The Role of Artificial Intelligence in Optimising Retail Inventory Management

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ABSTRACT

This review paper examines how Artificial Intelligence (AI) is transforming retail inventory management with predictive analytics, machine learning algorithms, and automation. Drawing on the results of four articles, the review examines AI-facilitated enhancements in demand forecasting, inventory optimization, supply chain integration, and reordering automation. The study also examines challenges and strategic implications of leveraging AI in the retail industry. The study establishes the premise that not only does AI enhance forecasting accuracy and response time, but it also supports lean inventory practices, scalability, and real-time responsiveness. With the help of AI, retail firms try to realign their inventory to achieve its full potential.

Keywords: Artificial Intelligence, Inventory Management, Retail, Demand Forecasting, Machine Learning, Automation, Supply Chain.

INTRODUCTION

Inventory management is one of the key factor that exerts a great influence on operational efficiency and profitability. Inventory management is really all about aligning customers' demand and supply costs at the lowest possible expense and not through stockouts or overstocks. Statistical techniques and tools have been the answer to this in the past. These do not do justice, however, to the dynamics of the contemporary retail market, including rapidly changing consumers' behaviour, globalization, e-business growth, and supply chain risks.

With the current pace of the world, Artificial Intelligence (AI) has been a game-changer. AI refers to the ability of machines to mimic human intelligence—learn, predict, and even make decisions themselves. In inventory management, the application of AI is huge: from real-time forecasting and dynamic pricing to automated buying and predictive maintenance of supply infrastructure. AI can assist businesses in freeing themselves from reactive inventory procedures and moving towards proactive, data-driven decision-making procedures.

Ünal et al. (2023) note that deep learning, machine learning, and reinforcement learning, all branches of AI, are the driving force behind the inventory management revolution. These technologies allow the retailers to handle vast amounts of data, learn from fresh data, and control their inventory with such accuracy and speed as is impossible by traditional means. For instance, AI not only can see past sales but also external influences like weather, social media, and financial projections to compute demand.

Second, AI plays a key role in coordinating different parts of supply chains. M.K. Islam et.al. (2024) illustrate in their cross-country study how AI implementation promotes higher transparency within supply networks to enable coordination among retailers, warehouses, and suppliers. This leads to a more robust and agile study that is able to handle disruptions and maintain service levels.

AI helps in achieving operational efficiency which ultimately results in customer satisfaction. AI-based inventory systems provide the needed products at the correct time, which minimizes lost sales and improve the overall shopping experience in the store. Oladele (2025) mentions Walmart and Amazon, big-box stores, employing AI not only to forecast future demand but also to personalize product availability and to automate

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restocking—practices that equate inventory with actual customer demand.

AI solutions are also extremely scalable and adaptable to implement in businesses of varying sizes. From small shops with AI-based inventory solutions to multinationals with fully automated supply chains from end to end, the technology can be implemented in varying intensities and configurations. Successful AI implementation is less a question of technical readiness than one of cultural change, for example, upskilling staff and going digital.

This review paper takes evidence from four novel studies to create an integrative summary of how AI is optimizing retail inventory management. It categorizes AI applications into demand forecasting, inventory optimization, supply chain integration, and automation—and employs empirical studies, case studies, and literature reviews to demonstrate the revolutionary nature of AI. It also discusses AI adoption issues and offers future research and field implementation directions.

LITERATURE REVIEW

Veluru (2022) examined the sophisticated AI algorithms which includes gradient boosting regressors and LSTM neural networks. It can enhance demand forecasting. The research explained that these models, through the examination of past sales, seasonality, promotions, and other variables, are more accurate than conventional statistical techniques. A correct forecasting helps companies to adopt just-in-time inventory systems which lowers holding costs and reducing wastage.

In their 2023 study, Ünal et al. investigated the application of reinforcement learning and deep learning to inventory management. Their research shown that these AI systems are able to use real-time supply and sales data to determine the appropriate inventory levels and reorder points. Agility is improved by machine learning-based solutions. It helps businesses in minimizing the shortage of stock. It also prevents overstocking and responds quickly to changes in demand.

Al Bashar et al. (2024) argued that AI adoption improves the overall efficiency of the supply chain. Improved visibility, proper maintenance, sensor-enabled monitoring etc. allow AI to plan logistics more effectively and solve the problems in advance. Those firms which applied AI to their supply chains witnessed increased responsiveness. It also helps in reducing interruptions in supply and thus helps in an improved coordination between retailers, distributors, and suppliers.

Oladele (2025) investigated stock management automation using AI. The study confirmed that AI facilitates forecast-based decision-making, stocking automation, and real-time monitoring. Automation increases operational efficiency and reduces the chance of stockouts and overstocking. According to Oladele, AI-based stock systems allow companies to grow effectively with little manual involvement while maintaining ideal stock levels.

AI in Retail Inventory Management

Demand Forecasting: By examining previous purchase and sales, AI helps in forecasting future purchase. It helps in minimising overstocking and understocking of goods.

Intelligent inventory choices: AI acts as an effective store manager. It monitors sales and supply data which helps in calculating optimum stock.

Integration of supply chain: Hooking Everything Together Rather than separate components of the business operating independently, AI facilitates suppliers, warehouses, and stores to operate like a single unit. It is similar to everyone being in the same group message, sharing information immediately.

Operating on Autopilot: The most recent innovation is stores that function much like they're automated. AI reorders products, monitors everything in real-time, and makes choices without human intervention necessary for every little detail.

Computer vision: AI-powered cameras and drones can easily detect shelves to estimate inventory, recognize

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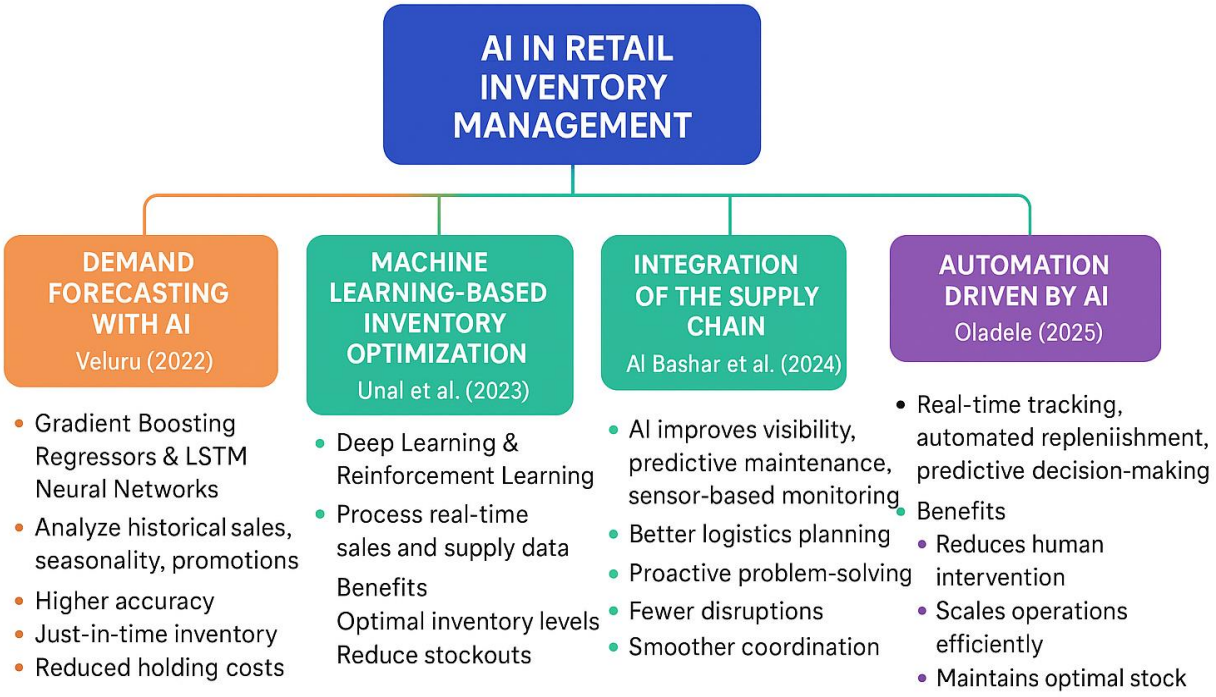
items, detect damage, and monitor for misplaced items. Thus, AI helps in improving accuracy and reducing manual effort. Reduction in manual effort saves time and energy which ultimately increases efficiency.



TECHNIQUES

Using a qualitative synthesis methodology, this review compares four peer-reviewed journals selected based on method quality, proximal publication (2022–2025), and relevance. Data on AI applications in inventory management, broken down by function (forecasting, optimization, automation, and integration), was obtained by scanning the journals. To provide a fair viewpoint, data from case studies, bibliometric reviews, and experiments were combined.

FINDINGS

Efficiency and Precision

According to studies, AI improves forecasting accuracy and operational effectiveness. For example, forecasting accuracy rose by up to 30% when using predictive models (Veluru, 2022). This facilitates prompt decision-making and more effective inventory management which ultimately increases profit.

Reduction of expenses and waste

AI systems improve lean inventory management by forecasting exact reorder quantities, reducing holding expenses, and reducing spoilage (Ünal et al., 2023). Without sacrificing availability, the merchants avoided unnecessary inventory to avoid overstocking.

Scalability and Integration

AI programs can be integrated with existing legacy ERP and SCM systems and upgraded in a modular fashion rather than being replaced (Al Bashar et al., 2024). These are thus within the reach of mid-sized businesses and not just technology behemoths.

Real-Time Decision-Making

AI facilitates real-time decision-making through real-time data streams and machine learning feedback loops (Oladele, 2025). Dynamic responsiveness of this type is essential for retailers operating in volatile or highly competitive markets.

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CHALLENGES

Despite the potential, AI deployment is hampered by numerous challenges. Data availability and quality are central challenges since the models require enormous amounts of clean data to learn. Al Bashar et al. (2024) and Ünal et al. (2023) also claim that employee resistance and compatibility with current systems are additional challenges. Ethical concerns of data privacy and AI bias need to be addressed by open algorithms and quality data governance legislation.

CONCLUSION

AI's ability to facilitate data-driven, responsive, and efficient business processes has helped to a great extent in retail inventory management. Technology plays a huge role in everything from automated reordering to real-time inventory tracking to demand forecasting. To make it useful, however, human, data, and integration issues must be resolved. Retail businesses will use AI software more if it is easy to use and intuitive. Future studies must examine ethical concerns, industry-specific flexibility based on various retail approaches, and hybrid AI-human models.

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