector, seasonal demand variations and the need to adapt quickly to changing consumer trends create significant challenges. Overstocking or understocking can lead to revenue loss or excess holding costs. The rise of e-commerce has also added complexity as companies strive to synchronise their online and offline inventory to meet customer expectations (Astuty et al., 2022; Pratama, 2015; Nasution et al., 2021).

Given the complexity and diversity of challenges associated with inventory management in global and local supply chains across various sectors, the research question that emerges is: How can inventory management strategies be optimised to reduce costs and enhance efficiency in supply chains, considering the global and local contextual factors and sector-specific challenges?

In inventory management strategies for cost reduction in supply chains, pervasive issues span global and local contexts, with various sectors grappling with distinct challenges (Pratama et al., 2019). On a global scale, the intricate nature of international supply chains introduces complexities such as extended lead times, diverse regulatory landscapes, and intricate transportation networks. These factors contribute to uncertainties in forecasting, leading to suboptimal inventory levels and heightened holding costs. Meanwhile, businesses contend with fluctuating demand patterns, supplier reliability concerns, and regional economic variations at the local level, exacerbating the intricacies of maintaining efficient inventory levels. For instance, in the retail sector, rapid
changes in consumer preferences and the influence of e-commerce demand synchronised inventory management across online and offline channels. In manufacturing, the delicate balance between raw material availability and production lead times poses challenges for just-in-time practices. In healthcare, stringent regulatory requirements and the imperative of ensuring the availability of critical medical supplies further underscore the multifaceted nature of inventory management challenges.

Based on the complexities mentioned above, the following research objectives are formulated:

a. Investigate global supply chain dynamics impacting inventory management,
b. Analyse sector-specific challenges in local inventory management and
c. Propose strategies for optimising inventory management to reduce costs across diverse supply chain environments.

Also to further understand the variables under study the paper adopted Economic Order Quantity (EOQ) theory and the Just-In-Time (JIT) inventory management system to further explain the study and achieve the research goals. These theories explains the amount of inventory to be ordered per time for purposes of minimizing annual inventory cost, it also helps in the management strategy, to reduce inventory holding costs and increase inventory turnover.

**METHODOLOGY**

A systematic review methodology was employed to conduct a comprehensive examination of inventory management strategies for cost reduction in supply chains. The systematic approach ensures the unbiased and transparent synthesis of existing literature. The research commenced with the identification of relevant journals using key search terms such as "inventory management," "supply chain," "cost reduction," and "optimisation" across databases like PubMed, Scopus, and IEEE Xplore. A total of 50 journals were initially identified. Subsequently, a meticulous screening process was implemented based on pre-defined inclusion and exclusion criteria, narrowing the selection to 23 published articles written in English. The inclusion criteria focused on relevance to inventory management strategies, cost reduction, and supply chain dynamics. At the same time, exclusions were made for articles not meeting these criteria or not written in English.

The selected articles spanned the timeframe between 2010 and 2023 to ensure the inclusion of contemporary and relevant studies. The articles were assessed, and each article's research methodologies, data sources, and statistical analyses were thoroughly examined. This scrutiny allowed for the identification of robust studies that contribute significantly to understanding inventory management strategies. Ethical considerations were paramount throughout the systematic review process, ensuring only peer-reviewed and ethically conducted research was used. The exclusion of non-English articles was a pragmatic choice to maintain clarity and consistency in the review process, ensuring that language barriers did not compromise the accuracy and reliability of the synthesised information. This systematic review adheres to ethical guidelines by prioritising transparency, objectivity, and integrity in selecting and analysing relevant materials, thereby providing a solid foundation for the subsequent research objectives.

**RESULTS AND DISCUSSION**

**Analysis and Discussions of Research Objectives**

In addressing the complexities of inventory management strategies for cost reduction in supply chains, three distinct research objectives were formulated to guide the systematic review and subsequent analysis. These objectives encompass a thorough investigation of global supply chain dynamics impacting inventory management, an in-depth analysis of sector-specific challenges in local inventory management, and the
proposal of strategies for optimising inventory management to reduce costs across diverse supply chain environments. This structured approach ensures a comprehensive exploration of the multifaceted issues associated with inventory management, providing a nuanced understanding that can inform practical solutions and strategic enhancements in a global context.

Lastly, two theories that are relevant to optimizing inventory management strategies for cost reduction in the supply chain are the Economic Order Quantity (EOQ) model and the Just-In-Time (JIT) inventory management system. The Economic Order Quantity (EOQ) model was first introduced by Ford Whitman Harris and it presented the familiar economic order quantity (EOQ) model in a paper published in 1913. Although Harris’s original paper was unnoticed for many years before its re-discovery in 1988. The model aims at determining the optimal number of units to order so that management can minimize the total cost associated with purchase, delivery and storage of a product.

The EOQ model is based on the premise of minimizing total inventory costs by finding the optimal order quantity that balances ordering costs and carrying costs. The thrust of the EOQ model lies in determining the ideal balance between the costs associated with holding inventory and the costs incurred from ordering and replenishing inventory. By calculating the EOQ, businesses can identify the most cost-effective order quantity that minimizes total inventory costs, leading to reduced holding costs and fewer stock outs. In the context of optimizing inventory management strategies for cost reduction in the supply chain, the EOQ model provides a quantitative framework for determining the optimal inventory levels that minimize costs while ensuring adequate stock availability to meet demand fluctuations.

On the other hand, Singh and Singh (2013) are two authors mentioned in this JIT inventory management model. The authors are mentioned in the elementary method of inventory control. JIT inventory management system focuses on minimizing inventory levels by synchronizing production with demand, thereby reducing waste and inefficiencies throughout the supply chain. The thrust of JIT lies in eliminating excess inventory and streamlining production processes to respond quickly to changes in customer demand. By implementing JIT principles, businesses can reduce inventory holding costs, improve cash flow, and enhance operational efficiency. In the context of optimizing inventory management strategies for cost reduction in the supply chain, JIT emphasizes the importance of lean and agile supply chain practices, enabling businesses to achieve cost savings through efficient inventory management and responsiveness to customer needs.

3.1 Analysis of Research Objective One
The first objective addresses and investigates the global supply chain dynamics. Excerpts from the reviewed articles showed that as companies increasingly operate in a complex and interconnected world, understanding the challenges and nuances of global supply chains is essential for developing effective inventory management strategies. Investigating global supply chain dynamics and their impact on inventory management is a critical undertaking in the contemporary global business landscape. One essential facet of this investigation is the recognition that global supply chains often entail extended lead times, diverse regulatory frameworks, and intricate transportation networks, all of which contribute to uncertainties in forecasting and disruptions in inventory management.

Empirical evidence underscores the multifaceted challenges posed by global supply chain dynamics. A study by Christopher and Lee (2017) exemplifies the significance of prolonged lead times in global supply chains, elucidating the impact on inventory levels and associated holding costs. Geopolitical factors further complicate the scenario. For instance, Sodhi et al. (2012) emphasise that disruptions stemming from geopolitical events, such as trade tensions or natural disasters, can have far-reaching consequences,
influencing supply and demand dynamics globally. The unpredictability introduced by these external factors demands a strategic approach to inventory management that is resilient and adaptable.

Across various sectors, global supply chain dynamics manifest in distinct ways, influencing inventory management strategies. In the automotive industry, for instance, Kanban systems and just-in-time (JIT) practices are employed to streamline inventory levels. However, the vulnerability to disruptions in the global supply chain is evident during events like the Japanese earthquake in 2011, which caused significant production delays (Womack et al., 2010). Similarly, in the technology sector, rapid technological advancements and global sourcing of components necessitate agile inventory management strategies to accommodate changing product lifecycles and demands (Lummus et al., 2019).

Specifically, the investigation into global supply chain dynamics has illuminated the intricate challenges businesses face in managing their inventories on a global scale. Extended lead times, geopolitical uncertainties, and sector-specific nuances underscore the need for resilient and adaptive inventory management strategies. This comprehensive understanding sets the stage for addressing these challenges in subsequent research objectives, ensuring a holistic approach to optimising inventory management for cost reduction in supply chains.

3.2 Analysis of Research Objective Two

The second objective of this study is to analyse the sector-specific challenges in local inventory management. The review of relevant literature indicated that as the global marketplace becomes increasingly interconnected, understanding sector-specific challenges in local inventory management is paramount for developing targeted strategies. Local contexts, marked by variations in consumer behaviour, regulatory frameworks, and economic conditions, necessitate a nuanced examination of the intricate challenges faced by businesses operating within specific sectors.

Empirical evidence underscores the significance of sector-specific challenges in local inventory management. For example, the rapid evolution of consumer preferences and the surge in e-commerce demand pose considerable challenges in the retail sector. Research by Kumar and Ozdamar (2019) illustrates how these dynamics necessitate agile inventory management practices, highlighting the importance of real-time data and analytics to align inventory levels with consumer trends. Similarly, in the manufacturing sector, achieving a balance in inventory levels at different stages of the production process is critical. Li et al. (2018) emphasise the challenges of synchronising raw material availability with production demands to avoid stockouts or overstocking.

Local inventory management challenges manifest diversely across sectors. In the healthcare industry, strict regulatory requirements, expiration dates of medical supplies, and the urgency to ensure availability further intensify the complexities. A study by Vanany et al. (2017) highlights the critical role of accurate demand forecasting and effective communication within the healthcare supply chain to optimise local inventory management. In the fast-fashion retail sector, where trends change rapidly, companies like Zara employ a vertical integration model to manage inventory locally, reducing lead times and responding swiftly to shifts in consumer demand (Ferdows et al., 2005).

By implications, the analysis of sector-specific challenges in local inventory management underscores these issues’ diverse and context-dependent nature. The retail, manufacturing, healthcare, and fast-fashion sectors, among others, face distinct challenges that necessitate tailored approaches. Recognising these challenges provides a foundation for formulating sector-specific strategies to optimise local inventory management. The insights gleaned from this objective contribute to the overarching goal of enhancing inventory management strategies for cost reduction across a spectrum of supply chain environments.
3.3 Analysis of Research Objective Three

The third research objective focuses on developing strategies tailored to sector-specific challenges in local inventory management, aiming to reduce costs across diverse supply chain environments. Three key strategies emerge as impactful solutions through the integration of empirical evidence and in-text citations.

**Just-in-Time (JIT) and Lean Inventory Practices:** The adoption of Just-in-Time (JIT) and lean inventory practices aligns with the works of Shingo (1988) and Ohno (1988), who emphasised the significance of minimising excess inventory and synchronising production with demand in the manufacturing sector. Their principles have been foundational in lean manufacturing and resonate in various sectors. For instance, the implementation of JIT practices by Zara in the fast-fashion industry reduces lead times. It allows for swift adjustments to changing consumer trends, corroborating the works of Ferdows et al. (2005).

**Advanced Analytics and Predictive Modeling:** Integrating advanced analytics and predictive modelling in the retail sector aligns with the study by Kumar and Ozdamar (2019). Their research underscores the importance of real-time insights into consumer behaviour for effective inventory management. Amazon’s successful use of predictive analytics to optimise inventory placement in fulfilment centres further supports this strategy, as demonstrated in the works of Bose et al. (2018).

**Collaborative Supply Chain Partnerships:** The collaborative supply chain partnerships strategy resonates with the study by Simatupang and Sridharan (2002), which emphasises the significance of close collaborations with suppliers and distributors. This aligns with the automotive industry’s successful implementations, reducing lead times and improving overall supply chain visibility. The works of Lummus et al. (2019) corroborate the idea that information sharing and collaborative relationships enhance responsiveness to changes in demand and supply, optimising inventory management across diverse sectors.

Specifically, these strategies, grounded in empirical evidence and aligned with the works of influential researchers, provide a robust framework for optimising inventory management and reducing costs in various supply chain environments. Businesses can enhance their supply chain resilience and operational efficiency by tailoring these strategies to sector-specific challenges.

**CONCLUSION**

The systematic review on optimising inventory management strategies for cost reduction in supply chains has shed light on the intricate challenges faced by businesses operating in diverse global and local contexts. The investigation into global supply chain dynamics and sector-specific challenges in local inventory management revealed the multifaceted nature of these issues. As businesses continue to navigate the complexities of contemporary supply chains, the insights derived from this systematic review provide a solid foundation for informed decision-making and strategic planning. Finally, the Economic Order Quantity (EOQ) theory and the Just-In-Time (JIT) inventory management system theory provides meaning and significant to the findings of this study by providing a systematic view and logical presentation of the phenomenon under study.

**5. Policy Implications and Recommendations**

The findings of this systematic review have significant policy implications for businesses and policymakers alike. Policymakers can leverage the identified strategies to formulate guidelines and incentives to encourage efficient inventory management practices. For businesses, aligning their policies with the proposed strategies can lead to cost savings, increased competitiveness, and improved sustainability. Recommendations include the incorporation of advanced technologies for data analytics, fostering
collaboration among supply chain partners and promoting continuous improvement methodologies such as JIT practices. Policymakers should consider incentivising the adoption of these practices through regulatory frameworks and industry-specific policies to create an environment conducive to enhanced inventory management and overall supply chain resilience.

6. Contributions to Knowledge and Suggestions for Further Studies

This systematic review contributes to the existing knowledge base by synthesising empirical evidence and sector-specific examples to offer a nuanced understanding of inventory management strategies. It enriches the literature by highlighting the global and local dynamics influencing inventory management and proposing actionable strategies for cost reduction. Future studies could delve deeper into the specific impacts of emerging technologies, such as blockchain and artificial intelligence, on inventory management. Additionally, exploring the influence of cultural and regulatory variations on the effectiveness of proposed strategies in different regions could further enhance the applicability and adaptability of inventory management approaches across diverse supply chain environments.

REFERENCES


