



Transformative Dynamics of E-commerce Integration in Supply Chain Management: A Systematic Review

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Abstract. E-commerce and Supply Chain Management are crucial for modern business operations, involving online buying and selling, planning, execution, and control of goods flow from suppliers to customers. This systematic literature review aims to explore and discuss the transformational dynamics of e-commerce integration in supply chain management. Using Preferred Reporting Items for Systematic Reviews and Met analysis (PRISMA) guidelines and database from Scopus, we identified 10 suitable articles published between January 2014 and March 2024, focused on the integration of E-commerce and supply chain management. The keywords used were "E-commerce, logistics, Inventory management, and supply chain management." The authors manually assessed 1136 articles, identifying 265 due to duplication and 215 abstracts. 10 documents were taken to be suitable for further analysis. Our findings highlight significant technological advancements, operational improvements, and strategic advantages. Despite these benefits, challenges remain, particularly in synchronizing inventory and optimizing delivery networks. The study concludes with promising novel approaches such as collaborative logistics models.

Keywords: Blockchain, AI, logistics, Inventory management, supply chain integration

1 Introduction

E-commerce and Supply Chain Management (SCM) are integral components of modern business operations, deeply intertwined in today's global economy [1]. E-commerce involves the buying and selling of goods and services online [2] [3], while SCM encompasses the planning, execution, and control of the flow of goods from suppliers to customers [4]. Over the years, both domains have evolved significantly due to technological advancements, changing consumer preferences, and globalization. Integrating e-commerce into SCM is crucial for businesses to remain competitive and meet customer expectation [5]. E-commerce adoption has benefits such as increased market reach, reduced transaction costs, and improved supply chain efficiency [6]. Electronic procurement platforms automate ordering processes, improve transparency, and enable efficient inventory management [7].

The modern corporate environment has made the cooperation of supply chain management (SCM) and e-commerce essential for improving operational efficiency and guaranteeing competitive advantage. E-commerce has profoundly changed both consumer behavior and established business strategies. It is typified by online purchasing and selling activities [8]. To handle the complex movement of goods from suppliers to end customers, integrating e-commerce into supply chain management (SCM) requires a robust and flexible system [9]. Due to this interdependence, a great deal of study has been done on how e-commerce integration changes supply chain management (SCM) techniques. The result has been innovations that address both opportunities and issues in the sector [10].

Numerous studies have explored the impact of e-commerce on supply chain management, highlighting various aspects and implications. In stance, [11] investigates the impacts of blockchain technology on consumer behavior within the context of supply chain management, [4] discusses various activities involved in supply chain management and illustrates the impact of e-commerce on these processes, using Dell Inc. as a case study [12]. A research model conceptualizing the impact of supply chain integration on various aspects, including business process integration and system integration, [13] explores how digital transformation has changed supply chain processes and identifies the resulting changes in supply chain dynamics. [14], Investigates the inter-

play between e-commerce performance, digital marketing capability, and supply chain capability, offering insights into enhancing digital capabilities for better performance. These studies provide valuable insights into the multifaceted relationship between e-commerce and supply chain management, shedding light on its complexities and implications.

This systematic review aims to analyze scholarly research published between 2014 and 2024 on integrating e-commerce within Supply Chain Management (SCM) frameworks. Scopus literature is scrutinized to identify emerging trends, best practices, and challenges in this dynamic domain. The review covers topics like technological innovations, integration strategies, performance metrics, adoption challenges, and the transformative role of emerging technologies. Following PRISMA guidelines (Moher et al., 2009), a thorough search was conducted using the Scopus database to identify relevant studies. The review focuses on 10 key articles on e-commerce, logistics, inventory management, and supply chain management, ensuring the most relevant and high-quality research in this field.

After examining the selected articles, it is clear that e-commerce integration in supply chain management has greatly improved operations and yielded strategic advantages. Supply chains' efficiency and transparency have been completely transformed by technological innovations like the use of blockchain technology and artificial intelligence [15]. The whole performance of the supply chain is enhanced by these technologies, which include automated decision-making, predictive analytics, and real-time tracking. Additionally, increased consumer satisfaction and loyalty have resulted from advances in logistics efficiency, such as quicker delivery times and better routing [16].

The articles methodical approach centers on the transformative dynamics of supply chain management's integration of e-commerce. It thoroughly explains the framework and research methods used in the study. The paper also sheds light on the subject by presenting and analyzing the findings of a systematic review. The paper ends by providing a summary of the key conclusions and consequences that were covered in the study.

2 Method

This section explains where to get publications about Transformative Dynamics of E-commerce Integration in Supply Chain Management. The process of literature reviews involves strict procedures and steps, using methodologies like Preferred Reporting Items for Systematic Reviews (PRISMA) and Meta-Analyses. PRISMA emphasizes using randomized assessments as a foundation for systematic reviews and includes criteria for selecting and omitting relevant articles [17]. It also highlights the importance of randomized trials for other research types, such as intervention, which presents challenges when evaluating qualitative or mixed-method study designs. PRISMA is a screening technique that searches numerous scientific databases and alternatives to ensure no significant study is missed [18]. It is commonly used in medical research and operation management because it emphasizes research difficulties and systematic review requirements. PRISMA offers inclusion and exclusion standards for studies. Academics from various fields, including medicine, are forced to analyze methodologically oriented literature articles due to the lack of methodological direction in research and insufficient current methodological references. Scopus and Web of Science are the two top citation databases in the competition. However, according to [19], looking through related publications in a single database is more pertinent than looking through them in many databases.

Researchers conducted an initial keyword search in two steps 1st: keywords "E-commerce" AND ("Supply chain management" OR "Logistics" OR "Inventory management" OR "Warehouse management"), and 2nd "E-commerce" AND ("Supply chain management" OR "Vendor-managed inventory" OR "VMI" OR "Demand forecasting" OR "Order fulfillment" OR "Customer satisfaction" OR "Supply chain integration"). The research keywords were searched using synonyms of prior studies, related terms, and variants. The Scopus advanced search tool yielded 1136 articles, with the quality of the literature review largely determined by the author's capacity to carry out the review. The review only included journal articles, focusing on English documents to reduce translation complexity. The year of publication was not restricted, as many researchers use it as an exclusion criterion. The publications were published between 2014 and 2024, and the inclusion and exclusion criteria for the selected article are summarized in Table 1.

Table 1. The Criteria of Inclusion and Exclusion for this Systematic Review.

| Inclusion Criteria | Exclusion Criteria |
|--------------------|---|
| Scopus-indexing | Non-Scopus Indexing |
| Journal articles | Conference paper, presentations, book chapters, book covers, and books. |
| Written In English | Non-English articles |

The writers read through the titles, abstracts, and full papers to manually assess the complete collection of 1136. Only peer-reviewed journal articles published in English were included. Documents were deemed suitable for further analysis 265 publications were removed for duplication, and 218 abstracts were rejected due to screening. A flowchart illustrating the complete search procedure is shown in Figure 1.

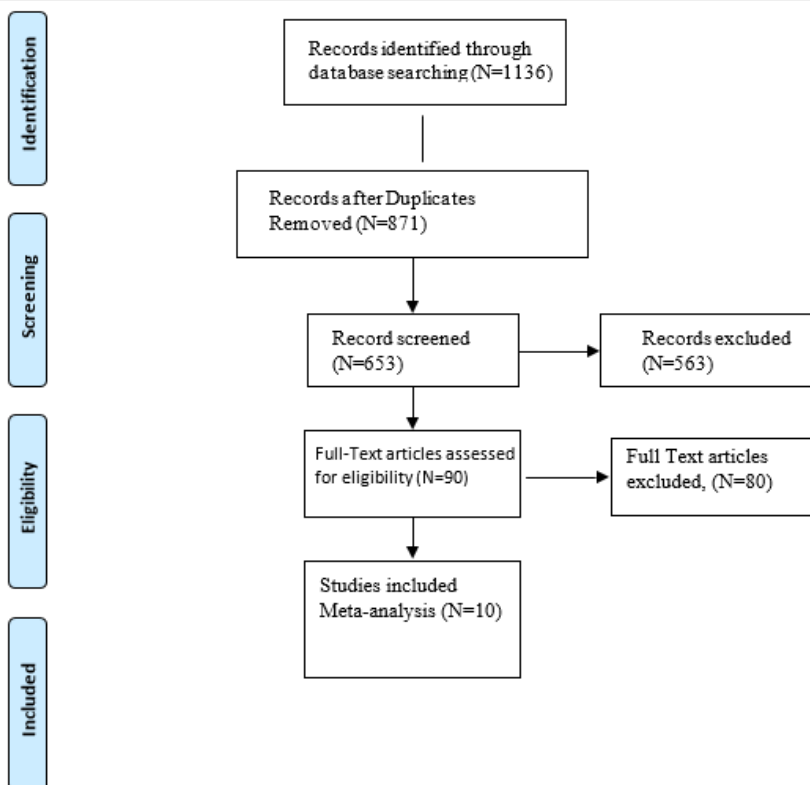


Figure 1. Flowchart of the search screening process

3 Results and Analysis

The systematic review of the selected articles provided insightful findings on the transformative dynamics of e-commerce integration in supply chain management. This section presents the key results, categorized into sub-sections focusing on technological impacts, operational improvements, and strategic advantage.

3.1 Overview of Selected Articles:

Table 2. Overview of Selected Articles.

| Author | [1] | [20] | [21] | [22] | [20] | [23] | [5] | [24] | [25] | [26] |
|---------------|---|---|---|--|---|--|---|---|---|--|
| Aim | Aims to describe the most recent e-commerce supply chain models and examine how they operate. | Aims to highlight the basic theory on the impact of e-commerce on supply chain management partnerships. | The study investigates the potential of e-commerce to improve customer experiences, streamline business processes, and boost economic growth, analyzing factors like research development and technological advancements. | Determine the strategies and processes involved in PSM's digital transformation. | Highlight strategic and tactical importance of e-commerce in SCM | to identify the main logistics research areas related to e-commerce implementation and the factors and key performance indicators. | The paper analyzes existing research on supply chain integration, focusing on factors influencing it, key developments in research and industry, and effective approaches to integrate supply chains. | The paper synthesizes e-commerce logistics literature, develops a decision framework, and supports retail executives in designing logistics, decision-making, and strategy development. | Analyze the relationship between supply chain integration and digital transformation. | The aim of the paper is to provide information on cookies used on websites for various purposes, such as enhancing functionality, personalization, and monitoring performance. |
| Method | Analysis of various commerce companies | A combination of quantitative and qualitative approaches | A systematic literature review. | Case study and interview | Quantitative and qualitative study with e-commerce businesspeople | A structured and comprehensive literature analysis. | A systematic and structured literature review | Systematics review | quantitative analysis with statistical methods and survey data | a review |

| | | | | | | | | | | |
|----------|---|--|--|--|---|---|---|---|--|--|
| Findings | <p>The study highlights the dynamic nature of e-commerce supply chain management and emphasizes the importance of technological integration and the constant need for innovation to manage the complexity of today's market landscape. By embracing agility, utilizing advanced technologies and fostering a culture of innovation, companies can position themselves for success in the ever-evolving world of e-commerce.</p> | <p>E-commerce has brought attention to supply chain management, enabling better decision-making with diverse partners, and emphasizing administrative partnerships for effective uncertainty management.</p> | <p>The paper emphasizes the importance of e-commerce as a powerful tool for selling and marketing, enabling companies to reach targeted customers and fulfill business objectives efficiently.</p> | <p>Identification of interventions and mechanisms for digital transformation of PSM</p> <p>The study emphasizes the significance of shared data sets for tactical and purchasing, requiring cross-functional teams to manage and serve these data. It advocates for global governance of open standards for interoperability. The study contributes to discussions on digital transformation in PSM processes.</p> | <p>Identification of strategic and tactical importance of e-commerce in SCM</p> <p>The study reveals a correlation between perceived uncertainty and partnership management value in e-commerce, emphasizing transaction value effects and resource dependence, and suggests ongoing information searching for improved partnership management.</p> | <p>Identification of five main logistics research areas, key factors, strategies, and performance indicators, and presentation of a methodological framework for e-commerce implementation.</p> | <p>The study explores supply chain integration (SCI) and its impact on business performance, particularly in fostering partner trust through information visibility and openness. It highlights variables influencing progress, significant advancements, and strategies for integration, and serves as a foundation for future research.</p> | <p>The paper presents a logistics decision framework for retail executives, identifying and researching opportunities and covering 43 decision elements such as return choices, efficient processes, inventory handling, and automated transport with robot delivery.</p> | <p>Identifying a favorable correlation between supply chain integration, digital transformation, and sustainable performance</p> | <p>Cookies on websites enhance functionality, personalize user profiles, and monitor performance. Companies can also use cookies to build user interests and display relevant advertisements on other sites.</p> |
|----------|---|--|--|--|---|---|---|---|--|--|

3.2 Trends of publication:

The figure below illustrates a consistent upward trend in published articles across the specified time frame, with a notable surge observed in 2023. This growth trend is discernible from January 2014 to March 2024, highlighting the ongoing expansion of scientific literature in the field. A comparative examination underscores the substantial leap in publications from 2014 to 2024, emphasizing the dynamic nature of research endeavors.

In 2023, 184 articles were published, marking a notable increase compared to 161 articles in 2022 and 127 in 2021. This upward trend in publication output is further evidenced by the numbers: 90 articles in 2020, 78 articles in 2024, 73 articles in 2019, 49 articles in 2018, 44 articles in 2017, 29 articles in 2016, and 22 articles in 2015. Notably, 2014 recorded the lowest publication rate with only 14 articles. Despite this initial low point, the trend has strengthened over time. Figure 2 shows an increasing number of publications each year, indicating the robustness and vitality of research activities in the field. This growth is attributed to advances in research methodologies, increased funding opportunities, and the

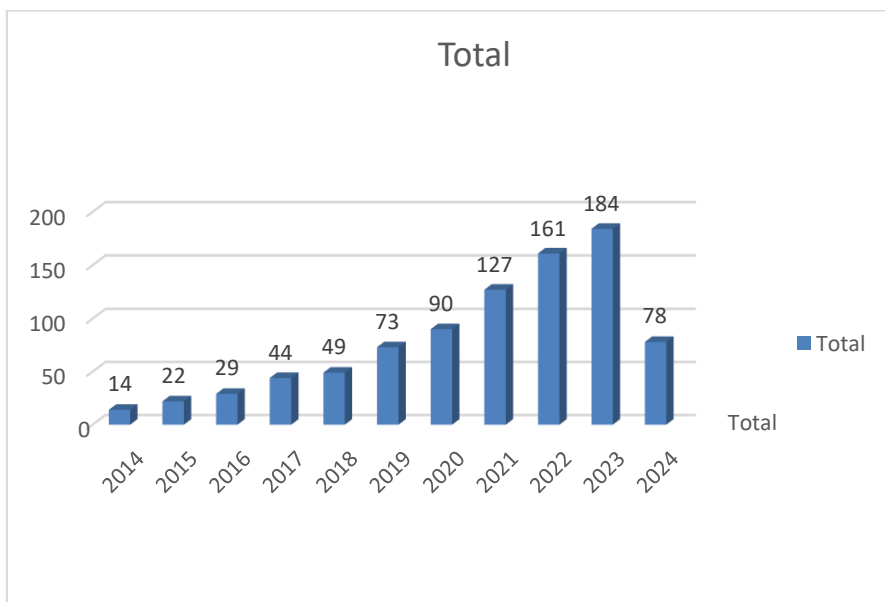


Figure 2. Year of publications

emergence of new research paradigms. Technological advancements like online publishing platforms and open-access initiatives have also contributed to the growth. Comparative analysis between different years provides insights into evolving research priorities and interests, enabling researchers to identify trends, address knowledge gaps, and strategically allocate resources.

3.3 Influence Publishers

The analysis of Top 10 publishers’ contributions in the literature review reveals that

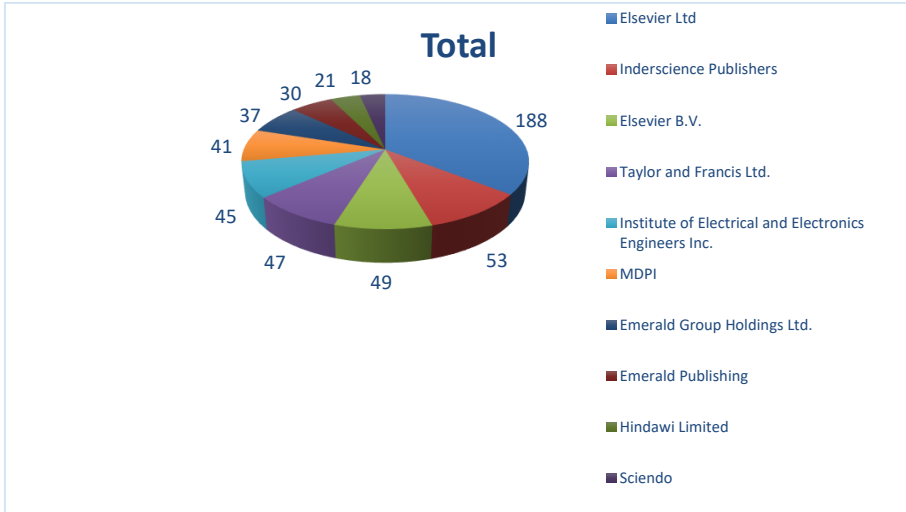


Figure 3. Distribution of articles among top publishers

Elsevier Ltd and its affiliate Elsevier B.V. dominate the publication landscape, Elsevier Ltd records up to 188 articles (36%). Inderscience Publishers holds the second position, records 53 articles with a 10.8% contribution. Elsevier B.V., part of the Elsevier group, also plays a significant role in the academic landscape with 49 articles (9%). Taylor and Francis Ltd., a major contributor, has a 9% publishing 47 articles contribution. The Institute of Electrical and Electronics Engineers Inc. (IEEE) also has a 9% contribution with record of 45 articles, reflecting its importance in engineering and technological research. MDPI, an open-access publisher, has an 8 % contribution. Emerald Group Holdings Ltd. has a 7% contribution, indicating its role in business and management research publications. Emerald Publishing, a branch of the Emerald Group, has a 6% contribution with 37 articles. Hindawi Limited, another open-access publisher, adds to the diversity of accessible research outputs. Sciendo, despite being smaller, showcases a range of interdisciplinary research. The distribution of publications across various publishers provides insight into the major sources of academic research and their relative influence within the field integration of e-commerce with supply chain management.

3.4 Technological Impacts

The integration of advanced technologies has been a pivotal factor in transforming supply chain management through e-commerce. Key findings include:

Blockchain Technology:

Blockchain technology offers a secure, decentralized method of monitoring data flow and transactional activity throughout the supply chain. Transparency and traceability have risen as a result of the use of blockchain in supply chain management (SCM). These factors are essential to maintaining product safety and stakeholder trust.

Numerous research has emphasized the application of blockchain technology to increase supply chain transparency and traceability. For instance, [27] showed how blockchain implementation shortened the time it took to track food goods in Walmart's supply chain from days to seconds. Allowing instant access to product provenance and history. This is due to its inherent characteristics, such as decentralization, immutability, transparency, and efficiency. Which reducing the risk of contamination and ensuring food safety.

Internet of Things (IoT): [28] point out that IoT has made it possible to manage and monitor inventories in real-time by using smart sensors. Integrating IoT into supply chain management has increased supply chain logistics efficiency by reducing the amount of inventories, facilitating real-time inventory management, and predictive maintenance. IoT sensors are employed by Amazon to enhance warehouse operations, resulting in expedited order fulfillment and decreased operational expenses[29].

Artificial Intelligence (AI)

AI-based technologies, like as predictive analytics and machine learning, have revolutionized SCM decision-making procedures. AI algorithms have played an instrumental role in forecasting demand and optimizing logistics services. According to [30], the use of AI in supply chain management has greatly improved the ability to predict demand trends, customizing Procurement strategies to mitigate disruptions and optimize delivery methods. Artificial intelligence (AI) systems facilitate automated decision-making, demand forecasting, and route optimization, resulting in lower costs and higher service standards. AI is being used by firms like DHL to optimize their delivery routes, which has increased customer happiness and saved a lot of money[31].

3.5 Operational improvements:**Warehouse Management:**

E-commerce platforms have revolutionized warehouse management by introducing automated storage and retrieval systems and robotics, leading to increased productivity and reduced labor costs. For example, JD.com has implemented fully automated warehouses that can handle millions of orders with minimal human intervention while managing millions of orders effectively. These warehouses make use of cutting-edge technology like intelligent routing systems, robots, and real-time analytics to streamline transportation duties, avoid traffic bottlenecks, and guarantee seamless operation[32].

Logistic and Distribution:

Technology developments in logistics have expedited distribution procedures. Consequences: Delivery accuracy and speed have increased with the adoption of last-mile delivery services and sophisticated logistics management systems. Companies such as FedEx and UPS have made significant investments in logistics technology to improve their delivery capabilities and satisfy the increasing needs of e-commerce customers[33].

3.6 Strategic Advantages:

Cross-border E-commerce integration with logistics has proven to be strategically advantageous, enabling companies to enhance their resource allocation, trade channels, and overall trade structure [34]. Businesses' visibility, customer service, trust, and purchasing power can all be improved by combining cross-border e-commerce with logistics. In order to increase the competitiveness of the digital marketplace, this entails coordinating operational processes, streamlining interest distribution regulations, and encouraging expansion in the contemporary service sector and international trade.

Customer Engagement:

Enhanced customer engagement through personalized experiences and improved service quality is a significant benefit highlighted in the literature [35]. The use of mobile applications and digitalized interactive platforms has been shown to enhance customer engagement by catering to human psychological needs such as autonomy, relatedness, and competence, ultimately leading to subjective well-being [36]. Moreover, in the hotel industry, digital customer engagement components like recognition, interest, communication, consumer experience, loyalty, and patronage intentions have been identified as key factors influencing customer interactions and revenue generation[36]. Data analytics can be used by businesses like Netflix to enhance user engagement and retention by recommending content based on their viewing history[37].

Market Expansion:

The digital transformation brought about by e-commerce has revolutionized market expansion by enabling companies to transcend geographical restrictions and tap into new customer segments globally [38]. This shift has enabled integrated e-commerce supply chains to operate around the clock, providing unparalleled access to a diverse and broad audience, thus offering a significant strategic advantage in the competitive landscape. The digital nature of e-commerce has facilitated market expansion, allowing businesses to reach new customer segments across geographical boundaries. The ability to operate 24/7 and cater to a global audience has been a significant strategic advantage for e-commerce-integrated supply chains.

Cross-border E-commerce:

Cross-border e-commerce has facilitated businesses to expand globally, thereby increasing sales and brand recognition. Alibaba's cross-border e-commerce platform, AliExpress, allows small and medium-sized businesses to sell their products to customers around the world[39].

4 Result and Analysis

The way business organizations function has been profoundly changed by incorporating e-commerce into supply chain management (SCM), which involves the convergence of digital technology, data analytics, and logistical channels. To better understand how e-commerce integration affects supply chains, this systematic study examines several important factors, including convenience, efficiency, fulfillment, and data security[40].

From 2014 to 2016, last-mile delivery, inventory control, and effective order fulfillment were the main focuses of the development of e-commerce logistics [24]. During this stage, conventional supply networks were converted to digital platforms, opening the door for e-commerce to be included in larger supply chain management frameworks. A change toward multi-channel logistics was seen in the middle of the 2010s, reflected in the expansion of online marketplaces and the variety of consumer touchpoints. Academics investigated inventory management challenges through various channels while preserving service standards and cutting expenses. The late 2010s saw the emergence of omnichannel logistics, which recognized the necessity of seamless integration between online and physical channels.[24].This phase emphasized the importance of a unified customer experience, where consumers expect consistent service regardless of the interaction point. Technological advancements such as IoT, AI, and blockchain revolutionized supply chain processes, enabling real-time tracking, predictive analytics, and enhanced transparency[41].

The reviewed articles emphasize how cutting-edge technologies like blockchain, artificial intelligence (AI), and the Internet of Things (IoT) are revolutionizing supply chain management (SCM).Blockchain technology has enhanced transparency and traceability across supply chains, reducing fraud and improving compliance , [27].IoT has revolutionized inventory management by providing real-time data on stock levels and location, thereby reducing stockouts and excess inventory[28]. AI, particularly machine learning algorithms, has optimized demand forecasting and route planning, leading to more efficient logistics operations[30].These technologies are still not widely used, despite their improvements. Significant obstacles include the requirement for qualified staff, high implementation costs, and technological complexity. Moreover, scalability is still a major problem for existing blockchain systems, which find it difficult to effectively manage high transaction volumes. For instance, many small and medium-sized enterprises (SMEs) are unable to finance the infrastructure and substantial computing power required by block chain technology. There are also the deployment of IoT devices requires substantial investment in infrastructure and maintenance. Additionally, problems with interoperability and data security when

connecting IoT devices into existing systems. Other major obstacles include the difficulty of integrating AI with current systems and the possibility of biases in AI algorithms.

E-commerce has completely changed supply chain management (SCM) in terms of operational improvements by improving warehouse efficiency. As demonstrated by Amazon's fulfillment centers, robotic process automation and automated warehouses have lowered lead times and operating costs. Automation ensures accurate order processing and reduces human error, while big data and advanced analytics improve businesses' distribution procedures and supply chains, resulting in more flexible and responsive supply chains. However, there are some challenges associated with these operational gains. The rapid advancement of technology necessitates ongoing investments in staff training and system updates. Companies must stay abreast of the most recent advancements in technology and make sure that their employees are equipped with the skills needed to use any new systems. Furthermore, real-time data exchange and intricate coordination are needed. It is imperative to attend to environmental considerations associated with heightened logistical operations, these technologies can interfere with current workflows and have large upfront expenditures. Socioeconomic worries are raised by the possibility that employment losses brought on by growing automation would occur.

In Strategic Advantages, the integration of e-commerce in SCM offers companies a competitive edge by enhancing customer satisfaction and expanding market reach[34]. E-commerce platforms facilitate direct customer interaction, offer valuable feedback for product and service improvement, and allow companies to expand into new markets, diversify revenue streams, and reduce local economic dependence.[42]. This expansion can lead to increased sales and brand recognition on a global scale, as companies can reach international customers without a physical presence, lowering barriers to entry. However significant privacy and legal problems are raised by the gathering and use of consumer data. It is essential to make sure that laws like the GDPR are followed and to establish moral data usage procedures.

5 Conclusion

Although the reviewed articles provide valuable insights into e-commerce integration and supply chain management, there are some limitations that need to be addressed. Blockchain technology has potential but faces scalability issues and high energy consumption, making it difficult to widespread adopt. IoT integration in supply chain management (SCM) allows real-time inventory management and improved logistical efficiency, while AI-driven solutions reduce costs and improve service levels. However, AI implementation requires significant investment and skilled personnel, and there is a risk of bias in algorithms. Automated storage and retrieval systems and robotics in warehouses increase productivity and reduce labor costs, but may lead to job losses and high initial investment. Advanced logistics management systems and last-mile delivery solutions improve delivery speed and accuracy, but the environmental impact and complexity of urban areas can lead to higher costs and operational chal-

lenges. Data analytics can be used to tailor offerings and improve customer satisfaction, but privacy concerns and regulatory challenges arise. Companies can reach a global customer base through cross-border e-commerce platforms like Alibaba's Al-iExpress, but navigating complex regulatory environments and logistical challenges can complicate operations. Future research should focus on the scalability of blockchain solutions in supply chain management (SCM) and its long-term impact on supply chain resilience. The integration of blockchain with AI and IoT technologies can enhance its utility. The ability of AI to predict and mitigate supply chain disruptions, especially in geopolitical events and natural disasters, is also worth studying. The ethical implications of AI in supply chain management are also crucial. The long-term effects of warehouse automation on employment and labor market dynamics are also important. Integrating warehouse management systems with artificial intelligence can improve operations. More studies should be conducted to explore the environmental impact of increased logistics activity and the role of artificial intelligence in improving logistics services and reducing carbon footprints. The ethical implications of data collection and use in customer engagement strategies and the impact of personalized marketing on consumer behavior and loyalty are also important. Investigating the regulatory challenges and logistical complexities of cross-border e-commerce can provide insights into improving global supply chains.

In conclusion, integrating e-commerce into supply chain management has led to a significant transformation in how business organizations operate. This systematic study has provided insights into the evolution of e-commerce logistics, highlighting key developments from 2014 to the present. The upward trend in publications underscores the growing interest and consistent advancements in this field. The surge in research output, particularly in 2023, reflects the dynamic nature of e-commerce and supply chain management research, driven by technological advancements and evolving market needs.

The integration of blockchain, AI, and IoT technologies is revolutionizing supply chain management (SCM). Blockchain enhances transparency, reduces fraud, and improves compliance. IoT provides real-time stock data, reducing stockouts and excess inventory. AI optimizes demand forecasting and route planning, leading to more efficient logistics operations. However, these technologies face challenges such as the need for qualified staff, high implementation costs, and technological complexity. SMEs struggle to finance infrastructure and computing power required for blockchain technology. IoT deployment requires substantial investment in infrastructure and maintenance, and problems with interoperability and data security persist. E-commerce has significantly improved warehouse efficiency, reducing lead times and operating costs. However, challenges include ongoing staff training, real-time data exchange, environmental considerations, and potential employment losses. E-commerce offers strategic advantages, such as enhancing customer satisfaction and expanding market reach. However, privacy and legal issues arise from the gathering and use of consumer data, necessitating strict adherence to laws.

The articles highlight limitations such as scalability, energy consumption, AI implementation, environmental impact, and regulatory challenges. Future research should focus on scalability, AI integration, and ethical implications. Additionally,

understanding the environmental impact of logistics and cross-border e-commerce can provide insights into improving global supply chains.

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