

Implementation of Supply Chain Management

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Abstract

This paper examines the emerging trend of Supply Chain Management 4.0 (SCM 4.0), which incorporates advanced digital technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and automation into supply chain operations. Through a review of existing literature and a bibliometric analysis, the study investigates how these technologies are transforming various aspects of supply chains. The paper also identifies challenges, opportunities, and areas for future research, aiming to provide valuable insights for both scholars and industry professionals. The findings lay the groundwork for further exploration of SCM 4.0 and its practical applications.

Keywords: Advanced technologies, Industry 4.0, Innovation, MCDM, SCM 4.0

1. INTRODUCTION

Digital technology has dramatically transformed how societies communicate and interact, affecting industries like logistics, manufacturing, transportation, and supply chain management. With the fourth industrial revolution, businesses are facing rapid technological changes, which means that industries must innovate to stay competitive. In today's fast-paced and competitive marketplace, supply chains can no longer operate in a traditional manner, where goods are moved or sold based on static, predetermined plans. Instead, supply chains need to be more flexible and responsive to dynamic market conditions. This requires supply chains to be "smart," capable of adapting quickly to changes. Terms such as "smart supply chain," "digital supply chain," and "intelligent supply chain" are all used to describe this new approach, which is collectively referred to as Supply Chain 4.0 (SCM 4.0).

The main goal of this research is to explore the relationship between digital technologies and supply chain management, focusing on how these technologies are transforming supply chain operations. This research is significant for several reasons: first, SCM 4.0 is a complex and emerging field; second, it is a current topic of research in academia; and third, recent technological advances have had a direct impact on the performance and efficiency of supply chains. Moreover, businesses must recognize the importance of integrating these cutting edge technologies with their physical operations to enhance visibility, connectivity, and overall supply chain performance.

Although the concept of SCM 4.0 has received considerable attention, there are still gaps in the research. Most existing studies focus on individual technologies or specific supply chain processes. Few have attempted to provide a comprehensive framework for understanding the impact of these technologies on supply chain operations. This paper seeks to fill these gaps by offering a detailed, conceptual framework for the implementation of SCM 4.0. It also aims to provide insights into the effects of different emerging technologies on supply chain processes.

2. LITERATURE SURVEY

Between the years 2020 and 2025, the field of Supply Chain Management(SCM) has undergone substantial changes, largely influenced by technological innovations and the imperative for resilience in the face of global disruptions. This study explores current research that emphasizes the roles of digitalization, artificial intelligence(AI), blockchain technology, and sustainability in the context of SCM.

The incorporation of digital technologies and artificial intelligence has been crucial in improving the efficiency of supply chains. Choi et al.(2020) examined the significance of big data analytics within operations management, emphasizing the ways in which data-informed decision-making enhances inventory management and demand prediction. In a related vein, Lee and Lee(2022) presented the idea of digital twins in supply chains, which facilitate real-time simulations and proactive problem-solving. Collectively, these investigations highlight the transition towards predictive analytics and automation in supply chain management[1].

Blockchain technology has surfaced as a viable means to improve transparency and security within supply chains. According to Francisco and Swanson (2020), the capacity of blockchain to generate immutable records plays a crucial role in minimizing fraud and verifying product authenticity. Their findings suggest that blockchain fosters trust among various stakeholders, especially in intricate, multi-tiered supply chain environments[2].

The focus on sustainable and resilient supply chains has become increasingly pronounced. Tseng et al.(2021) performed an extensive review of green supply chain management, pinpointing strategies like eco-design and reverse logistics as essential for promoting environmental sustainability. At the same time, a 2024 survey by McKinsey revealed that a significant number of supply chain executives feel their boards do not possess a thorough understanding of supply chain risks, with merely 25% having established formal mechanisms to address supply chain matters at the board level. This discrepancy indicates a pressing need for enhanced education and communication regarding supply chain challenges at the highest tiers of organizational leadership[3].

Technological progress has not eradicated existing challenges. Research conducted by Karaosman and Marshall (2024) underscored the critical need for adaptable strategies and data-informed analytics, particularly given the sector's ongoing struggles with demand forecasting. Furthermore, Gartner's report for 2025 stressed the significance of investing in essential capabilities to enhance the effectiveness of supply chain organizations up to 2030, with an emphasis on real-time execution and improving customer experience[4].

3. RESEARCH METHODOLOGY

In the context of **Supply Chain Management(SCM)**, methodologies such as **Just-In-Time(JIT)** and **Reverse Logistics** are strategic approaches used to optimize operations, reduce costs, and improve efficiency. These methodologies are applied in different aspects of the supply chain, from inventory management to product returns.

1. Just-In-Time (JIT):

Just-In-Time (JIT) is a way for companies to save money and work smarter. Instead of keeping lots of materials or products in stock, they only order what they need, exactly when they need it. This helps avoid wasting space, time, and money on storing extra items. But for JIT to work well, companies need to have

good communication and trust with their suppliers to make sure materials arrive on time. If done right, JIT helps businesses run smoother, cut-costs, and stay ready to meet customer needs quickly.

2. Reverse Logistics:

Reverse logistics is the process of handling products that need to go back from the customer to the company. This happens when items are returned, repaired, recycled, or even thrown away. For example, if a customer returns a damaged item, the company collects it, checks it, and decides whether to fix it, reuse it, or dispose of it properly. Reverse logistics helps companies save money, reduce waste, and take care of the environment by managing these returns efficiently. It's an important part of making sure products don't just move forward but also get handled properly when they come back.

3. Lean Supply Chain:

A lean supply chain is a way for companies to make their supply chain as efficient as possible by cutting out waste and focusing on what adds value. This means they try to use fewer resources, reduce unnecessary steps, and avoid overstocking or delays. By streamlining processes and working closely with suppliers and customers, a lean supply chain helps businesses save time, lower costs, and respond quickly to changes in demand. The goal is to deliver products faster and better while keeping everything simple and cost-effective.

4. TECHNOLOGY USED

Creating an **SCM web app** requires integrating a variety of technologies, including:

Frontend technologies : (React.js, html, css, JavaScript)

Backend technologies : (Node.js, Python, Java, Django, Express.js)

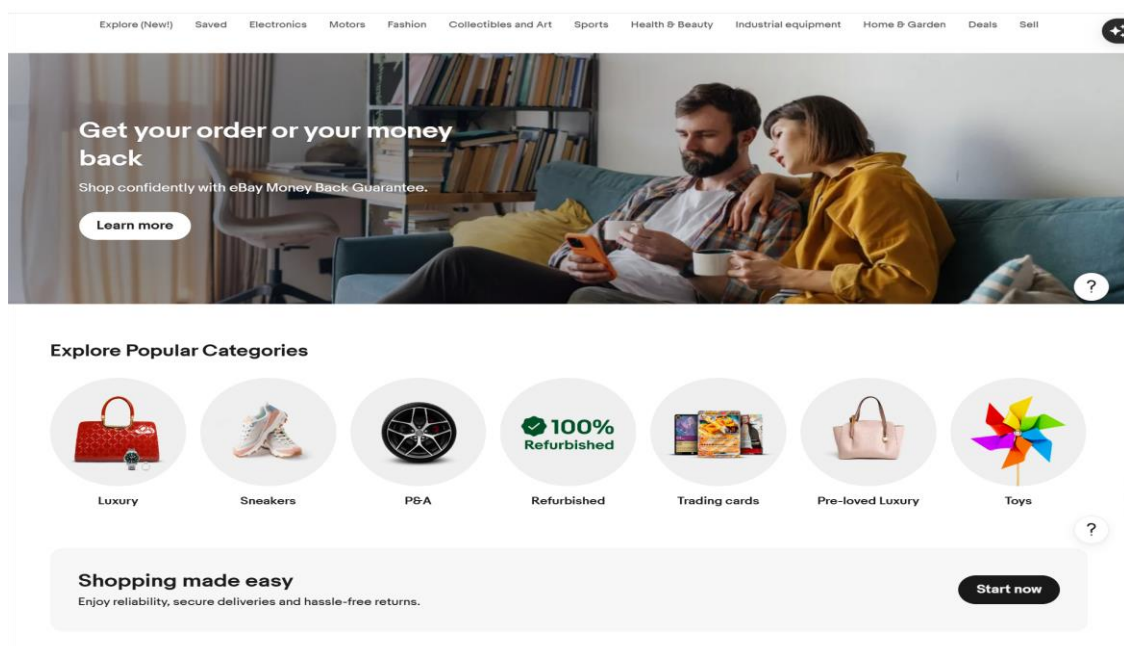
Databases : (MySQL)

Cloud infrastructure : (Google Cloud)

Analytics tools : (Power BI, Tableau)

Security : (OAuth, JWT, SSL/TLS)

5. RESULT



6. CONCLUSION

The connection between supply chain management and logistics is vital for the success of businesses. A well connected supply chain improves efficiency, customer service, and profits by ensuring all parts work together smoothly. Technologies like IoT, AI, and blockchain have made supply chains more visible, responsive, and customer-focused, boosting their resilience and agility. Aligning supply chain plans with business strategies helps companies adapt to market changes and stay competitive. While integration brings cost savings and flexibility, challenges like technological and cultural barriers remain. Supply chains are now seen as value creators, not just cost centers, giving businesses a competitive edge. More research is needed to address integration challenges and explore the growing role of digital technology in shaping the future of supply chains.

7. FUTURE WORK

1. Artificial Intelligence and Automation

[Artificial intelligence](#) (AI) is more popular than ever. Our [2023 State of Manufacturing](#) Report shows that 85 % of companies surveyed have already adopted AI solutions, and 45 % anticipate impacts to supply chain management functions.

2. Circular Supply Chain

There is now a growing belief in the circular supply chain process concept which involves recycling raw materials and even discarded products to reintroduce them into manufacturing.

3. Digitization

Businesses can drive their bottom line by creating [digital manufacturing ecosystems](#). This trend is particularly Electronic Supply Chain Management.

1. Improve efficiency and productivity by automating processes or workflows.
2. Improve inventory management with real-time tracking and a reduction in the risk of carrying too much inventory.

4. Cloud-Based Solutions

Companies like yours ([78% of respondents](#)) are already evaluating technology solutions to increase operational efficiency for new product development.

Software-as-a-Service (SaaS) models are beneficial for supply chain management. Not only is [SaaS reliable and secure](#), but it is highly efficient and convenient. With a global and digital supply chain, the efficiency of SaaS solutions is crucial.

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