

Research on the Innovation of Logistics System of E-commerce

--Taking JD Logistics as an Example

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Abstract: As a core component of e-commerce platforms, the efficiency and innovation ability of the logistics system is crucial to the enterprise's success. With the rapid development of e-commerce and the intensified competition in the global market, digital transformation, as a major trend in the current business environment, provides opportunities for the optimization and innovation of logistics systems. However, the digital transformation of small and medium-sized enterprises (SMEs) is still in the exploratory stage, and the transformation is difficult. Based on the case study method, this paper aims to study the technical achievements of JD Logistics in terms of digital transformation. It connects with the current situation of digital transformation of small and medium-sized enterprises to explore how the digital innovation of JD Logistics is inspiring to small and medium-sized enterprises. Through literature analysis and data integration, the successful experience of JD Logistics' digital transformation concepts and automation technology can be used in the development of warehousing and logistics technology for small and medium-sized enterprises., The successful experience helps small and medium-sized enterprises to solve the technological constraints in warehousing and leads to the development of the economy.

Keywords: Digital transformation, e-commerce platform, logistics system

1. Introduction

In the current intricate and unstable global economic landscape, global supply chains are slowly recuperating from the pandemic and are exhibiting reduced vulnerability compared to three years ago, while also displaying a trend towards increased diversification. JD Logistics has made notable strides in digital transformation, particularly through the utilization of cutting-edge technologies such as big data, artificial intelligence, and cloud computing to enhance logistics services and streamline supply chain management. numerous small and medium-sized enterprises face constraints when it comes to implementing digital transformation. Hence, it is imperative for small and medium-sized enterprises to pursue efficient digital transformation strategies for their future growth, and to draw insights from the successful practices of large corporations like JD Logistics. JD, as an exemplar of new retail, is committed to an efficient and innovative logistics system aimed at enhancing customer experience. It is at the forefront of the industry's digital transformation. The development of its logistics holds

significant implications for the future of e-commerce platforms. This research aims to examine the successful integration of emerging technologies by JD to enhance logistics efficiency and customer satisfaction. Additionally, it seeks to draw upon JD's expertise to provide valuable insights into the adaptation of small and medium-sized enterprises (SMEs) and to foster the advancement of the logistics sector [1].

2. JD Logistics System Analysis

JD has been building its own logistics system since 2007 and established the JD Logistics Group in 2017. Since its inception, JD Logistics has been adhering to the corporate philosophy of "customer-centric and reliable supply chain services to continue to create value", and put forward the 3S theory: in the role of consumption, industrial upgrading, and technological change logistics will enter a new era and present short-chain (Short-chain), smart (Smart), and symbiosis (Synergic) characteristics. The 3S theory offers a new conceptualization of the logistics sector and embodies the most recent evolution in logistics advancement.

2.1. Efficient Distribution Supported by Warehouse Network

"Short chains" refers to the practice of minimizing the frequency of goods being transported within the supply chain. In conventional logistics, products are typically routed through a series of intermediaries such as distributors, dealers, and retail outlets before reaching the end consumer. This multi-step process often leads to increased costs and longer delivery times due to the frequent handling of the goods. JD Logistics has established a comprehensive warehousing network across the country to proactively address customer demands and enhance customer satisfaction. JD Logistics categorizes its warehouses into several types, including central warehouses (Asia One), regional distribution centers, front-end distribution centers, distribution stations, and JD Cloud Warehouse. Approximately 650 warehouses spanning a total of 16 million square meters are strategically located across the country. These warehouses are strategically positioned based on comprehensive big data analysis to facilitate the efficient distribution of various commodities. Inventory levels are meticulously adjusted to align with demand patterns. Upon the generation of a user order, JD Logistics employs advanced algorithms to select the nearest warehouse for timely and precise delivery to the customer. JD Logistics has implemented a multi-tiered warehousing system, resulting in a significant reduction in cargo handling frequency from five to two times. This strategic approach has positioned the company as an industry leader, enabling the provision of exceptional same-day and next-day delivery services for the majority of its self-owned products. This capability has emerged as JD's primary competitive advantage, setting it apart from other e-commerce platforms [2].

2.2. The Role of Science and Technology in Facilitating Digital Transformation

The concept of "Intelligent" aims to establish a sophisticated intelligent logistics system by leveraging technological advancements and intelligent hardware and software. This is intended to enhance logistics efficiency, minimize costs, and enhance the precision and agility of the entire logistics process. In 2023, at the JD Global Technology Explorer Conference, JD Logistics released the "JD Logistics Brain" and the enhanced version of the digital intelligent supply chain product Jinghui 3.0, which is built using large models. The logistics big model is a massive data model developed by JD.com, which utilizes big data and artificial intelligence to analyze and optimize supply chain operations. JD Logistics Super Brain is a comprehensive technology platform that utilizes artificial intelligence, big data, and machine learning to improve logistics operational efficiency. This platform integrates various functions, including digital twin models, data integration and analysis, simulation and prediction, decision optimization and support, real-time monitoring, and continuous

improvement. One of the key components within this framework is the JD Logistics 3D SCADA system. This system utilizes IoT functionality and 3D modeling technology to replicate a real intelligent warehousing environment. It integrates various automation devices and adopts artificial intelligence, robots, sensors, and other advanced technologies to promote intelligent operation and maintenance computing. By seamlessly integrating multiple data sources and adopting predictive troubleshooting and maintenance techniques, this system can assist the JD Logistics super brain in making wiser optimization decisions.

Jinghui 3.0 is different from "JD Logistics Super Brain" and is a comprehensive digital intelligent supply chain data management platform, emphasizing the improvement from intelligent algorithms to business operations. The JD Logistics 3.0 system is different from traditional supply chain control towers and data dashboards. AIGC-based supply chain control towers are recognized for their adaptability in modifying content in real-time, integrating inputs from various content types, such as text and images, and meeting customer demands for data analysis and improved human-computer interactions through natural language processing, comprehensible technologies, and machine learning. This system offers a realistic experience. Furthermore, the comprehensive range of native algorithms within Jinghui 3.0 is evident in its applications for forecasting, inventory management, and supply chain operations. Various algorithmic methodologies are employed to address specific aspects of these functions. For instance, in the realm of forecasting, Jinghui 3.0 incorporates a diverse set of temporal algorithms that take into account the entire product life cycle, supported by a robust model, thereby enhancing the accuracy of our forecasts. In the end, supply chain management customers may perform intricate calculations and perform multi-level data analysis thanks to the automated consolidation of data into real-time series dimensions that is enabled by interaction with the actual world. Furthermore, alongside a diverse array of systems and platforms, the successful implementation of software systems necessitates the utilization of sophisticated hardware infrastructure. JD Logistics has made substantial investments in hardware facilities intending to enhance operational efficiency. JD Logistics has made a significant investment of RMB 3,120 million in technology in 2022, solidifying its prominent position in the automated warehousing and logistics sector. JD's automatic distribution wall is composed of various components, such as a packaging platform, distribution car, distribution rack, shelf container, etc. It is an automated equipment suitable for distributing small and medium-sized goods in multi-SKU and multi-flow scenarios, and can efficiently sort and distribute goods. Distribution walls typically use advanced technologies such as robots, conveyor belts, sensors, and computer vision technology to accelerate and optimize the sorting process [3]. The sorting and transportation within the warehouse are carried out by the Sirius cargo-to-person system and the Ground Wolf handling system. Usually, small items are sorted through the Sirius cargo-to-person system, achieving precise picking of goods from thousands of miles. Then, the automatic handling and sorting of goods are carried out through the Sirius handling system. The synergistic effect of these two systems creates an efficient automated process from storage to order execution, improving the overall operational efficiency of the warehouse. JD unmanned warehouse, as an automated warehouse, utilizes various robots with different functions and performances in different scenarios. For example, in the packaging area, a six-axis robot is used for grabbing, while visual recognition technology and infrared ranging technology are used to arrange and integrate products. Finally, the automatic packaging robot automatically packages the products. In the sorting facility, three distinct categories of Automated Guided Vehicles (AGVs) carry out the three stages of sorting, ranging from "order address sorting" to transferring bags for secondary sorting and handling and ultimately transporting them. These sorting robots move to and within the sorting area, possessing the capability to actively evade obstacles and autonomously recharge.

2.3. Integrated Logistics Industry Ecosystem

JD Logistics is committed to the principle of symbiosis, fostering mutually beneficial relationships with customers, industry partners, and the environment. The symbiosis theory underscores the collective generation of value by all stakeholders, the entire industry, and society as a whole, and the establishment of a symbiotic logistics ecosystem [4].

JD Logistics places significant emphasis on its "integrated supply chain logistics service" as the central focus of its operations. This service offers a comprehensive "logistics outsourcing service" to clients across various industries. Leveraging advanced data processing and algorithms in the digital domain, the company delivers a comprehensive solution encompassing supply chain strategy formulation, planning, and execution. In the practical field, this service also includes integrated support from solution design to actual operation. Integrated supply chain logistics services aim to assist customers in improving spot rates, accelerating inventory turnover, improving fulfillment efficiency, and reducing operating costs, thereby promoting high-quality growth for customers.

JD Logistics has launched a platform called "Smart Supply Chain Open and Synergy Platform". This platform aims to optimize the cost, efficiency, and experience of the supply chain through an open and collaborative approach. JD plans to collaborate with 80% of its brand partners through this platform in the next three to five years to improve supply chain agility and responsiveness, while also enhancing overall efficiency.

In order to build a logistics industry ecosystem, JD Logistics has been committed to sustainable development strategies in addition to various information-sharing platforms that integrate the upstream and downstream of the supply chain. JD Logistics is implementing the strategic level project "Qingliu Plan", committed to creating an end-to-end green and environmentally friendly supply chains from four aspects: "transportation", "warehousing", "technology", and "packaging". Through the deployment of new energy to electric vehicles and hydrogen energy vehicles, the construction of a distributed photovoltaic power generation system on storage roofs, and the circulation of express delivery boxes such as "Qingliu boxes", Collaborate industry and social forces to jointly focus on green and sustainable development from three aspects: "Environment", "People", and "Profits" [5].

3. Insights Gained from Studying JD's Logistics Practices

Chinese small and medium-sized enterprises account for over 99% of the total number of enterprises. Among them, 7.27% of enterprises have completed digital transformation, and 62.11% of enterprises have initiated partial digital transformation work. In addition, 25.11% of enterprises are in the preparation stage for digital transformation, and 5.51% of enterprises have not yet initiated any digital transformation initiatives [6]. This indicates that small and medium-sized enterprises play a crucial role in leading digital transformation. However, they encountered resistance and became the focus of challenges and obstacles hindering the pace of digital transformation. However, they encountered resistance and became the focus of challenges and obstacles hindering the pace of digital transformation.

The slow pace of digitalization in small and medium-sized enterprises can often be attributed to multiple factors.

There is often a lack of understanding of the significance of digital transformation. Many companies currently do not prioritize digital transformation and lack clear plans or strategies. This may be due to a limited understanding of the concept, implementation, and potential benefits of digital transformation, as well as deficiencies in cultivating a culture of change and innovation.

The digital transformation process requires a significant initial investment, including acquiring new technologies, employee training, and business process restructuring. Some companies may hesitate to transform due to budget constraints, uncertainty in investment returns, or a lack of

immediate results [7]. Many digital solutions are designed for large enterprises and may be difficult to scale or unaffordable for small businesses. These solutions may not be suitable for the business scale and financial capabilities of small and medium-sized enterprises, leading to challenges for them in breaking away from traditional supply chain models. To facilitate the better development of small and medium-sized enterprises, drawing on the successful experience of JD Logistics in digital transformation can be beneficial.

JD Logistics adheres to the corporate philosophy of "continuously creating value with reliable supply chain services centered around the customer," and has undertaken comprehensive digital transformation in various areas. This has resulted in the establishment of a 20,000-person customer service team dedicated to accelerating the response to customer needs. For businesses to implement a customer-centric strategy, significant adjustments in organizational culture, data, and technology are necessary to ensure that the entire organization is realigned around the customer, from the back office to the front line. This entails establishing a corporate culture in which every employee prioritizes the customer, whether in decision-making or daily operations. Small and medium-sized enterprises can draw inspiration from JD Logistics' customer-centric corporate philosophy by placing the customer at the core of their business operations. Initially, small and medium-sized enterprises must gain a comprehensive understanding of customer needs and preferences, which can be achieved through customer feedback, market research, and data analysis. By understanding customer needs, enterprises can provide products or services that better meet market demands. In addition, small and medium-sized enterprises should actively utilize technological means to enhance customer experience. For example, this can be achieved by simplifying the shopping process, providing personalized suggestions, and optimizing customer service processes using digital tools. These measures not only help to improve customer satisfaction but also enhance the operational efficiency of the enterprise. Furthermore, establishing effective communication channels is also crucial. Enterprises should ensure that customers can easily communicate with the company through various channels such as social media, customer service hotlines, and email. While communicating with customers, enterprises must promptly handle customer feedback and make necessary adjustments when necessary. Finally, cultivating a customer-centric corporate culture is crucial. This requires ensuring that every employee understands the importance of customers and continuously strives to improve the customer experience in their daily work. Through this comprehensive approach, small and medium-sized enterprises are able to distinguish themselves in intense market competition and establish a solid customer base and market position.

In the past, the various components of the traditional supply chain operated relatively independently, with logistics supply chain enterprises such as warehousing companies, distribution companies, and e-commerce platforms each operating within their isolated operational silos and being reluctant to synchronize their data. With the improvement of the "global supply chain infrastructure network," through cooperative efforts can greater value be created in the future. While some small and medium-sized enterprises are consciously undergoing digital transformation in hopes of enhancing fulfillment efficiency to meet customer demands, the lack of funds and technology constraints make it difficult to reverse the situation in the short term. The "integrated supply chain logistics service" offered by JD Logistics is disrupting the isolated nature of supply chains and providing an effective solution for cost reduction and efficiency improvement for small and medium-sized enterprises. Through JD Logistics' advanced logistics technology and supply chain solutions, small and medium-sized enterprises can enhance logistics efficiency and alleviate bottlenecks in the supply chain. With the expertise of JD Logistics in digital technology and algorithms, businesses can enhance their data analysis and decision-making processes, thereby improving overall operational efficiency. Furthermore, establishing a strategic partnership with JD can facilitate better access to and service of a wider customer base.

Low-code platforms are better tailored to the needs of small and medium-sized enterprises. Small and medium-sized businesses seeking to undertake digital transformation should prioritize an assessment of their current status and enterprise characteristics to devise a tailored development strategy. SMBs should emphasize addressing the unique challenges and difficulties they face in their operations. They can achieve this by leveraging low-code systems to tailor solutions to their specific needs and to streamline the incorporation of digital transformation within the SMB. Low-code platforms decrease the technical expertise required by developers, enabling technologies traditionally tailored for developers to become more accessible to the general population. Additionally, they cater to the intricate and customizable requirements of certain businesses within the company [8]. For instance, a traditional physical retail store can utilize a low-code platform for visualizing and integrating various data sources, such as sales and purchase records, to enhance the efficiency of its digital operations [8]. Furthermore, low code is appropriate for conducting small-scale trial operations within a controllable cost framework, initially implementing point-to-point solutions and subsequently expanding the scope of transformation after evaluating the effectiveness.

4. Conclusion

Following the 3S theory, JD Logistics encompasses a wide range of areas in its digital transformation, such as big data, blockchain, artificial intelligence, and automation technologies. JD Logistics has established a nationwide warehousing network, integrated intelligent systems and facilities, and emphasized collaboration with various components of the supply chain to create integrated logistics services, committed to building a green symbiotic logistics ecosystem. Cooperation at all stages of the supply chain effort facilitates the integration of logistics services and enhances operational efficiency and service quality. At the same time, to achieve sustainable logistics solutions, a green symbiotic logistics ecosystem is built. Furthermore, it assists small and medium-sized enterprises in overcoming technological limitations in warehousing and logistics, thereby contributing to overall economic development. It is important to note that small and medium-sized enterprises should actively adopt the digital transformation strategy and customer-centric approach of JD Logistics, and engage in comprehensive cooperation with large platforms or utilize low code to enhance operational efficiency and reduce costs.

The successful digital transformation of JD Logistics offers valuable insights and opportunities for other enterprises. In the digital age, companies must leverage big data and AI technologies, optimize their supply chains, engage in cross-border collaborations, and make leadership and organizational changes, while clearly defining strategic goals and developing detailed implementation plans to remain competitive in the market. Future research should focus on analyzing specific challenges faced by small and medium-sized enterprises in light of the experiences of JD Logistics, and tailor solutions to the unique characteristics of different types of enterprises.

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