Chapter 5
Optimizing Supply Chain Management for Deteriorating Items Addressing Inflation, Preservation Technology, and Shortages

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ABSTRACT

A supply chain model is developed for deteriorating products with exponential demand in an inflationary environment, leveraging big data analytics and preservation technology to control the rate of deterioration. This study attempts to evaluate the effect of preservation technology on the overall cost of inventory while accounting for shortages. The methodology is based on a previous model, with a flexible production rate. Big data is utilized for numerical analysis and sensitivity analysis to demonstrate the model's effectiveness.

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INTRODUCTION

Supply chain management (SCM) is a critical aspect of modern business operations. It involves overseeing the entire process of producing and delivering products or services, from the initial raw materials to the final delivery to the end customer. Integrating all the links and processes within the supply chain through information management systems allows for better coordination, communication, and optimization of resources (Haifeng et al 2022). In order to be competitive in today's rapidly evolving market, modern businesses must digitalize their supply chains and use digital technology to optimise their workflows. Building on the success of supply chain integration (SCI), supply chain digitalization (SCD) increases organisational effectiveness (Deep and Ravi, 2021). The role of supply chain had also been integrated with other functional domains like Human Resource Management (Mutsuddi, 2012) and process designing to leverage organizational success. While SCI focuses on integrating the various links and processes within the supply chain through information management systems, SCD takes this a step further by leveraging digital technologies to enhance and transform supply chain operations. Integrating IoT technology into a sustainable automotive supply chain (SASC) is indeed gaining traction as organizations recognize the potential for improving efficiency, reducing waste, and minimizing environmental impact. By adopting this kind of advancements in supply chain management & digitalization (El Jaouhari et al 2023), organizations can not only achieve operational efficiencies but also contribute to broader environmental and social goals, such as reducing carbon emissions, conserving resources, and promoting responsible consumption and production practices. Further, by integrating artificial intelligence (AI) and digitalization into supply chain management (SCM) can significantly enhance organizational accountability and sustainable performance (Di Vaio, 2024), especially during sudden crises when business resilience becomes paramount. By leveraging AI and digitalization in SCM, organizations can build more resilient and sustainable supply chains that are better equipped to withstand sudden crises while maintaining accountability to stakeholders and achieving long-term performance goals.

In the year 1963 Ghare & Schrader,1973 Covert and Philip,1981 Dave and Patel were studied and developed model with Constant and Variable deterioration rate with quantity discount. Now-a-days, a lot of attention has been given on how applying the very concept of preservation technology has significantly reduced deterioration rate. This paper discusses on the concept of preservation technology because of its ability to reduce deterioration rate in an era of rigorous societal transformations. Moreover, the rate of deterioration is very much sensitive to sales, inventory and order quantities especially for products that deteriorate rapidly. Higher yearly relevant costs and a reduced demand rate could result from an advanced rate of deterioration

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