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Digital Supply Chain Management: An Analysis of Technology Integration and Optimization of Modern Inventory Systems

Annisa Rizkyta Yulie, Flowrent Aprilianz, Magdalena Pazizi, Salwa Nabilah Putri, Yusnaini
Accounting, Faculty of Economics, Sriwijaya University
01031182328005@student.unsri.ac.id, 01031282328041@student.unsri.ac.id, 01031182328013@student.unsri.ac.id, 01031282328109@student.unsri.ac.id, yusnaini@fe.unsri.ac.id

Abstract

The rapid pace of digitalization is having a transformative impact on modern supply chain management, particularly in the implementation of Digital Supply Chain Management (DSCM). The integration of digital technologies such as integrated information systems, the Internet of Things (IoT), big data analytics, and cloud-based platforms—enables companies to enhance visibility, coordination, and efficiency in managing the flow of goods and information. This study aims to explain how the integration of technology in the digital supply chain can support the optimization of modern inventory systems and improve a company's operational performance. This research was conducted using a systematic literature review approach, examining various relevant scientific publications related to the digital supply chain and inventory management. The findings indicate that the implementation of high-performance digital technologies significantly contributes to optimizing inventory planning accuracy, accelerating decision making processes, and minimizing the risks of overstocking or stockouts. Additionally, the use of digital technologies enables companies to monitor inventory in real-time and optimize their ability to respond to changes in market demand. Therefore, the implementation of Digital Supply Chain Management is a critical strategy for organizations to optimize modern inventory systems, drive operational efficiency, and strengthen the company's competitive capabilities in the era of digital transformation.

Keywords: Digital Supply Chain, Inventory Optimization, Technology Integration

1. Introduction

The advancement of digital transformation in the Industry 4.0 era has brought about significant changes in how companies manage their supply chains. Digitalization has not only transformed previously manual operational processes into automated ones but has also created more integrated and data-driven systems. The adoption of digital technology in the supply chain enables companies to improve efficiency and accelerate the flow of information among supply chain participants [1]. In addition, digitization also enhances transparency and visibility of information, enabling more accurate monitoring of every activity in the supply chain [2]. The use of digital technology in the supply chain can enhance operational efficiency and support decision-making processes [3]. As a result, digital transformation has become a key element in creating an adaptive, efficient, and competitive supply chain system [4].

With the rise of globalization, the complexity of distribution networks has also increased, requiring companies to manage their supply chains more effectively and efficiently. Modern supply chains involve a wide range of interconnected parties, from suppliers and manufacturers to distributors and end consumers. This situation calls for a system capable of integrating the flow of information and materials quickly and accurately [5]. In addition, this complexity also increases the need for better coordination among supply chain participants [6]. Research shows that the digitization of supply chains can enhance collaboration and integration among stakeholders in the global supply chain network [7]. Digitization can also improve efficiency in distribution and logistics processes [8]. Therefore, the adoption of digital technology is a strategic solution for addressing the challenges posed by the complexity of modern supply chains.

Inventory management is a key component of supply chain management, as inventory plays a crucial role in ensuring the smooth operation of a company. Inventory is not only related to the availability of goods but also

directly impacts operational costs, production efficiency, and customer service levels. Suboptimal inventory management can lead to increased storage costs and a decline in customer service levels [3]. In addition, inventory levels that do not align with demand can also hinder production and distribution processes [9]. Previous research has shown that effective inventory management can improve a company's overall operational performance and competitiveness [2]. Therefore, efficient and integrated inventory management is a key factor in the success of the supply chain system [6].

Cost efficiency in supply chain management is influenced not only by digitalization but also by the implementation of operational management concepts. SCM plays a role in optimizing the flow of goods, information, and finances, thereby reducing logistics, storage, and distribution costs. Meanwhile, TQM focuses on continuous quality improvement, which can reduce costs associated with defective products and production waste. The integration of these two approaches has proven to significantly enhance a company's operational efficiency and profitability [10].

However, traditional inventory systems still face various challenges that can hinder a company's operational performance. One of the main challenges is the inaccuracy of inventory data resulting from the use of manual recording systems, which are prone to errors [11]. In addition, delays in the dissemination of information also prevent the company from responding quickly to changes in demand [12]. This situation often leads to inventory imbalances, whether in the form of overstock or stockouts [13]. Other studies show that traditional inventory systems also tend to increase operating costs due to a lack of information integration across departments [14].

Advances in digital technology offer significant opportunities to improve the effectiveness of inventory management through the implementation of Digital Supply Chain Management. Technologies such as the Internet of Things, Artificial Intelligence, Big Data Analytics, Cloud Computing, and Enterprise Resource Planning enable companies to manage supply chain data and activities more efficiently [15]. IoT enables real-time monitoring of production and distribution activities [14]. In addition, AI can help companies perform predictive analytics for more accurate inventory planning [4]. Big data analytics enables the processing of large volumes of data to support strategic decision-making [7]. Meanwhile, cloud computing and ERP enable more effective integration of information systems across organizational units [16]. As a result, digital technology has become a key driver in the transformation of the supply chain toward a more modern and integrated system [9].

The integration of digital technology into Digital Supply Chain Management enables companies to monitor inventory in real time and improve the accuracy of inventory data. By using a digital system, companies can obtain accurate information regarding product availability [2]. In addition, cross-departmental data integration also improves transparency and coordination in supply chain management [13]. The digitization of the supply chain significantly enhances visibility and inventory data integration. The implementation of Digital Supply Chain Management plays a crucial role in optimizing modern inventory systems to drive continuous improvements in supply chain performance.

2. Theoretical Review

Supply Chain Management Theory

The goal of supply chain management theory is to improve organizational performance and operational efficiency by managing the integrated movement of goods, information, and money from suppliers to final consumers. In terms of digital supply chain management, this theory provides the conceptual framework for comprehending how digital technology and information system integration improve supply chain actors' visibility and coordination. According to earlier studies, using digital technology in supply chain management increases information transparency and operational effectiveness.

Supply chain digitization can speed up decision-making in business operations and increase manufacturing efficiency [34]. Furthermore, research shows that enhanced supply chain visibility and digital supply chain integration improve coordination and information sharing within the supply chain network, which benefits supply chain performance [31]. These results are also in line with research explaining that the incorporation of digital technologies such as the Internet of Things and Big Data into logistics and supply chain information systems can enhance real-time visibility, demand forecasting accuracy, and operational efficiency [27]. Businesses can enhance

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cooperation among supply chain partners and increase supply chain management efficiency with integrated digital technologies.

Resource-Based View Theory

According to the Resource-Based View Theory, a company's capacity to utilize its strategic resources gives it a competitive edge. Technologies like artificial intelligence, the Internet of Things, big data, and integrated information systems can be seen as vital tools that enhance organizational performance in the context of the digital supply chain. Utilizing these digital technologies has been shown to significantly improve supply chain decision-making and operations effectiveness. The adoption of technologies like AI and machine learning can improve information transparency and boost operational efficiency in supply chain management [35].

These results are also in line with studies which claim that using Internet of Things technology in the supply chain enables businesses to monitor the condition of goods and logistics operations in real time [36]. As a result, information transparency increases, and supply chain operations can make decisions faster and more accurately. Digital technology in the digital supply chain can be viewed as a strategic resource that enhances a company's competitive advantage and creates value from the perspective of the Resource-Based View.

Inventory Management Theory

Inventory Management Theory explains how companies can optimally manage inventory levels to maintain a balance between product availability and operational costs. Effective inventory management aims to prevent both overstocking and stockouts. Digital technology is increasingly supporting inventory management in the modern supply chain, allowing businesses to track stock levels in real time and more precisely predict demand. Research shows that the use of Artificial Intelligence (AI) can help companies analyze data and improve the accuracy of inventory planning [30]. In addition, studies explain that the implementation of methods such as Just-In-Time (JIT) and Enterprise Resource Planning (ERP) systems also supports efficiency by reducing storage costs and improving inventory data integration [6].

The use of digital technology in the supply chain can assist businesses in controlling operational risks and increasing the effectiveness of inventory management [33]. These results are also in line with studies describing how businesses can enhance demand forecasting accuracy and optimize inventory levels through a more integrated inventory management system by utilizing digital technology [4]. Therefore, employing digital technology in contemporary inventory systems can assist businesses in lowering the risk of stockouts and overstocking.

3. Research Methods

3.1. Research Approach

Several databases, including Google Scholar, Garuda, SINTA, and Scopus, were accessed through the Publish or Perish program in order to conduct a systematic literature review. Three primary keywords were used in the search: "digital supply chain," "inventory optimization," and "technology integration." With regard to cognitive biases in financial reporting considerations in particular, this method was employed to guarantee that the retrieved material was genuinely in line with the research objective. 471 articles with a relevant theme were found in the first search. The following inclusion criteria were then used to conduct a multi-stage screening process: (a) empirical articles discussing the role of cognitive biases in professional judgment or financial reporting decisions; (b) articles published between 2020 and 2026; (c) articles in English or Indonesian; and (d) articles accessible in full text via the monitored databases. 42 final publications that satisfied all requirements for additional analysis were found after the screening procedure, which included full-text review, title and abstract relevance, and duplicate checks.

Content analysis was used to hand pick the data, which included a number of important components pertinent to the study's goals. The article source, author name, title, year of publication, study topic, research variables, research methodologies, and important conclusions about the use of digital supply chain management to facilitate technology integration and inventory system optimization are some of these components. Artificial intelligence, the Internet of Things, big data analytics, integrated information systems, and other digital technologies used in supply chain management were also identified in the analysis, along with their effects on operational decision-making, better supply chain visibility, and inventory management efficiency. Figure 1 shows the phases of the

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article screening procedure, which was carried out in a staged and methodical manner to guarantee the literature employed was relevant to the research objective.

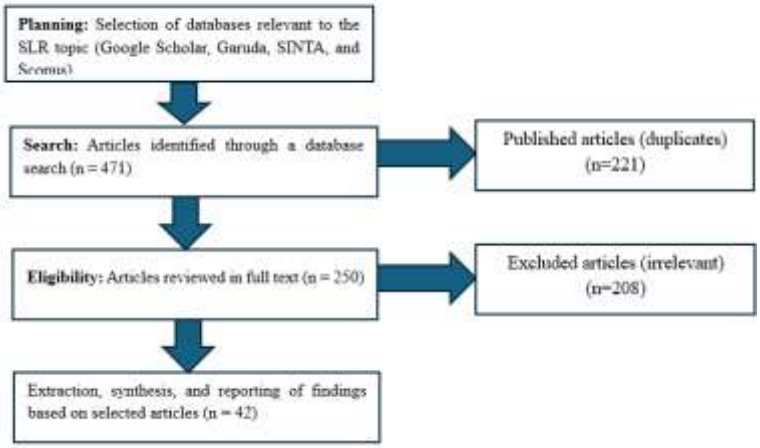

Figure 1. SLR Information Source Protocol

3.2. Article Source

Table 1. Article Source

Article Source	Number of Articles
Scopus	13
SINTA	13
Garuda	6
Google Scholar	20
Total	42

3.3. Article Index

Table 2. Article Index

Article Index	Number of Articles
Q1	8
Q2	2
Q3	2
Q4	1
Sinta 2	1
Sinta 3	2
Sinta 4	2
Sinta 5	8
Garuda	6
Google Scholar	10
Total	42

3.3. Article Index

Table 3. Research Results Based on Independent Variables: Author, Year, and Research Results

Variables	Author and Year	Results
Digital Supply Chain	(A. C. Putri & Nasihin, 2025), (Alfarabi & Hananto, 2025), (Ammar et al., 2021), (Apriani, Aridito, Cahyono, Sukarjo, Gustina, & Laksana, 2023), (Azhari et al., 2025), (Bramantyo & Yasin, 2025), (Daios et al., 2025), (Eryc & Deu, 2024), (F. Putri et al., 2020), (Fauziyyah & Candra, 2025), (Fenny et al., 2025), (Gabrielle, 2024), (Gultom & Yosephine, 2024), (Ho et al., 2021), (Javaid et al., 2022), (Khairi et al., 2025), (Kumar et al., 2023), (Li, 2023), (Maria, 2025), (Masruroh et al., 2025), (Miethlich et al., 2020), (Muaffa & Rohman, 2025), (Nabila et al., 2025), (Nadia Athira, 2025), (Nujum et al., 2024), (Omar et al., 2020), (Rahamneh et al., 2023), (Rizkiawan & Ramza,	+

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	2024), (Rochma et al., 2025), (Salhab et al., 2023), (S et al., 2024), (Shahzad et al., 2020), (Siagian & Rony, 2024), (Tiwari et al., 2024), (Tubis & Rohman, 2023), (Wahyani & Sain, 2025)	-
	(Setiawan et al., 2025)	NE
	(Efrilianda & Saesario, 2023), (Permana & Hasibuan, 2025), (Rakhman et al., 2025), (Segarwati et al., 2022), (Trisanto et al., 2024)	
Positive (+); Negative (-); No Effect (NE)		

4. Results and Discussions

4.1. The Transformation of the Supply Chain into a Digital Supply Chain

The transformation of the supply chain from a traditional system to a digital supply chain represents an organization's adaptation to technological advancements and demands for operational efficiency. In traditional systems, supply chain processes are still carried out manually with limited integration, often resulting in information delays, high operational costs, and low flexibility in responding to market changes. Therefore, digitalization has become a critical strategy for enhancing business process effectiveness and corporate competitiveness. Research indicates that supply chain digitalization can maximize performance and strengthen integration among actors within the global business network [2].

A digital supply chain is a supply chain management system that leverages digital technology to integrate activities such as procurement, production, distribution, and inventory management in a more efficient and transparent manner. The implementation of this technology enables more efficient and accurate data exchange and helps optimize connectivity among supply chain participants. Studies show that digitization can accelerate the flow of information and improve coordination within global supply chains [2]. In addition, the use of data-driven systems and real-time information enables more effective monitoring and supports increasingly accurate decision-making. Research shows that data-driven systems can improve a company's response time to changes in demand and operational disruptions [9].

The transition to a digital supply chain also requires organizational readiness in terms of governance, human resource competencies, and internal controls. Research shows that the success of digital transformation depends not only on technological aspects but also on an organization's readiness to undergo transformation [25]. Furthermore, the implementation of digital systems drives business process automation, enhances transparency, and strengthens operational efficiency through integrated inventory and logistics systems. Studies show that the implementation of a digital supply chain can improve both efficiency and accountability in the management of supply chain activities [21].

4.2. Technology Integration in Digital Supply Chain Management

A crucial element of digital supply chain management, which attempts to increase the efficiency and coordination of the supply chain, is the incorporation of digital technologies. Rapid and integrated data gathering, processing, and exchange are made possible by technologies like the Internet of Things (IoT), artificial intelligence (AI), big data analytics, cloud computing, and enterprise resource planning (ERP). Research shows that using digital technology can enhance information integration and improve collaboration between organizational units [22]. Furthermore, studies also explain that technology integration contributes to cost efficiency by reducing errors, speeding up distribution, and improving the accuracy of demand forecasts, which in turn leads to reduced waste [6].

By connecting and transmitting data in real time, the Internet of Things improves operational visibility for physical assets like production equipment and logistics systems. Research shows that the use of IoT can increase productivity by providing more precise activity monitoring [22]. Additionally, predictive analytics uses artificial intelligence and big data analytics to manage risk, estimate demand, and optimize inventory. Studies show that the use of AI enhances companies' ability to manage risk and improve operational efficiency [24], while other research shows that big data improves the quality of decision making [9].

While ERP combines manufacturing, logistics, finance, and inventory tasks, cloud computing allows for centralized data storage and flexible access. Research shows that integrating ERP with cloud computing can enhance information coordination and operational efficiency [21]. Overall, studies demonstrate that technology

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integration in the digital supply chain significantly improves business performance, particularly when organizational agility and innovation are fostered.

4.3. Improved Visibility and Integration of Inventory Data

Data integration and inventory visibility are greatly enhanced by the use of digital technology in supply chain management. Through integrated information systems, companies can monitor inventory in real time, resulting in more accurate information on product availability. This helps companies improve their responsiveness in operational decision-making and minimize potential distribution disruptions. Research shows that supply chain digitization can increase operational efficiency by improving information visibility [34]. This is consistent with supply chain management theory, which highlights the significance of information integration and coordination among various supply chain components.

Interdepartmental inventory data integration also improves the accuracy of inventory information because the warehouse, production, and distribution departments can access the same data simultaneously. Research shows that the use of digital technology can improve information transparency and operational efficiency in supply chain management [35]. This is supported by studies regarding digital information systems that can improve the effectiveness of an organization’s data management [18].

In addition, research shows that improving supply chain visibility through digital supply chain integration can enhance supply chain performance [31]. Other studies also found that digital transformation can improve system integration and reduce operational risks in supply chain management [29], [33]. This aligns with Inventory Management Theory, which emphasizes the importance of accurate and integrated information systems for optimizing inventory management and avoiding the risks of overstocking and stockouts.

4.4. Optimizing Inventory Management Through Digital Technology

The digital supply chain serves as an example of how utilizing digital technology is essential to increasing the effectiveness of inventory systems. Businesses may handle inventory data more rapidly and precisely by implementing technologies like artificial intelligence, big data, and integrated information systems. According to Supply Chain Management Theory, integrating technology into inventory systems improves inventory management efficiency by strengthening the synchronization of operational activities across the supply chain [30].

Based on previous research using similar variables, the literature also highlights the importance of implementing data-driven demand forecasting in inventory management. By leveraging data analytics technology, companies can predict demand patterns more accurately, thereby aligning inventory levels with market needs. An organization's capacity to use digital technology and data analysis is a strategic resource that can improve the quality of operational decision-making, according to Resource-Based View (RBV) Theory. Research shows that using digital technology in the supply chain can strengthen inventory planning procedures and enhance an organization's capacity to interpret demand data [37]. Additionally, by creating a more connected inventory system, digital technology integration helps reduce the risk of overstocking and stockouts. Digital systems enable companies to monitor inventory movements more accurately and integrate data across procurement, production, and distribution activities. Suboptimal inventory management can increase operational costs due to overstocking and stockouts, making the integration of SCM and data-driven forecasting systems essential for maintaining efficiency [6].

4.5. The Impact of Digital Supply Chain Implementation on Operational Performance

Because digitization makes it possible to integrate information across all supply chain activities, from production and procurement to distribution and inventory management, the adoption of a digital supply chain has a noticeable effect on a business's operational effectiveness. When the flow of information accelerates processes and can be monitored in real time, companies can reduce coordination delays between departments, minimize manual errors, and avoid bottlenecks in operational processes. This enables companies to operate more efficiently because each department no longer operates based on isolated data, but rather on shared, interconnected information. Research shows that supply chain digitization enhances real-time visibility of supply chain activities, strengthens internal and external coordination, and accelerates operational decision making [34]. In addition, studies indicate that the

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digital supply chain has a positive impact on lean manufacturing through improved information integration, enhanced collaboration, and greater operational efficiency [7].

Another benefit is the reduction in storage and inventory management costs. This occurs because the digital supply chain enables companies to monitor inventory more accurately, forecast material needs with greater precision, and align replenishment with actual demand conditions. As inventory visibility improves, companies no longer need to hold excess inventory as a precaution against uncertainty, thereby reducing warehouse costs, storage costs, and the risk of obsolescence. Research shows that the implementation of integrated information systems and IoT has a significant positive impact on inventory management efficiency [37]. These findings indicate that digitization not only aids in inventory management but also improves the overall quality of inventory control. Previous studies confirm that a digital supply chain reduces costs not only due to the use of technology, but because it enables inventory to be managed based on continuously updated actual data rather than rough estimates. Several studies also show that integrating SCM with quality approaches such as TQM can significantly reduce operational costs, even achieving reductions of up to 20–30% in the long term, as improved production quality reduces waste while supply chain efficiency accelerates distribution and lowers logistics costs [6].

In addition to improving efficiency and reducing inventory costs, the implementation of a digital supply chain also accelerates data-driven decision-making. Companies with integrated digital systems can access operational data directly and analyze changing situations more quickly, so decisions are no longer delayed by manual reconciliation processes or multi-layered verification. In a dynamic market, this speed of decision-making is critical as it determines a company's ability to respond to supply disruptions, shifts in demand, or adjustments to distribution schedules. Research shows that digitalization and AI enhance transparency, visibility, and the quality of decision-making in supply chain management [22]. In other words, the better the implementation of a digital supply chain, the greater a company's ability to act quickly, accurately, and strategically. In this context, the digital supply chain must be understood as a modern operational foundation that not only accelerates work processes but also enhances the quality of a company's response to various business challenges.

4.6. Implications and Links to Previous Research

The implementation of digital technology plays a significant role in optimizing inventory system performance, as digitization enables companies to manage inventory more accurately, seamlessly, and responsively to changes in operational needs. Digital systems allow inventory levels, goods movements, and supply requirements to be monitored in real time, so decisions regarding procurement, storage, and distribution no longer rely on slow and error-prone manual record keeping. Research highlights how supply chain digitization enhances visibility into supply chain activities, speeds up coordination, and supports operational efficiency [34]. These findings are also supported by studies indicating that the digital supply chain has a positive impact on process efficiency, integration, and inventory management [7], as well as research emphasizing that digitalization and artificial intelligence enhance transparency, accountability, and the quality of decision-making in supply chain management [22]. Thus, the findings of this study further reinforce the view that the benefits of digitalization in the supply chain are consistent and relevant across various organizational contexts.

In practical terms, these findings imply that companies need to view the implementation of digital technology in the supply chain as a strategic step to improve operational performance and competitiveness, particularly in inventory management. Companies that implement digital integration will be better able to improve inventory visibility, align inventory with actual demand, reduce costs, and respond more quickly to market changes. This means that digital technologies such as integrated information systems, IoT, AI, and ERP should not be viewed merely as administrative tools, but must be positioned as part of a comprehensive strategy to improve supply chain performance. Therefore, companies seeking to enhance the efficiency and resilience of their supply chains need to strengthen their digital infrastructure readiness, improve human resource competencies, and establish work systems that support optimal data utilization. The success of digital supply chain implementation lies not only in the use of technology, but in a company's ability to integrate that technology into business processes effectively and sustainably.

5. Conculsion

The transformation toward Digital Supply Chain Management is a strategic approach with significant impact for optimizing effectiveness and integration in modern supply chain management. The integration of digital

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technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), big data analytics, cloud computing, and Enterprise Resource Planning (ERP) enables real-time management of information flows and inventory, thereby improving the accuracy of decision-making to minimize the risks of overstock and stockouts. Furthermore, supply chain digitization strengthens coordination among organizational units, improves operational transparency, and drives cost efficiency and responsiveness to market dynamics. Thus, the optimization of modern inventory systems depends not only on the utilization of technology but also on an organization's ability to effectively integrate these technologies into business processes to optimize operational performance and sustain competitive advantage.

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