Literature Review: Inventory Management in The Supply Chain

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This literature review paper focuses on inventory management in the supply chain and the issues involved in performance, costs, responding to demands, logistics, and sustainable pressures. There are multiple angles to view these challenges in the supply chain, subscription/auto-delivery procurement, handling and reuse of defective items under global sourcing, joint pricing–inventory control in multi-channel systems, integrated inventory–transportation planning with collaborative consolidation, and retail strategies for liquidity and space constraints. Below I synthesize key contributions, highlight methodological approaches, and identify recurring gaps that motivate further doctoral research.

Scholars continue to study how inventory management systems can be better used in order to achieve a balance between cost and risk. This literature review synthesizes scholarly peer reviewed contributions from 2021 to 2025 to highlight the evolving role of inventory management in modern supply chains. Ahmed et al. (2022) examines the global supply chain environments in which defective products can be reworked and inventory levels interact with multi-trade-credit arrangements, demonstrating the complexity of managing stock when financial and quality considerations intersect. Furthermore, Bekci et al. (2023) mention inventory management decisions to be in multiple systems with various demands, emphasizing the importance of having flexible control mechanisms in supply chains with incomplete information.

Chen and Moinzadeh (2023) introduce subscription-based auto-delivery systems that interconnect both consumer behavior with operational planning. Additionally, Li and Mizuno (2022) highlight dual-channel supply chains in which pricing power structures affect both inventory and fulfillment decisions. Hence, adding to the strategic correlation between channels in omnichannel markets. Meanwhile, Hatami-Marbini (2025) discuss a unique approach to improving collaborative inventory systems, highlighting the value of proper coordination between supply chain partners. Today's literature also illustrates the increasing role of technology, automation, and analytics in transforming inventory management. Grutzner (2025) discusses a process-reference model for automated inventory, in which it demonstrates the ongoing change toward AI-led decision-making and integrated operational technology. Karpagavigneswari (2025) introduces chaos-theory-based forecasting models as tools for better inventory resilience when volatile demand cycles occur.

Auto-Delivery (Subscription) Procurement

In regard to auto-delivery models, analytical models can cast the supplier as a discount setter and the buyer as a subscription and quantity decision maker, highlighting how well-thought-out discounts can produce mutual gains. Buyers obtain lower effective prices and planning convenience, while suppliers can gain from the increased demand, predictable orders, and lower inventory costs (Chen et al., 2023). Examples such as Amazon Business/subscription-based programs show how essential such mechanisms can be (Chen et al., 2023). Ahmed (2022) mentions that it would be useful to treat defective units as reworkable assets. This would be

because repairs can lower environmental impact and products can be reintegrated back into inventories.

Joint Dynamic Pricing and Inventory in Dual-Channel Supply Chains

As manufacturers add direct online channels to traditional retail distribution, joint pricing and inventory control problems become more complex. Li & Mizuno (2022) analyze a periodic-review dynamic model with price-sensitive stochastic demand under three power structures (Manufacturer Stackelberg, Retailer Stackelberg, and Vertical Nash). They show the optimal policy takes an inventory-dependent base-stock and list-price form: starting inventory affects both base-stock levels and markdowns, and channel power alters base-stock determinants even when policy structure is preserved. Numerical experiments reveal how wholesale price regimes shift the preferred power structure for channel members. Stochastic dynamic programming combined with game-theoretic leadership models highlights the operational impact of vertical power and the value of coordinating pricing and replenishment.

Collaborative Merging and Transportation Considerations

Hatami-Marbini (2025) mentions that inventory management operations should implement transportation costs and sustainability goals. Their two-phase approach adds congestion, emission, price, and shortage terms. There also need to be scenario-based multiple-choice systems in place that gather decision-maker preferences in uncertain times. The framework aims to identify pre-merging strategies that reduce total inventory/transportation costs while accounting for environmental impacts and equity in cost sharing. This approach links micro (retailer) optimizations to system-level merging decisions. This can allow modelling real-time congestion dynamics and assessing how information sharing affects incentives to merge.

Retailers' Liquidity, Space Constraints, and Discount-Based Liquidation Strategies

Retailers that work in costly small spaces trade off stocking large, discounted-price inventories (Hasan et al., 2021). Time-based discount policies can accelerate turnover to get back invested capital while balancing holding costs and lost margin. Some limitations can be on how uncertainty treatment varies, and some works assume deterministic or known stochastic processes, while others embed robust optimization but do not address learning and information asymmetry explicitly. Sustainability and congestion are increasingly recognized, but dynamic interaction between transport networks and inventory policies is still under-explored.

Safety-Stock Optimization and Inventory Classification Methods

Correctly determining safety-stock levels is still an ongoing problem for inventory management. Traditional methods like fixed "number-of-days" coverage to SKUs continue to be commonly used even though this approach can fail to take into account the demand variability (Demiray Kirmizi et al., 2024). In response,

scholars have studied alternative methods, including the Theory of Constraints (TOC) replenishment model, service-level optimization techniques, and hybrid methods. It would be essential for inventory management to analyze and categorize inventory by value, importance, and demand volatility. Demiray Kirmizi (2024) Findings indicate that hybrid service-level models outperform traditional methods, bringing larger reductions in total inventory costs. These results highlight the influence of demand variability on safety-stock requirements. Hence, offering improved operational benefits and cost-effective stock planning.

Perishable Inventory Management and IoT Adoption

There are greater challenges in inventory management whenever the products are perishable, such as food, pharmaceuticals, fresh produce, and temperature-sensitive items. This window of perishability creates strict requirements for monitoring environmental factors, such as temperature, humidity, microbial growth, and enzymatic activity, yet many MSMEs lack the technological capabilities necessary for real-time supervision (Maheshwari et al., 2025). With the rise of artificial intelligence, Internet of Things (IoT) technologies seem to be in a position to help the inventory management team to be better equipped to better manage the movement of perishable inventories. This would be because technology systems can improve the observation of products' shelf life, thus lowering waste, and get early insights on the possibility of deteriorating products. Having access to such information in real time can allow warehouses to enhance their operations. Hence, IoT would be a logical investment for MSMEs that are looking for improvement and compliance in the quality standards for perishable items.

Inventory Learning in Two-Echelon Systems

Multi-echelon inventory systems are used in which a central warehouse receives initial products and then spreads out inventory throughout multiple retail locations. The objective is to minimize total expected costs, including transportation, holding, lost-sales penalties, and disposal (Bekci et al., 2023). A central difficulty lies in generating unbiased demand estimates from incomplete or truncated data. These insights are increasingly relevant as retailers navigate heightened demand volatility, larger product assortments, and global supply-side disruptions.

Retail and Wholesale Inventory Dynamics Across SCM and Economics

A key distinction between R&W sectors and manufacturing is that retailers and wholesalers usually work with finished goods and do not substantially change the product they obtain (Marzolf et al., 2024). Manufacturers, on the other hand, need to handle multiple inventory stages, such as raw materials, work-in-process, and finished goods, each managed by different operational drivers, such as make-to-order strategies.

AI-Enhanced Forecasting and Predictive Analytics in Modern Supply Chains

Forecasting accuracy has become an essential determinant of inventory performance because of all the elements that make inventory demand unpredictable. Commonly used models like the economic order quantity (EOQ) and the news-vendor formulation provide a good understanding of data, but they can usually be false in information in environments that are characterized by nonlinear patterns, structural changes, and complicated interactions across the supply chain cycle. Karpagavigneswari (2025), address these issues and mention how a forecasting approach based on the Red Panda Optimizer enhanced with Logistic Mapping (RPO-LM) can be effectively used. RPO-LM can perform better compared to other forecasting models because having more accurate demand forecasting and inventory management personnel can make informed decisions to reduce out-of-stock inventory or even overstocking. 2025 is an interesting time for many businesses, as artificial intelligence, including machine learning and predictive analytic systems, is changing the supply chain decision-making processes.

Inventory Management as a Foundation for Supply Chain Automation

In inventory management, using supply chain automation is essential in order to be able to automatically classify SKUs and align them with the correct inventory policies. Doing so, companies can improve their processes and develop more resilient operational structures (Grutzner et al., 2025). Supply chain automation reveals three key elements: strategic management decisions, product tracking, and customer fulfillment. Companies should invest in data-driven decision frameworks that analyze risk–reward trade-offs because having a strong inventory management system can create the backbone for high-performing automated supply chains and serve as the beginning of a successful implementation of AI initiatives.

Advanced Retail Analytics and Omnichannel Inventory Optimization: Evidence from Alibaba

Alibaba gives a real-life example of large-scale application of advanced analytics in retail inventory management. The company has implemented deep learning models for predictable demand forecasting, simulations for inventory planning, and algorithmic pricing tools for real-time markdowns (Yuming et al., 2023). These operating systems are used throughout Alibaba's omnichannel infrastructure, allowing for better decision-making. Alibaba's business model shows the operational effects of using modern analytical tools, with the company reporting millions in savings from enhanced inventory efficiency and the use of product recommendations. Alibaba uses real-time price adjustments in its stores, which improves responsiveness. The successful implementation of these technologies shows how the supply chain industry is changing toward more intelligent inventory systems that are driven by data, automation, and machine learning.

Emerging Research Questions

How do suppliers optimally set subscription discounts when buyers learn demand over time and may strategically enter/exit auto-delivery?

What contract forms (revenue sharing, repair-cost sharing, dynamic trade credit) best align incentives for local rework of defective units under stochastic quality rates?
In dual-channel systems, how do real-time inventory and demand signals alter the comparative advantages of different vertical power structures?
Can adaptive leadership models outperform fixed Stackelberg/Nash formulations?
How do temporary discount strategies interact with supplier credit, space allocation, and multi-product competition under stochastic demand?

Integrating the Genesis Model: Creation, Fall, Redemption, and Consummation

Creation: God creates a world with order, abundance, and purposeful work (Genesis 1–2). Inventory management in a supply chain reflects these creation principles because during operations it is essential to have proper stewardship of scarce resources and help partners and consumers flourish through providing reliable products and services.

Fall: The Fall introduces disorder, scarcity, and misaligned incentives (Genesis 3). Supply chains can be seen as having waste from products that have gone bad from staying in inventory longer than their shelf life or from products that have been broken as they moved through the supply chain, along with pricing by suppliers that is opportunistic, and having a mistrust or lack of communication in data.
Redemption: God provides a redemptive opportunity that allows for restoration and reconciliation. Technological improvements within inventory management can allow for this redemptive work when such tools are used efficiently to reduce waste, use collaborative planning between suppliers, and provide fair pricing. Technological innovation, when done through ethical intent, is then a means of healing operational inefficiencies and providing fairer, more sustainable supply chain ecosystems.
Consummation: In restored creation, justice and flourishing can flourish. Companies can design operational systems that uphold God's values, such as sustainability initiatives that highlight God's care for creation and inventory practices that prioritize employee well-being. Further development of AI-driven forecasting and omnichannel optimization can be used as instruments that push forward companies closer to operations that are consistent with God's intended order.

Conclusion

This paper highlights the important role of modern technology such as AI used to improve operational efficiency, reduce risk, and maintain competitive advantage. Proper inventory management works as a strategic lever that connects upstream procurement decisions with downstream customer service outcomes. Some commonly used models in the supply chain focus on reducing costs through ordering policies, safety stocks, and replenishment timing, while current studies have further elaborated this lens to incorporate uncertainty, use of real-time data, and the interdependencies between supply chain partners.

By creating supply chain processes that reduce waste, uphold fairness, leverage technology for good, and steward resources wisely, companies can be part of God's redemptive work in the world we live in. Hence, inventory management in the supply chain can be said to be a purely operational discipline that can become a powerful part of business owners contributing to God's mandate to create and restore what has been broken and anticipate the fullness of His kingdom through ethical, thoughtful, and innovative business practices.

Predictive analytics, AI, automation, and subscription-based replenishment systems have also changed the understanding of inventory dynamics. AI data-driven forecasting, machine learning, and integrated information systems can allow companies to respond more proactively to changes in demand, supply disruptions, and unexpected changes in global trade. Vendor-managed inventory, auto-delivery programs, and multi-echelon optimization also show how essential information-sharing between supply chain actors can be for the success of all those involved in the up and down supply chain process in order to be able to effectively manage inventory. Along with these advancements with technology, there remain certain gaps. For example, many studies rely on assumptions about demand distributions, lead times, or partner behavior, limiting real-world and uncertain environment outcomes. Technological advancements also continue to move faster than academic peer-reviewed literature can research and publish on the topic.

As supply chains grow more digitized, future research should move beyond cost-centric methods in order to further research the inventory's role in resilience, sustainability, and strategic collaboration. Such further research can help to expand theoretical understanding and also equip practitioners with the knowledge for navigating the challenges of modern supply chains in 2026 and beyond.

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