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REVOLUTIONIZING INVENTORY MANAGEMENT: PIONEERING APPLICATIONS OF EOQ MODELS IN THE DIGITAL AGE

Anu Sayal [1,*] Chaithra [2,], Nitin Mehra [3,]

[1]*Centre for Artificial Intelligence, Madhav Institute of Technology and Science Deemed University, Gwalior, MP, INDIA*
Adjunct Professor School of Accounting and Finance, Faculty of Business and Law, Taylor's University. Subang Jaya, 47500, MALAYSIA
[2]*Department of CSE (Cybersecurity), JAIN (deemed to be University), Bangalore, Karnataka, India*
[3]*School of Business, Northumbria University.United Kingdom*

ABSTRACT

In recent decades, the economic order quantity (EOQ) model has experienced significant advancements because of the integration of practical factors and digital technologies. This article examines new uses of the economic order quantity (EOQ) model for optimizing inventory, considering the increasing adoption of artificial intelligence, predictive analytics, and the Internet of Things. This literature review explores the development of EOQ models and analyzes the impact of e-commerce, forecasting technologies, and IoT on their advanced implementations. The findings suggest that incorporating EOQ frameworks into these emerging paradigms brings about additional intricacies while delivering measurable improvements. A comprehensive case study utilizing 37.5 years of UK food retail data demonstrates the practical application of AI-enhanced EOQ optimization, where SARIMA forecasting models achieved 0.90prediction accuracy and generated £93 annual cost savings compared to static demand assumptions. Studies suggest that utilizing analytical modeling in advanced EOQ applications can effectively address challenges such as demand variability and Just-in-Time manufacturing. Implementing intelligent inventory planning can result in higher profitability, lower expenses, and improved customer service compared to traditional inventory planning methods. Examples of such applications encompass the integration of backorders in customized manufacturing, the implementation of sustainable ordering for perishable goods, AI-driven demand forecasting for seasonal products, and the implementation of dynamic pricing strategies in e-commerce. Before implementing the EOQ, it is important to consider organizational readiness factors, such as user training and data accuracy. Although digital technologies can fully utilize the capabilities of EOQ models, it is necessary to reassess their formulations and applications in response to rapid technological advancements. The article concludes by examining the results, constraints, and potential future advancements of EOQ models through empirical validation and reassessment of this fundamental quantitative technique.

***K*eywords** Inventory management · EOQ models · technological advancements · digital supply chains · inventory optimization.

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[*]*Corresponding Author's E-mail: anu.sayal.07@gmail.com*

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