A Study on Artificial Intelligence: Driven Inventory Solutions and Enhancing Manufacturing Efficiency

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Abstract

Artificial Intelligence is pivotal in transforming Manufacturing and Inventory management practices and maintaining this delicate inventory balance. AI-driven predictive forecasting, for instance, considers historical data, seasonality, and market dynamics to provide exceptionally accurate demand forecasts. Managing inventory has become a complex puzzle in today's fast-paced business world. As companies expand their reach and cater to a global audience, tracking inventory and maintaining an accurate "available-to-promise" status in real time has become a challenge. In the current competitive landscape, retailers prioritise a seamless approach to inventory management, especially with the growing importance of omnichannel fulfilment. The art of balancing supply and demand while keeping costs in check has become a high-stakes game where every piece of the inventory puzzle must fit perfectly. In this article, we explore the remarkable role of Artificial intelligence in Manufacturing and Inventory management. We will discuss how businesses can harness the power of AI to optimize their efficiency in Manufacturing and Inventory processes.

Keywords – Artificial Intelligence, Manufacturing Process, Inventory Management, Supply Management and Automating Payroll.

1. Introduction

Artificial Intelligence

Artificial intelligence is the intelligence of machines or software, as opposed to the intelligence of humans. It is also the field of study in computer science that develops and studies intelligent machines. "AI" may also refer to the machines themselves. AI technology is widely used throughout the manufacturing and inventory management industry in these days.

Manufacturing Process

Manufacturing is utilising Tools, Labor, Machinery, Artificial Intelligence, and raw materials or parts to create finished goods.

Inventory management

The Ordering, Storing, Using, and Selling of a company's inventory is referred to as Inventory Management. This includes managing Raw materials, Components, and Finished Products as well as the Warehousing and Processing of these items.

The main objective of the article is to optimise and streamline the procedures involved in managing and overseeing a company's inventory is the goal of implementing artificial intelligence (AI) in inventory management. AI may be used to improve inventory management in several ways, giving companies data-driven, accurate, and more efficient solutions and minimising manual work.

2. Literature Review

According to Adnane Drissi Elbouzidi, (June 2023), Digitalization makes it easier to build more linked and effective systems that can adjust to changing conditions and maintain company continuance. According to Eliamani Foya, (May 2021), Accurate and timely data collection has greatly improved inventory procedures, which encourages businesses to use AI technology. According to Treleaven and Batrincra (2017), AI enables automated compliance, which lowers costs and improves the efficiency of a value chain network", According to Wen et al (2018) "Through automation, AI can assist in the simplification of time-consuming jobs in warehouse operations." According to Petri Helo & Yuqiuge Hao, Nearly all operational processes have been digitalized by advanced technologies to control manufacturing throughout whole supply chains, (2020). Artificial intelligence (AI) can process, analyse data (automatically), and most importantly, predict it. It offers precise and trustworthy demand forecasting, which enables companies to optimize their sourcing in terms of ordering and purchasing procedures, reducing expenses associated with supply chain management, warehousing, and transportation." (July 2019   article)

Rupa Dash, Mark McMurtrey, Carl Rebman, Upendra K. Kar, AI may provide you with a competitive advantage by seeing possibilities and forecasting future trends, and it may even inspire new creative designs." Vehicle-to-vehicle (v2v) communication combined with artificial intelligence (AI) can proactively notify pilots, captains, and drivers of impending issues with other vehicles as well as other traffic hazards. Samir K. Srivastav (November 2019)

The present study is one of several that continuously demonstrate the benefits of integrating engaging AI methods in the field of Manufacturing and in the process of all inventory management.

3. Methodology

This Article states that the use of Artificial Intelligence in the field of the modern age of Manufacturing and Inventory management makes it even more efficient and more accurate. This makes it an article based on secondary data. Articles from reputed journals are considered.

4. Improvements Possible Through AI

1. Improved Communication: Compared to human operators, automated AI systems are able to transmit precise information more quickly. Instantaneous updates can be made while on the go by implementing cloud-based devices.
2. Logistical: Artificial intelligence (AI) can now optimize logistical activities, such as counting pallets or assigning the necessary equipment to people, thereby cutting down on processing time and human error.
3. Inventory Optimization: By using AI, funds and resources that are typically allocated to inventory control are freed up.

4. Automating Payroll and Performance Reports: Artificial intelligence (AI) enables the scheduling of payroll and performance reports. To provide more accurate insights into employee performance, they could be connected to data.

5. Challenges and Solutions

A vital component of corporate operations, inventory management is not without its difficulties. AI has a big part to play in solving these problems and boosting inventory management effectiveness. The following are some typical problems and possible AI-based fixes:

▪ **Forecasting demand**

Challenge: Overstock or stockouts might result from inaccurate demand predictions.

AI Solution: Use machine learning techniques to forecast demand. These algorithms improve the accuracy of demand predictions by examining seasonality, historical data, and other pertinent variables.

▪ **Overstock & Stockouts**

Challenge: It might be difficult to keep the proper balance of goods, which can result in stockouts or overstock scenarios.

AI Solution: AI can continuously analyse data to change stock levels based on market trends, supplier performance, and real-time demand. This allows AI to optimize inventory levels.

▪ **Management of Suppliers**

The challenge is in overseeing supplier relationships, monitoring their performance, and guaranteeing on-time delivery.

AI Solution: By evaluating supplier performance information, forecasting delivery dates, and streamlining order processing and communication, AI may improve supplier management.

Trends and Seasonal Demand

Managing demand fluctuations brought on by seasonality or shifting trends is a challenge.

AI Solution: Machine learning models can find patterns and trends in past data, which makes it easier for companies to adjust to changing market trends and seasonal variations.

▪ **Integrity and Accuracy of Data**

Keeping accurate and current inventory data across many platforms is a challenge.AI Solution: Put in place AI-driven solutions that can automatically update inventory levels, integrate with a variety of data sources, and monitor data correctness continuously.

▪ **The danger of obsolescence**

Challenge: The possibility that items will become antiquated or outmoded.

AI Solution: To detect products in danger of obsolescence, AI may examine market trends, product life cycles, and historical sales data. This makes proactive management possible, including inventory discounts and phase-outs.

▪ **Optimal Order Fulfillment**

Problem: Ineffective order fulfillment and picking procedures.

AI Solution: By anticipating order quantities, allocating inventory for effective picking routes, and automating order fulfilment procedures with robotics or intelligent picking systems, AI can improve warehouse operations.

▪ **Tracking in Real Time**

Problem: Inability to see inventory movements in real-time.

AI Solution: Put in place AI-driven tracking tools to facilitate quicker decision-making by giving real-time visibility into inventory levels, shipments, and order statuses.

▪ **Adjustable Prices**

Optimal pricing setting in light of shifting market conditions is a challenge.

AI Solution: By utilizing artificial intelligence (AI) to power dynamic pricing algorithms, prices may be instantly adjusted for optimal profitability by analyzing market trends, rival pricing, and demand fluctuations.

▪ **Analysis of Customer Behavior**

Comprehending consumer inclinations and conduct presents a challenge.

AI Solution: Businesses may adjust their inventory and marketing tactics to match customer expectations by using AI to analyze customer data and find patterns, preferences, and trends.

6. Benefits of Using AI

The benefits of improving inventory management with AI

➢ Effortless demand forecasting In the past, businesses relied on demand forecasting methods such as exponential smoothing and autoregressive integrated moving averages. However, these methods are rapidly becoming antiquated as businesses generate more data, thus necessitating the need for a robust system that can spot demand patterns and use the data to forecast and optimize inventory replenishment plans.

➢ Automated material procurement All manufacturing businesses need an elaborate and efficient procurement process.

➢ However, the large number of documents and suppliers involved is enough to confuse any human worker, leading to mistakes and inefficiencies.
These procedures, which range from obtaining the best prices to moving items through the supply chain, can be automated with the aid of artificial intelligence. A recent McKinsey analysis states that companies using AI in their procurement process report improvements in inventory and service levels of 35% to 65% as well as a 15% decrease in logistical expenses.

➢ Safety stock control Businesses used to set a static quantity for their inventory levels, which essentially meant setting aside a small amount for walk-in sales that weren't considered when calculating inventory levels for other fulfilment channels like eCommerce.
Nevertheless, relying on generalized information is no longer convenient due to today's omnichannel engagements and constantly shifting consumer expectations. Businesses in today's market must adjust their stock levels dynamically to leverage and respond to new demand.

➢ Less of a difference between supply and demand Artificial intelligence can reliably forecast consumer demand and consistently maintain appropriate stock levels when paired with data analytics. To forecast customer demand for the upcoming season, these systems typically analyse customer demand for seasonal products over the previous few years. Additionally, some systems allow users to pre-order products, which further streamlines business processes.

➢ Data accessibility support Lack of visibility is one of the most common data-related inventory challenges that often lead to gaps and inaccuracies in important inventory and sales information. This issue often stems from the use of legacy systems and manual inventory management methods, which are susceptible to human error. AI inventory management solution enables you to automate the storage,

collection, and dissemination of all inventory-related data. These include product tracking, supplier delivery times, product information, and item location within the storage facility.

➢ Enhanced productivity of workers For every employee in every department of the company, a properly maintained inventory can greatly minimize performance-related pain points. AI has been shown in recent surveys to increase employee performance by as much as 40%, particularly for workers who interact directly with customers. These workers can recommend products more accurately and quickly by using AI to analyse and interpret data.

AI can also enhance a retail company's overall performance by providing business education resources like administration programs that provide management data and trading courses.

7. Impacts on the Process with Use of AI

Demand and supply forecasting

Artificial intelligence (AI) has made it possible for businesses in the manufacturing sector to precisely estimate supply and demand using machine learning and predictive analytics. By utilizing these technologies, businesses can better seize possibilities for increased production yields while proactively anticipating possible problems like delays or inventory shortages.

Predicting market trends with accuracy

By correctly forecasting a variety of market trends, including customer preferences, industry demands, and sales projections, artificial intelligence is also assisting manufacturers in streamlining their processes. It can evaluate vast amounts of data quickly, which allows it to perform tasks that humans cannot. This capacity lowers the possibility of excess inventory or shortages of essential components by enabling businesses to modify their production in response to changes in demand.

Make real-time tracking better

Furthermore, real-time tracking and monitoring of the commodities in the supply chain is made possible by artificial intelligence. Businesses can use AI to get real-time data on weather trends, the status of items in transit, and other topics. This makes it possible for them to guarantee on-time deliveries and react promptly to any delivery problems. This real-time visibility boosts customer happiness, lowers delay-related expenses, and promotes efficiency.

Enhanced warehouse performance

AI can also streamline warehouse operations by automating a number of tedious jobs. Robots having AI capabilities, for instance, may manage inventories, pick orders, package, and even move items around the warehouse. This automation lowers labour expenses, lowers the possibility of human error, and boosts productivity all around. These robots are also capable of 24/7 operation, which boosts output.

8. Conclusion

In summary, there are several advantages to using AI in inventory management, including increased forecasting precision and operational efficiency. Businesses may maximize supply chain management efficiency, cut expenses, and improve inventory levels by utilizing machine learning algorithms and data analytics. The ongoing development of AI technology has the potential to significantly alter traditional inventory management procedures, increasing their adaptability and responsiveness to changing market conditions. Businesses in a variety of industries have found AI to be a game-changing and incredibly successful option when it comes to inventory management. There are many advantages to integrating artificial intelligence into inventory control, including process simplification, accuracy improvement, and

overall efficiency enhancement. Artificial intelligence (AI) has several applications in inventory management that can greatly improve handling and inventory process optimization in terms of accuracy, efficiency, and overall effectiveness. Businesses may improve decision-making, streamline processes, and adjust to changing market conditions by implementing AI technology like machine learning algorithms and data analytics.

9. References

1. https://iopscience.iop.org/article/10.1088/1742-6596/1325/1/012085/pdf
2. https://ieeexplore.ieee.org/abstract/document/9693060
3. https://web.archive.org/web/20210814042715id_/https://www.irojournals.com/aicn/V1/I2/02.pdf
4. https://www.irjmets.com/uploadedfiles/paper/issue_3_march_2022/19468/final/fin_irjmets1646486656.pdf
5. https://www.theseus.fi/bitstream/handle/10024/500648/Thesis_Foya_Eliamani_TLE17S1.pdf?sequence=2
6. https://www.gep.com/blog/technology/ai-for-inventory-management
7. Abiodun, O. I., Jantan, A., Omolara, A. E., Dada, K. V., Mohamed, N. A., & Arshad, H. (2018). State-of-the-art in artificial neural network applications: A survey. Heliyon, 4(11),e00938. https://doi.org/10.1016/j.heli- yon.2018.e00938
8. Abu Zwaida, T., Pham, C., & Beauregard, Y. (2021). Optimization of Inventory Management to Prevent

   DrugShortages in the Hospital Supply Chain. Applied Sciences, 11(6), 2726. https://doi.org/10.3390/app11062726
9. Addo, A., Centhala, S. & Shanmugam, M. (2020). Artificial intelligence for risk management. Business ExpertPress
10. Addo, A., Centhala, S., & Shanmugam, M. (2019). Artificial Intelligence for Risk Management(ISSN).BusinessExpertPress https://ebookcentral-proquest-com.ezproxy.jamk.fi:2443/lib/jypoly-ebooks/detail.action?docID=6134046
11. Ai, R. (2019, September 25). Artificial Intelligence for Inventory Management. - Remi AI.Medium. https://medium.com/@RemiStudios/artificial-intelligence-for-inventory-managementc8a9c0c2a694[Ac- cessed 06 May 2021].
12. Anyoha, R. (2017, August 28). The History of Artificial Intelligence. SITN. https://sitn.hms.har-vard.edu/flash/2017/history-artificial-intelligence/