

Path Selection of Integrated Development of Enterprise Supply Chain Management Driven by Digital Transformation

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Abstract: Digital transformation provides a new impetus for the development of the supply chain, which can not only improve and expand the visualization level of the supply chain system and the matching scheduling ability, so as to improve the system agility and work efficiency. Based on this, this paper analyzes and discusses the integrated development of supply chain management driven by digital transformation, discusses how to integrate different technologies under the digital background to form a centralized and fast response of supply chain management, and correspondingly cultivate a dynamic supply chain ecosystem to achieve the overall strategic change of the organization.

Keywords: digital transformation; supply chain management; integration

1. Introduction

Digital Drive describes a holistic approach to digital transformation that not only penetrates digital technology into various areas of the business, but also rebuilds processes from a digital perspective, thereby achieving broad technology integration and promoting business model innovation accordingly. In this regard, this paper discusses the topic of enterprise supply chain management driven by digital transformation, and the impact of digital transformation on the construction of integrated, transparent and agile supply chain systems has been extensively discussed in the previous research in this field. Gezgin *et al* note that digital transformation elevates supply chain performance through integrated technologies that enhance data visibility and decision-making [1]. Cakic *et al* demonstrate how distributed ledger technology and OCR improve transparency in wine supply chains [2]. Verma and Lalwani discuss 5G's impact on supply chain communication, enabling faster data exchange and better logistics management [3]. Meier emphasizes that transitioning to digital supply chains requires rethinking processes and business models [4]. Nowicka explores how digital innovations drive competitive advantages in supply chain management [5]. Angevine *et al* highlight that industrial companies must implement digital technologies for operational efficiency [6]. Henke *et al* envision the future of supply chain digitalization, stressing the need for real-time data-driven decision-making [7]. Lavikka *et al* advocate for developing digital business ecosystems to foster collaboration among supply chain partners [8]. Ding identifies challenges in digital transformation, emphasizing its benefits despite potential barriers [9]. Bujak investigates telematics and IoT's roles in enhancing supply chain transparency and operational efficiency [10].

Simchenko *et al* analyze how IoT and digital twins enhance supply chain strategy through better forecasting and risk management [11]. Sinitsyna and Nekrasov explore digital tools for sustainable supply chains, integrating lifecycle management to track environmental impacts [12]. Anisiforov *et al* focus on how digital transformation influences corporate logistics processes, highlighting the importance of adapting to new digital paradigms [13].

Combined with the above analysis, the existing research shows that the digital transformation of the supply chain system changes its operation mode, enabling different elements of the ecosystem to obtain better collaboration, thereby improving internal transparency and overall operational efficiency. Based on this, this paper analyzes the integrated supply chain management model, analyzes its integration method, discusses the corresponding technology and deployment measures, and elaborates the path selection of the digitally-driven integrated development of enterprise supply chain management.

2. Technologies Enabling Integrated Supply Chain Management

For supply chain systems, the Internet of Things can connect real-time data upstream and downstream, including the complete path of raw materials to finished products, and includes different data sources for raw material supply, warehousing, logistics, processing and production links. As a result, integrated supply chain management enabled by the Internet of Things makes it easier to integrate data from multiple sources, monitor inventory levels, transportation routes, and production schedules, and integrate information to build an assessment of how well the supply chain is functioning, examining its load levels or congestion sites, thereby reducing delays and improving decision-making. In this process, artificial intelligence and machine learning provide effective support for large-scale data processing, which can not only complete automated data processing, help multi-source data collection and integration, but also ensure big data integration and analysis, from which more complex supply chain operation assessment and pattern differentiation are drawn, and optimization measures are formed accordingly. By analyzing historical data, AI models can predict potential disruptions, such as supply shortages or logistics bottlenecks, enabling businesses to take proactive measures to safeguard supply chains by forecasting demand patterns, optimizing production plans, managing inventory more effectively and safeguarding supply chain practices. In this process, Big Data integration analytics forms the intermediary link between the integration of large-scale data in the IoT environment and machine learning analytics, which can extract actionable insights from raw data, enabling business managers to make informed decisions in purchasing, manufacturing, and distribution. This data-driven decision-making helps reduce costs, shorten lead times, and increase customer satisfaction by ensuring that products are delivered accurately and on time. The extensive data flow involved is difficult to store in a specific data center, and factors such as disaster preparedness and network transmission need to be considered, combined with local storage and cloud storage, so that real-time sharing of information is relatively less pressure on IT infrastructure investment, ensuring the flexibility of expanding operations as the business grows, and ensuring that the company remains agile in the dynamic market. And improve data accessibility. Given the complex data collection, integration, analysis and distribution involved in this process, supply chain management also requires the introduction of blockchain technology, which provides a decentralized and secure way to track transactions and verify information in the supply chain, ensuring data integrity and transparency, which is particularly beneficial for industries that require strict compliance, such as pharmaceutical or food production. The collation requirements diagram is shown in Figure 1.

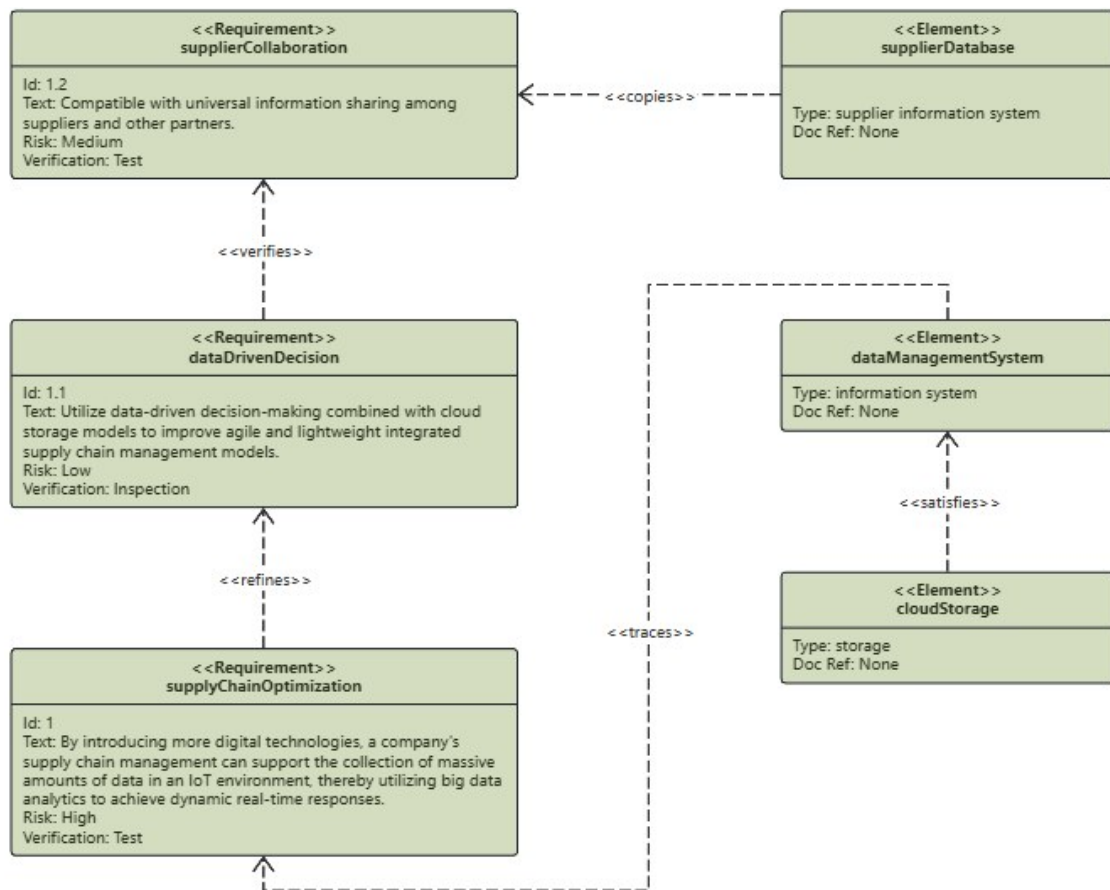


Figure 1. class diagrams for requirements.

3. Organizational and Process Changes

3.1. Data Integration and Distribution

Digital transformation significantly enhances data integration and distribution across supply chains. Traditional supply chains often operate in silos, leading to inefficiencies and communication breakdowns. Each segment of the supply chain—suppliers, manufacturers, distributors, and retailers—would assess performance independently, resulting in fragmented information and missed opportunities for collaboration. With the advent of digital tools and technologies, organizations can now centralize data, breaking down these silos.

This centralized data approach allows for real-time sharing of information among all stakeholders, ensuring that everyone involved has access to the same data. This integration not only facilitates more accurate and timely decision-making but also enhances the agility of the supply chain. For instance, when demand changes suddenly, integrated data enables swift adjustments in production and logistics plans, ensuring that resources are allocated efficiently. Consequently, this reduces waste in production and transportation processes, fostering a more responsive and efficient supply chain.

3.2. System Design and Coordination

The design of supply chain systems has also undergone significant changes due to digital transformation. Historically, supply chains were linear and often reactive, with each segment operating independently. Digital technologies have introduced a more collaborative and proactive approach to system design. The new paradigm emphasizes real-time coordination between suppliers, manufacturers, and customers, facilitating seamless interactions across the supply chain.

By leveraging technologies such as Internet of Things (IoT), Artificial Intelligence (AI), and cloud computing, organizations can design systems that enable continuous monitoring and optimization of supply chain processes. For instance, AI algorithms can analyze vast amounts of data to predict demand patterns and optimize inventory levels, while IoT devices can track shipments in real time, providing valuable insights into

the status of goods in transit. This level of coordination minimizes the risks associated with information gaps and enhances the overall efficiency of the supply chain. This background is summarized into PEST analysis results as shown in Figure 2.

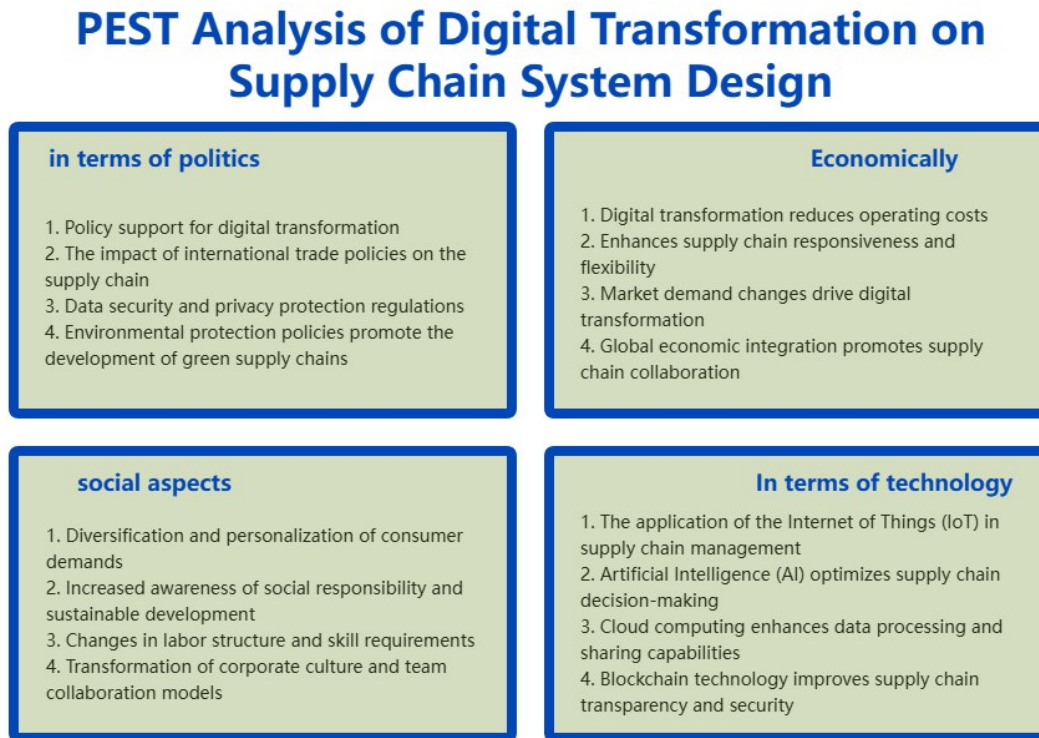


Figure 2. PEST analysis.

Moreover, digital transformation enables a shift from self-assessment to collaborative assessment of supply chain performance. With integrated data and collaborative systems, organizations can collectively evaluate performance metrics, identify bottlenecks, and implement improvement initiatives. This collective approach fosters a culture of continuous improvement and innovation, driving the supply chain towards greater efficiency and effectiveness.

3.3. End-to-End Visibility

Achieving end-to-end visibility is perhaps one of the most significant changes resulting from digital transformation. In a traditional supply chain, visibility was often limited to certain stages, leading to challenges in tracking products and anticipating disruptions. However, digital technologies facilitate a comprehensive view of the entire supply chain, enabling organizations to monitor every aspect of their operations from procurement to delivery.

This enhanced visibility is crucial for establishing seamless data flows between suppliers, manufacturers, and customers. It relies on breaking down information silos and providing stakeholders with access to real-time data, enabling them to coordinate their efforts effectively. For instance, suppliers can adjust their production schedules based on real-time sales data from retailers, while manufacturers can better manage their inventory levels based on demand forecasts.

The benefits of end-to-end visibility extend beyond operational efficiency; they also enhance customer satisfaction. With real-time insights into order status, organizations can provide accurate delivery estimates and proactively address any potential issues. This level of transparency builds trust among stakeholders and improves collaboration across the supply chain, ultimately leading to better customer service and loyalty.

4. Conclusion

Through the introduction of more digital technologies, enterprise supply chain management can support the

massive data collection in the Internet of Things environment, thereby leveraging big data analysis to achieve dynamic real-time response, data-driven decision making combined with cloud storage model to complete agile and lightweight integrated supply chain management model, while compatible with suppliers and other partners universal information sharing. In this process, digital transformation not only changes the supply chain management measures from the data integration and distribution links, but also changes the coordination mode of the supply chain from the perspective of system design. It gets rid of the chain link self-evaluation and analysis under the condition of insufficient information communication, improves the transparency of the system, so that the upstream and downstream cooperation can avoid excessive waste in the production and transportation links, and establishes the upstream production and logistics plan based on the final marketing plan, ensuring the stable and reliable supply of materials and the cooperation ability. End-to-end visibility is critical to enabling seamless data flow between suppliers, manufacturers, and customers. This visibility relies on breaking down information silos and centralizing data, allowing stakeholders to access real-time information and coordinate their efforts effectively, thus changing the supply chain system at a holistic level to be managed in an integrated way around downstream end needs. By embracing these elements, companies can build more flexible, resilient and data-driven supply chains to help them succeed over the long term in an increasingly dynamic global marketplace.

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Conflicts of Interest

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