Analysis of Artificial Intelligence Perspective in Inventory Management

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***Abstract*—Artificial intelligence (AI) has been on the cutting edge of research for manufacturing execution systems' operations and inventory management. The impact of AI on increased operational performance has been described in the literature, but further research on IM in adopting AI is needed. To close this gap, an investigation of IM in the application of AI approaches is essential.**

***Index Terms*—Artificial Intelligence, Machine Learning, Inventory Management, Artificial Neural Networks**

I. Introduction

Stock is among a business's most key resources. In diligence with substantial supplies, similar to retail, manufacturing, food services, and others, an association's raw accouterments and completed goods constitute the foundation of its operations. In inventory management, a shortfall can be harmful. Budget limits might be problematic when and where they are most needed. Innovative manufacturing technologies are the future of the manufacturing industry, with AI as one of the most visible of these technologies [1]. They are incorporating AI results in problem solutions with greater accuracy, speed, and input volume [1].

Inventory is the bundle of unfinished items, also known as work-in-progress and finished commodities, that an organization has on hand to reach and perfectly fits its functional needs. It presents substantial financing and an uncontrolled implied waste source. A business's force is its inventory on hand in anticipation of future demand [2].

One of the main problems in every retail firm is predicting product demand. Another query that must be clarified is how we intend to use this information, bringing artificial intelligence into inventory control. What role does AI play in inventory management's complex, quick, and simple sphere? Is it any help at all? The answer is an absolute yes. It must be used in conjunction with human oversight and as an addition to the system, not in place of it, much like any other practical application of cutting-edge AI. Artificial intelligence should be used in collaboration with human monitoring and viewed as an integral system component rather than a substitute for it [3].

II. Literature Review

As a result of the current MES with AI-embedded aspects of digital systems, the manufacturing shop floor is becoming more intelligent, significantly impacting decision-making. Consequently, there is a growing need for studies to examine and analyze the impact of AI on decision-making, as well as promote the cutting-edge innovation and operational efficiency of AI applications [4], [5].

There are two methods employed in inventory management [1], the capacity to categorize and identify the goods in the existing warehouse from one (the most typical) angle. How are shelves arranged, barcode products, and what additional procedures are employed? Nevertheless, those are only the fundamentals. The inventory management plan must deal with several challenges. An essential requirement for effective inventory management is the industry's rapid expansion in e-commerce. The currently used inventory management techniques are subject to enhancement with more research. AI is the driving force behind all business processes in many prominent firms, such as Amazon and Google, to increase efficiency [5]. To analyze data patterns and provide the necessary outputs, AI integrates algorithms [1], [2].

With rising demand for technology advancements and rivalry within the retail sector, AI has received all the necessary acknowledgment over the past few years [1], [6]. Similar to its utilization in problem-solving and prioritization, business-related data analytics, and other areas. An advanced system uses artificial neural networks (ANN). That makes use of neural layering. ANNs are pretty good at solving problems. Management is needed in the past research of ANN for inventory to improve forecast accuracy [7]. A mixed approach that combines the multi-criteria decision-making (MCDM) technique and numerous ML algorithms for inventory analysis considers many features [8].

III. Observations, Benefits and Challenges

Following the literature review, multiple research studies have looked into the benefits businesses might enjoy by integrating AI into their processes, notably in supply chains and logistical processes. Researchers have described how a machine can learn and comprehend information. In that situation, jobs are carried out accurately by creating new technologies. The emergence of artificial intelligence (AI) in areas like product modification, predictive market modeling, target marketing, relationship management, and web customizing has considerably aided the growth of the business sector. It has also given more freedom to control audio, text, and video information for accurate item demand forecasting by

looking at customer conduct. Deep Neural Networks, however, govern other technologies, such as computing, and the Internet of Things (IoT), according to several research studies and literature reviews.

A. Observations

Industrial AI applications in two significant ways for inventory:

1) Market Analysis for Inventory Control: This is the simplest method, and if executed properly, it might be highly illuminating. As the name implies, the destination target is to design a time series prediction that can predict the ultimatum over the several subsequent cycles for each item in a particular inventory system [1].
2) Reinforcement learning for inventory management: As a more advanced AI technique takes complete control of inventory operations by going beyond predictions — they also act on it. The aim is intelligent decision-making, achieved by the model appraisal [9]. Such situations attract penalties for keeping hold of more expensive goods for an extended period and allowing an inventory item to fall out of supply.

Artificial intelligence's advantages and difficulties for enterprises:

B. Benefits

AI has enabled various technologies, particularly industrial applications [10]. Multiple research studies examined the benefits of integrating AI into business processes [10], notably in supply chains and logistics [1]. AI can alter enterprises by addressing commercial operations such as inventory management [10]. The emergence of AI in areas like product modification, predictive market modeling, target marketing, relationship management, and web customizing has considerably aided the growth of the business sector. It has also given more freedom to control audio, text, and video information for accurate item demand forecasting by looking at customer conduct.

C. Challenges

Beyond the benefits AI brings to the workplace, the research investigation's findings indicate difficulties arising when a new technology is used [10]. Its functionality is that it can adapt to environmental changes, much like human intelligence. To ensure the successful installation and ongoing maintainability of AI systems, the cost issue and a lack of staff with knowledge regarding their introduction are critical, requiring much data to function [10]. Artificial intelligence has the potential to violate people's privacy by using data that is extracted from cloud databases and used online. If not adequately controlled, it could end up in the hands of cybercriminals [1], [10].

IV. Conclusion

The study investigated the impacts of AI on business with the rapid growth of the global technology market, particularly in the logistics and supply chain sectors. It Identifies the various applications of AI in logistics processes like inventory management and strategies for improvement. AI technology has substantially altered and established a value chain for many logistical tasks, particularly inventory management, enabling productivity and efficiency in industrial operations, which results in cost optimization and improved return on investment. Studies help to clarify recent advancements due to AI adoption, as well as adoption challenges and limitations.

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