REVIEW ON GREEN INVENTORY MODEL AND REVERSE LOGISTIC

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Abstract
Inventory management involves overseeing and controlling the commodity and materials flow within the company to optimize operations of supply chain, minimize costs, and meet customer demand. Logistics processes are an integral part of any supply chain management. Forward logistics emphasis on the goods transport from the place of origin to the final destination, while reverse logistics involves managing returns, repairs, and refurbishments. Incorporating both ensures efficient management of resources and maximizes value recovery. Supply chain management (SCM) serves as a coordination method between industries, companies, suppliers, and customers to improve relationships and enhance overall business performance. Effective SCM reduces delays, spoilage, and transportation costs. By implementing effective inventory management practices and considering the specific challenges of deteriorating products, businesses can minimize waste, optimize stock levels, and ensure the availability of fresh products to customers. Industries and transportation contribute to carbon emissions, and supply chain management fulfill its role in managing and reducing carbon footprint. Sustainable practices and carbon emission management are important considerations in SCM. Trade credit functions as a funding instrument that facilitates commercial transactions and contributes to various aspects of corporate finance, supply chain management, and marketing. It provides flexibility in cash flow management, helps coordinate supply chain activities, and fosters relationships between trading partners. Agility in supply chains allows businesses to capitalize on market opportunities, gain a competitive advantage, manage risks, improve operational efficiency, and foster innovation and collaboration. It plays a key role in promoting economic upswing by enabling businesses to adapt and thrive in a rapidly changing market environment.

Keywords: Inventory, Supply chain, green supply chain management, Reverse Logistic, deterioration, trade credit, agility.

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Introduction

The present paper focuses on an assessment of the existing literary works so far within the expertise of inventory management, derived from conceptual and research findings in several studies in the area of determinants of investment inventory. And also, the process which is still going on in the present study field. This is a summary of key points of specific topics, including Inventory Management, supply chain management, green supply chain management (SCM), Reverse logistics (RL), deterioration, trade credit and volume agility.

Inventory management

The verb "inventory" refers to the act of counting or listing items in a systematic manner. In the field of operations research, inventory modeling is a well-developed area that focuses on designing production inventory systems. The main purpose is to lower the costs associated with inventory retention while meeting the demand fluctuations in the market. From an accounting perspective, inventory is considered a current asset and includes all the stock held by retailers and manufacturers at various stages of production. By maintaining inventory, businesses are able to continue selling or manufacturing products without interruptions. Inventory management is a crucial aspect of business operations as it ensures a smooth flow of goods and helps respond to customer demands promptly.

Indeed, the procedure of inventory maintenance represents a complex and organized system that involves the procurement of inputs, consumption of portions of those inputs, and the accumulation of remaining stock for future use. It is important to note that excess inventories are generally undesirable, highlighting the need for effective planning and control inventory systems., ensuring customer satisfaction at minimum cost. There are several factors that affect production and, consequently, the inventory system. These factors comprise customer requirements, natural product decay, phenomena or calamity, manufacturing rate, availability of storage space, and the manufacturing system employed, such as a volume flexible system or an imperfect production system. However, many existing inventory models assume an inflexible manufacturing system and a known production rate. In practice, the manufacturing pace of particular products is frequently influenced by market requirements, which fluctuates over time. The assumption of a constant production rate does not align with the reality of situations involving demand fluctuations. The market presence of products also has a substantial impact on demand. The increased visibility can stimulate dormant needs and generate demand even from unexpected sources. Companies strive to increase the visibility of their products and brands, expanding their reach to as many potential customers and geographical areas as possible. This motivates manufacturers to enter new markets, including previously neglected areas. Shopping malls are being established not only in urban areas but also in tier II, tier III, and tier IV cities, semi-urban, rural, and even remote areas. Considering these market dynamics, a volume-agile production system, where the machine production rate is a controllable factor, is often preferred. Some researchers argue that maintaining inventory on display can attract more customers, leading to increased sales and profits. This suggests that inventory management can also be influenced by marketing strategies aimed at enhancing product visibility and customer engagement.

Supply Chain management

The supply chain model covers the complete cycle from the factory's source material manufacturing to the final customer's receipt of finished goods.. It involves various stakeholders, including the producer, buyer, distributor, transporter, and customer. Actions taken by any member of the supply chain can influence the financial viability of other members. Efficient supply chain management is crucial for the success of any business. It involves understanding market demand, effectively communicating information to customers, and meeting their expectations to ensure the financial performance of every participant in the chain. The supply chain plays a vital role in ensuring the safe and efficient movement of commodity from their source to the final destination. Supply chain management serves as a coordination method between industries, companies, suppliers, and customers. It focuses on improving relationships between all parties involved and enhancing overall business performance. Effective supply chain management enhances the probability of on-time delivery and product quality, increases revenue, and reduces transportation costs. A well-organized supply chain provides easy access to customers, builds trust between manufacturers, suppliers, and customers, and sustains customer interest in the products. The framework of a supply chain generally comprises production facilities and distribution channels. Products undergo multiple stages within the supply chain infrastructure, including sourcing and processing of raw materials, and inventory management of final products.

Supply chain management (SCM) functions as an organizational mechanism capable of accurately diagnosing problems and disruptions that may occur. Its primary purpose is to ensure the rapid, safe, and efficient delivery of goods to the end consumer SCM is widely acknowledged as a prevalent approach for synchronizing operations across industries, firms, vendors, and clients. Efficient SCM is crucial for the success of any business as it serves as the backbone of the organization. To meet their production needs, Companies rely on a network of suppliers that can efficiently provide the necessary raw materials. An Effective SCM enables manufacturers to increase production and profitability by understanding market demand and aligning their operations accordingly. By maintain a systematic supply chain, goods can be delivered with consistent quality and reliability, while managing fair pricing. Numerous researchers have conducted studies on supplier relationship management, exploring the collaboration among vendors, suppliers, fabricators, and other stakeholders. The concept of SCM was initially proposed by Goyal, S. K. (1977) emphasizing the collaboration between suppliers and customers. Relevant cost, including the cost of raw materials, plays a crucial role in managerial decision-making. Banerjee, A. (1986) presented a joint total relevant cost inventory model for purchasers, leading to the establishment of inventory control systems within supply chain management. Viswanathan, S. (1998) integrated inventory model for vendor and buyer. Overall, SCM serves as a strategic approach to efficiently oversee the flow of resources, data, and resources across the supply chain, ultimately optimizing business performance and customer satisfaction. Rolf et. al. provides a comprehensive analysis of the utilization of RL algorithms and their practical use in supply chain management (SCM).

Green supply chain management

In the current circumstances, the adverse effects of human activities on the environment, particularly global warming caused by carbon emissions have become a significant concern. This concern is shared by environmental enthusiasts and those who strive to keep the Earth healthy and clean. Supply chain management is closely linked to carbon emissions and carbon footprint management. While industries are essential for the development of any country's economy, they are also major contributors to climate change caused by their greenhouse gas emissions. Additionally, transportation, a crucial component of the supply chain, contributes to carbon emissions. In response, governments around the world have implemented policies to create a pollution-free environment and reduce emissions. Businesses are prioritizing the creation of inventory strategies that can reduce carbon footprints. Current studies have explored various approaches to reducing CO2 emissions, for example carbon tax, release limits, and carbon offsets. Companies can invest in different facets of supply chain management, encompassing production units, transportation, framework, and inventory, to reduce carbon emissions. Embracing cleaner energy sources and allocating resources to sustainable technology are other ways to reduce carbon emissions. Supply chain management is particularly relevant in addressing carbon emissions because when all participants in the supply chain cooperate and make investments in interconnected facilities, significant profits can be achieved at minimal costs while reducing carbon emissions. Businesses and industries are under pressure from laws, environmental organizations, and consumers to become more eco-friendly. At every stage of a product's formation, conveyance, dispersion, and exploitation, carbon emissions are generated in varying degrees. Thus, the mitigation of carbon emissions within the supply chain is a topic of great interest among researchers who aim to develop eco-friendly inventory models that minimize carbon exhaustion across the entire supply chain.

In recent years, there have been significant efforts by researchers, industry organizations, and green organizations to control carbon emissions and protect the environment. Huising et. al. [2015] conducted research to evaluate and model policies and technologies aimed at reducing carbon emissions. This study aimed to track the progress made in decline of carbon emission in the past several years. The transportation industry is a major generator of greenhouse gas emissions, mainly due to the combustion of fossil fuels in vehicles such as automobiles, trucks, airplanes, and other transportation methods. Rout et al. [2020] formulated an inventory model explicitly designed for deteriorating and defective items, taking into account carbon emission regulations within the framework of environmentally-conscious supply chain management. Their model aimed to mitigate greenhouse gas emissions arising from diverse aspects of supply chain management, including transportation and warehousing, by implementing carbon reduction policies. Bhuniya et al. [2021] introduced an intelligent production inventory system that considers the energy consumption during the production process of items within the supply chain management The goal of their research was to enhance energy efficiency and minimize carbon footprint in the production phase.

Yadav et al. [2021] examined a sustainable supply chain framework that integrated storage techniques and demand responsiveness to price changes. Their research focused on developing a supply chain model that not only considered environmental sustainability but also took into account demand dynamics and product preservation techniques. These studies highlight the increasing attention given to carbon emissions and sustainability in supply chain management research. By developing models, evaluating policies, and incorporating innovative technologies, researchers aim to create more environmentally friendly and sustainable supply chains.

Indeed, Green Supply Chain Management (GSCM) plays a pivotal role in helping companies reduce wasted energy, carbon emissions, and environmental impacts while maintaining their operations. The research conducted by Halat and Hafezalkotob (2019) highlights the significance of GSCM in this respect. Chen et al. (2019) proposed the development of sustainable inventory models that incorporate income expansion, waste minimization, and decreased energy expenses in various sectors, such as the online pharmaceutical supply chain. The environmental performance of inventory systems is also influenced by direct carbon emissions resulting from the transport and storage of goods, as illustrated by Arikan et al. (2014) investigated supply lead time management, order quantity determination, and storage equipment choices, as discussed by Fichtinger et al. (2015), have a direct impact on costs and emissions. Designing and implementing reverse logistics systems, as emphasized by Bostel et al. (2005), is becoming increasingly important in various sectors. However, the challenge lies in considering uncertainties in product returns and supply estimations. Practical models capable of addressing intricate industrial scenarios and effective solution methods for handling large-scale data are imperative in this context. The adoption of cleaner technologies, as highlighted by Yadav et al. (2021), plays a vital role in reducing waste and lowering disposal costs. Circular economy (CE) strategies, described by Geisendorf and Pietrulla (2018), support supply chains in becoming more sustainable by preventing resource depletion, closing energy and resource loops, and facilitating sustainable growth at various levels. While CE practices focus on environmental care, as described by Prieto-Sandoval et al. (2018), it is noteworthy to mention that not every system incorporating closed-loop systems are inherently more environmentally friendly or sustainable. Consideration of triple aspects of Renewable practices- environmental, financial and societal, is necessary to achieve comprehensive sustainability, as stated by Alarcón et al. (2020). The research paper by Padiyar et al. (2022) focuses on the notion of flawed manufacturing process and its impact on the inventory system. The study specifically addresses the scenario where damaged goods are generated during the imperfect production process. Chen et. al. (2022) focuses on identifying the key challenges faced by manufacturing industries in adopting green initiatives in inventory management. In conclusion, the incorporation of GSCM and CE principles in supply chains can contribute to their sustainability, reducing carbon emissions, and promoting efficient resource utilization. By adopting green practices, considering reverse logistics, and embracing circular economy principles, companies can work towards a more sustainable and environmentally friendly future.

Reverse Logistics

Logistics, in its most limited perspective, refers to the complex procedure of efficiently and effectively conveying goods from their place of departure to their intended destination. However, reverse logistics is a specific aspect within the broader logistics domain that centers on the transportation of goods in the opposite path. The inclusion of reverse logistics in logistic processes is crucial for sustainable business practices. It helps reduce environmental impact by promoting recycling and responsible disposal methods. Additionally, it enables organizations to enhance customer satisfaction by providing efficient returns handling and ensuring timely resolutions to any product issues. Reverse supply chain management is a crucial aspect that encompasses a range of operations. It centers on the product returns from the end user to the manufacturer or retailer. This process involves activities such as product returns, repairs, refurbishment, recycling, and disposal. Implementing an effective reverse logistics system ensures that products are properly handled after they have been sold, reducing waste and maximizing value. In today's competitive marketplace where sustainability and environmental responsibility are key considerations for consumers and businesses alike, having a robust reverse logistics system is more important than ever. By effectively managing reverse logistics processes, businesses can not only meet regulatory requirements but also unlock opportunities for cost savings and revenue generation. It enables them to identify trends in product returns or repairs that can inform product design improvements or identify potential quality issues. In conclusion, understanding the notion of product returns and recovery within the broader context of logistics management is crucial for businesses looking to optimize their supply chains. By embracing efficient reverse logistics practices, companies can improve their operational efficiency while contributing to a more sustainable future. Proper reverse logistics management is a crucial aspect of any business that deals with product returns and the efficient management of the reverse supply chain. It encompasses a range of measures and strategies that are implemented to ensure smooth operations and cost-effective processes. These measures include effective returns processing, inventory management, refurbishment or repair processes, as well as disposal or recycling methods. By implementing proper reverse logistics management, businesses can minimize costs, reduce waste, improve customer satisfaction, and contribute to sustainable practices in the industry.

The research on reverse logistic has developed gradually over the years. A preliminary definition of reverse logistic was given by Murphy and Poist (1989) indicating about the reverse supply chain. Afterwards, Carter and Ellram (1998) institute the phrase "environment" in the description of reverse logistic. Rogers and Tibben-Lembke (1999) underscored the aim of the reverse logistics and settled the widely recognized definition as "*RL is the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal*". Stock (1998), Dowlatshahi (2000), and Srivastava (2008) have also explained reverse logistics from diverse viewpoints. Explaination of reverse logistic has been transitioning and broadening its extent in relation to the intrigue of investigators. Singh et. al. (2016) stated the importance of reverse logistics management cannot be overstated as it supports the achievement of the organization's goals, including heightened customer satisfaction, reduced resource investment, enhanced customer service, asset recovery, understanding hardware return motives, inventory reduction, cost-effective repairs, and streamlined distribution costs. Fleischmann et al. (1997) conducted a study on reverse logistics (RL) focusing on the viewpoints of logistics planning, stock control, and manufacturing planning. Rogers and Tibben-Lembke (2001) presented the extent of the conventional supply network, enlarged to encompass the product return management from consumption to the source of origin Prahinski and Kocabasoglu (2006) put forth ten research hypotheses to examine existing practices, crucial concerns, and management approaches in reverse logistics. Pokharel and Mutha (2009) examined 164 articles that centered on crucial reverse logistics aspects including product procurement, pricing strategies, retrieval of used products, reverse logistics network structure, and the incorporation of manufacturing and remanufacturing facilities. Fleischmann et al. (2000), Akçalı et al. (2009), Chanintrakul et al. (2009), and Sheriff et al. (2012) conducted reviews of the existing studies on network design challenges in reverse logistics, providing valuable insights into previous research on various issues. However, there are certain areas that have not been extensively covered. For instance, the acceptance and execution of RL, predicting product reversions, subcontracting, reverse logistics networks from resale market perspectives, and disposition decisions have not been adequately addressed in the existing literature. De Brito and Dekker (2002), Linton et al. (2007), Meade et al. (2007), Rubio et al. (2008), and Lambert et al. (2011) conducted reviews of scholarly works addressing different dimensions of reverse logistics but some of the specific concerns are inadequately represented or not addressed within their publications. Krapp et al. (2013a) observed a lack of reviews specifically concentrating on the topic of estimating product returns. Rogers et al. (2012) and Hall et al. (2013) highlighted that product disposition is a significant concern in reverse logistics and requires more attention. Rogers et al. (2012) also emphasized the need for secondary market networks, given their size and potential profitability. Govindan et al. (2015) examined an extensive collection of 382 articles encompassing the full range of reverse logistics, providing in-depth insights from different perspectives. However, they reviewed only a limited number of Publications focusing on predicting product returns and subcontracting, whereas the matters of adopting and executing, as well as deciding on disposition, were inadequately examined.

Reverse logistics is now a fundamental prerequisite for attaining sustainability objectives in a competitive environment. Limited resources to implement reverse logistics solutions have greatly affected both multiple supply chain expenditures and customer satisfaction, hindering the ability to meet return processing expectations. Under such circumstances, the primary driving force behind effective sustainability operations is the heightened demand from clients for superior service quality. Jayaraman et al. (2003) explored reverse logistics systems pertaining to the recycling and reutilization of beverage containers. Richey et al.

(2004) presented that although many industries have recognized the indispensability of reverse logistics for Competitive sustainability, there remains a lack of agreement regarding the suitable timing for the adaption and execution of reverse logistics systems. Reverse Logistics management has proven advantageous for certain organizations such as General Motors, Canon, Dell, and Hewlett-Packard. Wu and Cheng (2006) conducted a study to investigate the potential advantages of adopting reverse logistics in the publishing industry. Jayaraman and Luo (2007) highlighted that Kodak demonstrated the ability to reutilize as much as 80% of the used camera's parts. Kumar and Craig (2007) focused on the Dell's computer manufacturing process in their research. Lau and Wang (2009) examined the electronics manufacturing sector in China and investigated the challenges encountered during the implementation of reverse logistics (RL). Stock and Mulki (2009) emphasized firms have also discerned that comprehending product returns and optimizing RL can deliver a competitive edge. Erol et al. (2010) defined RL as “the effective and efficient management of the series of activities involving retrieving products from customers in order to dispose of them or recover value”. Hazen et. al. (2011) defined reversed supply chain management that encompasses the concepts of waste reduction, product reuse, remanufacturing, and recycling when managing returned items. It mentions Production-based measures for packaging and waste control. Kannan et al. (2012a) highlighted the importance of reverse logistics has been on the rise, prompting more organizations to adopt it as a tactic instrument for achieving financial gains and shaping a positive Organizational societal perception. Subramanian et al. (2014) conducted a study on disposal of obsolete goods in the China’s production industry. Other investigations on the Operationalization of reverse supply chain have been carried out in diverse industries, including the carpet industry examined by Biehl et al. (2007), the retail industry explored by Bernon et al. (2011), the bottling sector studied by González-Torre et al. (2004), the paper industry investigated by Ravi and Shankar (2006), packaging firms analyzed by González-Torre and Adenso-Diaz (2006), the cell phone industry researched by Rathore et al. (2011), the pharmaceutical industry examined by Narayana et al. (2014), and battery recycling studied by Wang et al. (2014). Homrich et. al. (2018) stated that the thought of “reusability” addresses to reverting surplus items to the manufacturer for refurbishment and reutilization. The word “remanufacture” portray the method of repairing, refurbishing, or reconditioning items to prolong their useful lifespan. “Recycling” is the procedure of revisiting from the consumer to the manufacturer taking into account the quality and durability of the product, as they assist organizations in achieving optimal fiscal performance while upholding environmental responsibility [Zarbakhistan et. al. (2020)]. Agrawal and Singh (2019) illustrated that owing to the influence of ordinances and ecological challenges, businesses have recognized the significance of exercising heightened vigilance in reverse logistics activities. Bhatia et al. (2020); Gupt and Sahay (2015) exhibited that reverse logistics is currently gaining significant attention due to the exponential growth in consumer demand, shorter product life cycles, and the environmental impact of the linear economy. Yang and Chen (2020) highlighted Reverse logistics aids in capturing value from pre-owned or reversed products, which leads to reduced costs and waste. Wang et. al. (2021) stated reverse logistics has become a vital element of a prosperous and streamlined supply chain, as it strengthens global value chains to promote sustainable practices in the supply chain. Consequently, Dominic et. al. (2021) analyzed this augments advantage for the end-consumer and enhances customer gratification and devotion. Mohammadkhani and Mousavi (2022) Respond to the changing environmental attitudes and sustainability responses of government and customers. Bockholt et al. (2020); Ghoreishi et al. (2011); Paut Kusturica et al. (2020) described the term “take-back” as often used to define the process of retrieving customer returns and forwarding them to the recovery site. Vegter et al. (2020) proposed that the Circular supply chain is based on the concept of a closed-loop supply chain and open-loop supply chain, Varying according to the sector of reverse flow within the Sector-specific or cross-sector. Singh and Ordoñez (2016) stated that “as the transition to the circular economy (CE) gains momentum, there is a growing emphasizes on recirculating products, components, and materials through strategies like reuse and recycling”. Consequently, Bhatia et al. (2020); Ghoreishi et al. (2011) illustrated that implementing RL has become essential for organizations. However, RL poses unique challenges that require special attention and capabilities distinct from those of traditional logistics. Vaz et al. (2013); Waqas et al.(2018) stated that many companies struggle with designing and implementing RL due to various reasons, including a lack of knowledge and experience in this area. Ren et. al. (2023) provides an overview of combinatorial optimization problems (COPs) that arise in the context of End-of-life (EOL) management and product reutilization. The study emphasizes the academic and practical value of addressing these COPs to enhance the Effectiveness of the product reclamation process. Dabees et. al. (2023) focuses on the role of Sustainable Service Quality in Reverse Supply Chain and Reverse Service Quality in the context of Customer Fulfillment and Relational Effectiveness within the reverse logistics service providers.

Deterioration

Deterioration pertains to the disintegration of a substance over time. Several products, such as edible goods, pharmaceuticals, and chemicals can spoil or deteriorate throughout the storage time. It is common to find products in the market that have been spoiled due to negligence or improper storage. For example, vegetables, fruits, meat, dairy products like milk, curd, and others can worsen if not kept at 4.4 degree Celsius. Bacteria play a significant role in the deterioration of these substances, causing them to spoil and develop unpleasant odors. Moreover, certain type of bacteria can contaminate these products, leading to the spread of diseases. The rate of deterioration of stock during storage is an important consideration for researchers. When designing inventory systems, it is vital to account for the concept of deterioration. Ignoring deterioration can lead to inaccurate inventory management and potential losses. Therefore, considering the natural property of deterioration is essential in developing effective inventory models that account for the degradation or spoilage of items over time.

Deterioration has a major impact on inventory research, particularly with regard to products that are prone to spoilage or decay. Various substances, such as fruits, vegetables, and food items, are known to deteriorate quickly if not properly stored. Additionally, substances like salt, liquor, turps, and nuclear substances can degrade over time as long as they are stored under specific conditions. In the contemporary era, academic investigations have been centered on the concept of deterioration in inventory models. Singh et. al. (2013) developed time-based demand in the two-warehouse inventory model for deteriorating items, taking into account imperfect manufacturing, learning effects on production costs, and partial backlogging of shortages. Singh et. al. (2016) explored a supply chain inventory model for perishable items, considering both the market and supplier, and incorporating time- sensitive demand. Rani et. al. (2017) presented an environmentally conscious inventory model for decaying items, taking into account a reverse logistics-enabled supply chain and an inflationary environment. They assumed quadratic demand for reprocessed goods and a linear demand profile for newly manufactured items. Padiyar et. al. (2022) devised an integrated fuzzy approach to handle uncertainty in inflation and deteriorating rate. Sridevi et. al. (2010) developed a Weibull-based inventory system for decaying products with demand dependent on selling price. Singh and Vishnoi (2013) discussed a supply chain management problem involving price-responsive demand, reworking products and decaying items with dual storage levels. Singh et. al. (2013) analyzed an inflation-adjusted inventory model for decaying items with shortages and steady demand. Singh et. al. (2016) investigated a model for items with a limited shelf life involving both the manufacturer and supplier, considering trapezoidal demand and disallowing shortages. The research paper by Alharbi (2022) focuses on the assessment of various factors such as greenness, warranty periods, and carbon reduction technology on overall profit in the context of an imperfect production system for items with a decaying quality. Singhal et. al. presents a novel inventory management model that incorporates two warehouses and deals with the management of deteriorating items that exhibit non-instantaneous deterioration. Roy and Mashud (2022) explores the potential benefits of integrating preservation techniques and cap-and-trade regulations with the aim of efficiently reducing product deterioration and enhance profitability in a controlled environment. Marchi et. al (2023) focuses on inventory management in the context of assets with changing worth, known as ameliorating and decaying items, and the supply chain financing. Chandramohan et. al. (2023) presents a proposed stock management system specifically designed for items with gradual deterioration in supply chains. The study considers various factors such as carbon emissions, carbon tax, credit periods between suppliers and retailers, and inspection processes to separate imperfect products from the lot. Padiyar et. al. (2023) investigated multi-tier fuzzy inventory model for time-sensitive products in a supply chain with imperfect manufacturing and exponential demand.

Trade credit

Trade credit, also known as permissible delay of payment, is a financing arrangement in which one trader extends credit to another trader to facilitate the purpose or sale of goods or services. It is a common practice in business transactions and plays a significant role in various research domains, including corporate financing and manufacturing economics (specifically supply chain optimization), and marketing analytics. From a corporate financing perspective, trade accredit provides a means for companies to manage their cash flows and working capital. By allowing buyers to defer payment for gods or services, trade credit can help improve cash flow for purchasing companies, giving them more flexibility in managing their financial resources. In terms of production economics and supply chain coordination, trade credit impacts the relationship between buyers and suppliers. It can influence inventory management, production planning, and order quantities. The term of trade credit, such as the credit period and discount for early payment, can affect the coordination of activities within the supply network and the overall effectiveness of operations. From a marketing science standpoint, trade credit can serve as a marketing tactic to boost sales and build customer relationships. Offering favorable credit terms can attract customers and enhance competitiveness in the market. It can also influence customer purchasing behavior and the timing of sales. Considering the interdisciplinary nature of trade credit, research in this area often involves studying its impact on financial decision-making, supply chain dynamics, and marketing strategies. Understanding the role and implications of trade credit is crucial for businesses seeking to optimize their financial operations, coordinate supply chain activities, and effectively manage customer relationships.

Goyal, S. K. (1985) introduced the concept of permissible delay in payments in a single-item economic order quantity (EOQ) model with a constant demand rate. Chand and Ward (1987) analyzed Goyal's problem. Aggarwal and Jaggi (1995) enhanced the model by incorporating the exponential deterioration of items and trade credit. Jamal et. al. (2000) focused on determining the optimal trade credit duration considering both acceptable payment delay and item degradation. Sarkar and Moon (2011) created a production-inventory system that considered uncertain demand and the impact of inflation. Other researchers, such as Sana and Chaudhuri (2008), Khanra et. al. (2011), Sarkar et. al. (2010), Teng et. al. (2011), have also contributed to the field of trade credit and inventory management. Pal et. al. (2013) proposed a three-tier trade credit policy in a tri-level supply chain, specifically addressing a production-inventory system. Manna et al. [2017] introduced a dual-tier environmentally sustainable inventory model for imperfect production, incorporating three-level credit periods. Saha and Chakrabarti [2018] developed a comprehensive inventory model for imperfect production incorporating variable demands for deteriorating goods with trade credit.". Lashgari et. al. [2016] tackled a stock management dilemma for declining items involving backorders and financial aspects, incorporating dual-tier trade credit tied to order volume. Tayal et. al. (2019) created an inventory model for spoilable products in preservation technology by incorporating the valuation of trade credit. Shaikh et al. [2020] devised deterioration-based inventory model with ramp-shaped demand, trade credit, and preservation methods. Raut et. al. [2019] developed a production model for deteriorating goods considering an imperfect production process, reworkable process, and shortage. Singh et. al. (2020) analyzed a trade credit strategy for a replenishment model in the context of inflation, assuming a decreasing demand rate as items approach their expiry date. In recent years, discount policies have also received attention. Saren et. al. (2020) presented an advanced inventory model with price discount policy and payment delay for deteriorating items. Ali et. al. focused on developing sustainable supply chain inventory model with demand based on credit period for deteriorating products. Murmu et. al. (2023) explores the impact of quality on the sales of fresh products while considering sustainability concerns. The study specifically focuses on the use of FIFO and LIFO inventory management strategies in inventory modelling. This investigative research highlight the importance of considering trade credit, payment delays, and discount policies in inventory models, particularly when dealing with deteriorating items and green supply chain practices. The research in this area aims to optimize inventory decisions while considering financial factors and sustainability aspects.

Agility

Agility in supply chains plays a significant role in promoting economic expansion by capitalizing on opportunities in an evolving market. Researchers have explored various problems and aspects of supply chain management to enhance agility and address emerging challenges. Singh et. al. (2014) established a three-layered supply chain model that considered multi retailers, multi suppliers, and multiple products. Khatua et. al. (2017) focused on environmentally sustainable supply chain practices and addressed the uncertainity of holding costs. Dai et. al. (2017) formulated a supply chain model that accounted for three different types of demand and allowed for shortages with partially backlogging. Rani et. al. (2017) proposed an inventory model for deteriorating items within a green supply chain context, accounting for variable demand in an inflationary environment. Tayal et. al. (2019) proposed a stock-dependent demand two-level storage model for managing inventory of deteriorating items. Supply chain management is particularly crucial in adapting inventory models to changing market scenarios. Padiyar et. al. (2021) developed an inventory management model that specifically addresses constrained shortage issues for perishable goods. Vandana et. al. (2021) analyzed the influence of energy and carbon emissions reduction through the integration of two-tier trade credit policies in the supply chain system. De-la-Cruz-M'arquez et. al. [2021] investigated carbon emission inventory modeling for perishable goods under conditions of limited supply. Their research aimed to assess and manage carbon footprint in the supply chain while accounting for inventory growth. Handa et. al. (2023) determines the optimal overall cost in a forward and reverse logistic system. The paper presents an algorithm to optimize the problem and generate the optimal outcome, considering factors such as time, production rate, carbon emissions, and volume flexibility. These studies highlight the significance of agility and logistics management in addressing various challenges and optimizing inventory decisions in dynamic market environments. Researchers continue to explore innovative approaches to enhance agility, sustainability, and economic growth in supply chain processes.

Conclusion

Effective logistics management relies on the use of technologies such as inventory management systems, demand forecasting tools, and logistics software. Additionally, effective communication and collaboration among supply chain partners are crucial for successful SCM implementation. Researchers are increasingly interested in developing environmentally friendly inventory models that minimize carbon emissions throughout the supply chain. The integration of GSCM and CE principles can contribute to more sustainable supply chains by reducing carbon emissions and promoting efficient resource utilization. Proper inventory management practices are essential for minimizing waste, optimizing stock levels, and ensuring the availability of fresh products to customers, especially in the case of deteriorating products. Trade credit is an important aspect in financial management, supply chain dynamics, and marketing strategies. Understanding its implications is crucial for businesses aiming to optimize their financial operations, coordinate supply chain activities, and manage customer relationships effectively. Agility in supply chains is essential for operational efficiency. By streamlining processes, leveraging technology, and fostering collaboration, businesses can reduce lead times, optimize inventory levels, and improve overall productivity.

In conclusion, efficient supply chain management involves the integration of technology, supply chain collaboration, focus on reducing carbon emissions, managing deteriorating products, optimizing financial operations through trade credit, and promoting agility for operational efficiency. By incorporating these practices, businesses can create competitive advantages, drive sustainability, and enhance overall business performance.

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