

Research on the Supply Chain Optimization Approach of JD's Transformation into a Digital Ecosystem Retailer

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Abstract: With the rapid development of global e-commerce, digital retailing has become an emerging trend, forcing companies to continuously adjust and optimise their supply chain strategies to enhance market competitiveness. This essay will focus on analysing the supply chain optimisation strategies of Jingdong, a leading technology-driven e-commerce platform in China, during its transformation from a traditional e-commerce to a digital eco-retailer. The study focuses on JD's data quality and management issues supply chain innovation, and model adaptation issues. Through case studies on technological innovation, logistics expansion, and ecosystems, it is found that JD has achieved significant results in matching supply and demand and logistics efficiency. The results of the study show that JD has successfully constructed a highly flexible and responsive supply chain system through comprehensive data analysis and systematic integration of intelligent technologies, and this transformation has not only enabled JD to stand out in the highly competitive market but also provided a successful case for promoting the digital transformation of the whole industry. The significance of this paper is to analyse JD's supply chain optimisation strategy to provide a reference case for academia and corporate practice.

Keywords: E-commerce, digital retail, supply chain optimisation, traditional supply chain, Jingdong.

1. Introduction

With the rapid development of e-commerce, the rise of digital retailing have presented new challenges and opportunities for traditional business models. Against this backdrop, optimising supply chain strategies has become a key factor for companies to remain competitive in an increasingly competitive market. Traditional e-commerce supply chains often rely on linear processes and emphasise a single transaction model, which not only increases logistics costs but may also slow down the ability to respond to customer needs. In contrast, digital retail supply chains are more flexible and efficient, able to adjust dynamically through data analysis, real-time monitoring and smart technologies to quickly adapt to market changes.

Particularly in China, JD, as a leading technology-driven e-commerce and retail infrastructure service provider, understands the importance of supply chain optimisation, and JD has adopted a series of innovative supply chain optimisation strategies in the process of transitioning from traditional e-commerce to digital eco-retailer. The purpose of this paper is to compare and analyse in depth the various supply chain optimisation strategies adopted by JD in this transformation process,

in order to reveal its successes and challenges in the context of digital retailing, so as to provide important references and lessons for other enterprises.

2. Traditional E-commerce Supply Chain vs. Digital Retail Supply Chain

2.1. Traditional E-commerce Supply Chain Characteristics

The traditional e-commerce supply chain has a complex structure involving multiple intermediate links, including suppliers, manufacturers, distributors and retailers [1]. This structure leads to poor information, logistics and capital flows, increasing costs and time delays. In addition, due to the lack of an effective information sharing mechanism, the traditional e-commerce supply chain is difficult to respond to market changes in real time, resulting in frequent inventory backlogs or stock-outs.

The structural composition of the traditional e-commerce supply chain can be roughly divided into five key aspects: supplier management, warehouse management, order processing, logistics and distribution, and after-sales service. Although the traditional e-commerce supply chain has been relatively mature, there are still some significant problems. Firstly, the management concept is backward, China's supply chain is relatively backward in terms of management concepts, and lacks advanced supply chain management strategies and methods [2]. Secondly, the credit mechanism is not sound, and the credit mechanism in the supply chain is not perfect, which affects the co-operation and trust of all parties in the supply chain [2]. At the same time, the lack of industry standards, the lack of unified industry standards, resulting in the supply chain between the links is difficult to achieve effective synergy and integration [2]. In addition, the lack of basic support, concentrated in the supply chain basic support capacity is insufficient, the lack of support, including capital flow, logistics and other aspects [2]. Finally, due to poor synergy, the synergy between supply chain members is poor, which affects the operational efficiency of the entire supply chain [3].

In order to improve the efficiency and service quality of traditional e-commerce supply chain, traditional e-commerce enterprises need to make improvements in several aspects. Firstly, they should improve the management concept and strategic awareness, and at the same time need to update the concept and strategy of supply chain management and strengthen the strategic awareness of the supply chain [3]; they should build an institutionalized management system, establish and improve the supply chain management system, and improve the standardization and standardization of the supply chain [3]; improve the level of informatization, strengthen the application of information technology in the supply chain, and improve the accuracy and timeliness of the information transmission; they should develop a digital and professional platforms: cultivate digital and professional supply chain platforms, and accelerate technological innovation and application [4]; improve the credit mechanism and industry standards: establish a perfect credit mechanism and unified industry standards to promote the cooperation and trust among supply chain parties [2]; and finally, strengthen the synergy among supply chain members, and enhance the synergy and spirit of cooperation among supply chain members through various mechanisms and measures [3 ,4].

2.2. Digital Retail Supply Chain Characteristics

The digital retail supply chain achieves a comprehensive upgrade of the traditional e-commerce supply chain through technological innovation and data-driven, and its process mainly includes data management, information fusion, intelligent optimisation, collaborative innovation, and whole-link optimisation. In the data management link, the digital supply chain first needs to effectively manage and analyse a large amount of data [5]. By establishing a data management system and decision-making model, data management efficiency can be effectively improved to achieve efficient management of data in the digital transformation of the supply chain of manufacturing enterprises [5]. Data management not only includes the collection, storage and processing of data, but also

involves the security and privacy protection of data, as well as the ability how to transform data into usable information. Information fusion, on the other hand, creates a comprehensive view of information by integrating data from different sources to better understand the supply chain state and make decisions [6]. Constructing a digital supply chain operation system based on collaborative innovation enables the integration and interaction of knowledge and technology, thereby enhancing core competitiveness.

Compared with traditional e-commerce supply chains, digital retail supply chains have achieved innovation and advantages in several aspects.

By utilising the latest digital technologies and methods, digital supply chains not only improve the efficiency and effectiveness of the supply chain, but also bring new business opportunities and competitive advantages to enterprises. However, achieving this transformation also faces challenges such as data quality, technology integration, and organisational change, which require companies to think deeply and implement strategic planning, technology application, and organisational management [7].

Table 1: Comparison of Supply Chain Strengths and Weaknesses.

	Traditional e-commerce supply chain	Digital Retail Supply Chain
Advantages	Physical Store Advantage	Low cost and high efficiency
	Wide market coverage	consumer-centric
Disadvantages	High costs and inefficiencies	Highly technology-dependent
	Harder to keep up with market trends	Data security risks

3. Jingdong Group Supply Chain Status and Problems

3.1. Current Status

JD Group's supply chain status can be analysed from several dimensions, including its ability to respond to the COVID-19 epidemic, its logistics operation model, the development of its smart supply chain, the operation of supply chain finance and the application of big data in supply chain cost control.

JD Group demonstrated strong supply chain resilience during its response to the COVID-19 epidemic. By utilising its integrated supply chain structure and comprehensive intelligent platform, JD was able to quickly adjust its delivery procedures to cope with specific disruptions, effectively controlling the situation across the Chinese market [8].

3.2. Problems Faced

JD has made significant achievements in digital transformation and business expansion but also faced some challenges.

Data quality and management issues: With the deepening of digital transformation, the demand for and reliance on data has increased significantly. However, poor data quality and poor data management are some of the main problems JD faces in supply chain management. Data quality directly affects the accuracy and efficiency of supply chain decision-making, while poor data management may lead to poor information flow and affect the overall operational efficiency of the supply chain [7]. **Logistics and distribution efficiency and cost issues:** Although JD has established a more complete self-built logistics system, but in the context of rapid expansion and changing market demand, how to further improve the efficiency of logistics and distribution and reduce costs is still a challenge. Especially during the epidemic, logistics and distribution faced greater pressure and uncertainty [8]. **Supply chain innovation and model adaptation issues:** In the process of digital transformation, JD needs to continuously innovate its supply chain management model to adapt to

the changing market environment and consumer demand, including how to optimise the supply chain design by using big data, artificial intelligence and other technologies to improve supply chain flexibility and responsiveness [9]. Meanwhile, in the face of global competition and international market expansion, JD also needs to explore new supply chain models, such as the C2M (Consumer to Manufacturer) model, in order to better connect consumers and manufacturers and achieve personalised production and sales [9].

4. Jingdong Supply Chain Optimisation Case Study

4.1. Cases of Technology Innovation

JD has undertaken a number of technological innovation initiatives in supply chain optimisation in recent years, with particularly notable ones including the implementation of unmanned warehouses, unmanned vehicles and blockchain and drone-based inventory and traceability systems. These technological innovations have significantly improved JD's logistics efficiency and customer service levels with excellent results.

JD has established several unmanned warehouses. JD's unmanned warehouse technology enables efficient warehouse management through highly automated robotic systems. According to 'JD.com: Operations Research Algorithms Drive Intelligent Warehouse Robots to Work', JD's intelligent warehouses use advanced scheduling algorithms that are capable of solving large-scale integer planning problems in seconds, and real-time storage racks mobile robots are scheduled [10]. This intelligent warehouse management has enabled JD to reduce fulfilment expense ratios to a world-leading 6.5% and achieve delivery of 90% of first-party retail orders within one or two days of placing an order by 2020 [10]. In addition, 'Exploring JD's Full Process Unmanned Warehouse' mentions that unmanned warehouses are 10 times more efficient than traditional warehouses.

JD has also made significant progress in the development and application of unmanned delivery vehicles. JD's unmanned delivery products have started regular operation in many places, especially during the epidemic, these unmanned delivery products played an important role.

The blockchain and drone-based inventory and traceability system combines drone and blockchain technology for automated inventory management and item traceability. The drone acts as a mobile scanner and works with a ground-based unmanned vehicle as a mobile platform to work together to quickly collect and verify inventory data. The system is able to acquire inventory data faster than traditional manual tasks and ensure the security and trustworthiness of the data through blockchain technology.

4.2. Cases of Logistics Expansion

As one of China's leading e-commerce platforms, JD's expansion and optimisation of its supply chain logistics has always been the focus of industry attention. Through self-managed logistics and cooperation with third-party logistics, JD has not only improved its own service efficiency and customer satisfaction, but also successfully maintained its leading position in the fiercely competitive market.

With the continuous expansion of business and the diversification of market demand, it is difficult to meet all the needs by relying only on self-managed logistics. Therefore, JD began to explore the mode of cooperation with third-party logistics. The E-Commerce and Express Cross-Border Business Strategy and Its Risk Management - Based on the Case Study of Shunfeng Express and JD E-Commerce (2019) points out that the cooperation between JD and Shunfeng not only strengthens the service capacity of JD logistics, but also helps Shunfeng expand the e-commerce market, which achieves mutual benefits for both parties. The success of this cooperation model provides a good model for JD's application among small merchants.

4.3. Cases of Ecosystems

The JD Supply Chain Ecosystem case, in particular the implementation of the JD x Plan, JD Cloud, and Cloud Computing Services, demonstrates how technological innovation and data-driven approaches can be used to optimise supply chain management and improve efficiency and customer satisfaction.

The Jingx program is a key innovation in JD's supply chain management, which uses big data and cloud computing technologies to optimise all aspects of the supply chain. Through this program, JD is able to collect and analyse large amounts of data in real time, which allows it to more accurately predict market demand, optimise inventory management, and reduce excess or shortages [11,12]. In addition, the Jingx programme promotes supply chain transparency and traceability, improving the efficiency and responsiveness of the entire supply chain [13].

JD cloud and cloud computing services provide JD with powerful computing and storage capabilities to support its vast business operations. These services support not only daily e-commerce activities, but also complex supply chain management and data analysis tasks. Through cloud computing, JD is able to quickly process and analyse data from all parts of the supply chain to achieve optimal resource allocation and maximise operational efficiency. Besides, cloud computing supports JD to rapidly adjust its supply chain strategy during an epidemic to meet changing market demands [14].

By the application of big data and cloud computing, JD has achieved remarkable results in supply chain cost control. For example, by optimising inventory management and improving logistics efficiency, JD succeeded in reducing warehousing and transportation costs [11,12].

The application of the Jingx programme and cloud computing services has significantly improved the efficiency of the supply chain. Through real-time data analysis and forecasting, JD was able to respond faster to market changes and reduce inventory backlogs and out-of-stock situations, thus improving overall operational efficiency [13].

Supply chain optimisation also directly improves the customer shopping experience. Through faster delivery and higher product availability, JD enhances customer satisfaction and loyalty [13].

By applying IoT technology and blockchain technology, JD enhances the security and transparency of the supply chain and effectively reduces supply chain risks [15].

5. Conclusion

This thesis discusses the comparison between traditional supply chains and digital supply chains, focuses on the current situation and challenges of JD Group in modern supply chain management, and proposes corresponding optimisation strategies. The traditional supply chain relies on a linear, hierarchical structure, and its information flow is slow, the response is not flexible enough, and it is difficult to quickly adapt to market changes. The digital supply chain, on the other hand, realises information transparency and immediate response through data technology and intelligent decision-making, and improves overall operational efficiency.

In terms of technological innovation, JD has greatly improved logistics processing efficiency and distribution flexibility by introducing automated facilities such as unmanned warehouses, unmanned vehicles and drones, effectively reducing labour costs and improving the responsiveness of the supply chain. In terms of logistics expansion, JD adopts the strategy of combining self-built logistics and third-party logistics, which not only ensures the comprehensive coverage of its own distribution network, but also improves logistics efficiency through resource integration. In addition, JD has further constructed a business ecosystem centred on cooperation and win-win situation through the implementation of the JD X Plan, JD Cloud and Cloud Computing Services, enhancing the synergy and integration between upstream and downstream enterprises.

However, this paper has some shortcomings. For example, there is a lack of in-depth analysis of the implementation difficulties encountered by JD in the specific operation process, and the dynamic evolution process of the traditional supply chain and digital supply chain is less involved. Future research can focus on the impact of internal organisational changes brought about by supply chain change, in-depth exploration of the application of technology, and how to more effectively integrate various types of resources to improve the overall supply chain resilience and adaptability and other areas. Through the above, it can provide more perfect theoretical support and empirical analyses for academic and practical exploration.

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