Proceedings of ICFTBA 2024 Workshop: Finance in the Age of Environmental Risks and Sustainability
DOI: 10.54254/2754-1169/127/2024.OX18254

The Impact of Digital Transformation on Logistics Efficiency

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Abstract: The logistics business, like others, is undergoing dramatic transformations as a result of the worldwide digitization movement. The logistics industry in China, as a critical pillar of economic development, faces enormous potential for growth. Digital transformation has emerged as a fundamental driver for the logistics industry, with the potential to significantly improve logistics efficiency, cost, and user experience through technological and model changes. This article examines the digital transformation of the Chinese logistics business, using Jingdong Logistics as a sample case study. It investigates how Jingdong Logistics has significantly improved logistics efficiency through digital transformation, as well as an in-depth investigation of how it serves as an industry leader in this regard. The purpose of this study is to highlight Jingdong Logistics' digital transformation success stories, as well as provide useful references and inspiration for the digital transformation of the logistics industry and other industries. The number of firms participating in digital logistics has increased significantly across the country, and the market size has continued to grow, indicating the powerful significance of digital transformation in driving the logistics industry's expansion. Jingdong has significantly improved logistical efficiency by leveraging elements such as data-driven decision-making, process automation, and precision marketing, resulting in a more convenient and personalized shopping experience for customers. Jingdong not only focuses on improving its own operating efficiency, but it also actively provides digital procurement services to the real economy, supporting inclusive and shared growth in the logistics industry.

Keywords: Digital Transformation, Operational Efficiency Improvement, Enterprise Digital Transformation Strategy, Leading Role.

1. Introduction

The rapid advancement of information technology and the digital era have benefited a variety of sectors. In October 2022, the country had over 16,000 digital logistics enterprises, with the percentage of newly founded companies increasing from 0.4% in 2018 to 2.02% [1]. Experts anticipate the digital logistics market to reach a valuation of 35.67 billion yuan in 2020 and 128.05 billion by 2022, exhibiting an annual growth rate of 70.86%. In this context, the digital logistics market is thriving [1]. Manufacturing achieves intelligent production and personalized customization; retail has omnichannel marketing and intelligent inventory management; finance innovates; and the medical, education, agriculture, and service industries digitize, including telemedicine and online education. Digitization brings both benefits and challenges. More businesses and industries, particularly e-

DOI: 10.54254/2754-1169/127/2024.OX18254

commerce, are digitizing in response to increased consumer demand and spending power. Many businesses and industries, particularly e-commerce, are digitizing in reaction to changing consumer preferences and increased purchasing power. China's logistics business has expanded quickly over the last decade, making digital transformation critical for competitiveness. Data-driven decision-making, process automation, precision marketing, and other features all contribute to increased efficiency, cheaper costs, and a better customer experience.

Due to inefficiencies and high costs, Jingdong digitized cargo management and delivery route planning. The company divides digital transformation into introduction, expansion, integration, and platform. Boe entered the display industry in 2003, established capacity businesses from 2007 to 2012, integrated systems from 2012 to 2017, revolutionized IoT in 2017, and excelled in external enabling in 2020 [2]. Jingdong's "Jingcai Cloud" procurement plan, which incorporates "six management capabilities," uses retail infrastructure to intelligently match procurement requests and plans. Jingdong Enterprise Business Services serves 6,000 significant businesses, including 428 Fortune 500 companies [3]. While digitizing logistics, Jingdong Logistics achieves intelligent warehousing, precise delivery, and efficient service. Digital transformation can boost traditional firm value and produce new business value, according to Ding Meng's evaluation of Jingdong's enterprise value [4].

Following a series of digital transformations, greatly improved operational efficiency, and a world-class inventory turnover of nearly 10 million self-operated goods, Jingdong has achieved phased success. The inventory turnover time has decreased to approximately 30 days. Its intelligent supply chain superautomation can complete the intelligent decision-making and automatic purchase of the whole process of goods, helping Jingdong inventory turnover to drop to nearly 30 days [5].

Jingdong, as a rapidly developing enterprise, has also received certain attention in the academic community. Ye and others' investigations lack a specific analysis of Jingdong's logistics efficiency, and there is no evidence to support the evaluation of Jingdong's enterprise value following its digital transformation [6]. In contrast, Deng Meng's research focuses on the market value brought by Jingdong before and after its digital transformation [4]. However, neither of these articles examined the specific aspects of digital reform that directly impacted Jingdong's logistics efficiency, thereby influencing the evaluation of Jingdong's enterprise value. Therefore, this paper will examine the success of Jingdong Logistics' transformation, focusing on three specific aspects of digitalization, and subsequently analyze the impact of digitalization on Jingdong's enterprise value. Logistics efficiency is one of the key factors affecting Jingdong's value, so it is difficult to demonstrate the success of Jingdong's digital transformation without a specific analysis of logistics efficiency.

Given the importance of digital transformation to Jingdong's corporate valuation, this paper focuses on the impact of digital transformation on Jingdong's logistics efficiency. It explores the changes in logistics efficiency brought about by Jingdong's digital transformation drive and then analyzes the three aspects that have undergone major reforms using digital technology to assess their impact on logistics efficiency.

2. Case Description

Liu Qiangdong founded Jingdong, a well-known comprehensive e-commerce platform in China. The platform started as an offline sales company for optical and magnetic products and then gradually transformed into an online e-commerce enterprise. The Jingdong brand is dedicated to providing consumers with a diverse range of high-quality products, including electronics, household goods, clothing and cosmetics, food, and fresh products. Its core values of "authenticity guarantee" and "excellent service" have won the trust and love of a large number of consumers. Logistics plays a crucial role in Jingdong's development.

Jingdong Logistics is not only one of the key differences between Jingdong and other e-commerce platforms, but also an important component of its core competitiveness. Jingdong has become a leader

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in China's e-commerce sector due to several factors, including its proprietary logistics system, product quality control, logistics delivery services, and after-sales services. Logistics plays a crucial role in Jingdong's development. Jingdong Logistics is famous for its efficient, fast, and precise delivery services, which not only enable same-day and next-day fast delivery but also provide door-to-door pickup and return/exchange services.

In the context of the e-commerce industry's increasingly fierce competition and the rapid development of the digital economy, Jingdong has embarked on the path of digital transformation by leveraging its successful experience and market-leading position in its self-built logistics system. While there is no specific "start date" to determine the exact implementation time, it is evident that Jingdong has made continuous investments in the realm of digital technology and strategic adjustments in recent years.

Jingdong's digital transformation encompasses multiple aspects such as logistics, supply chain, marketing, and human resources. The adoption of intelligent warehousing, unmanned distribution, and other technologies in logistics enhances digital control over the entire link.

Jingdong has significantly enhanced the order processing speed and distribution efficiency. In the supply chain domain, Jingdong has established a digitally intelligent system to optimize all facets of the supply chain and enhance its flexibility and responsiveness. Big data and AI technology enable precision marketing and personalized recommendations in the marketing arena, thereby enhancing the return on investment of marketing activities. In human resources, the application of digital tools optimizes recruitment, training, performance management, and other processes, boosting organizational efficiency and employee satisfaction. Presently, this digital transformation has reached an advanced stage, which not only reduces operating costs for Jingdong but also notably improves overall efficiency and competitiveness, providing users with a superior and more efficient shopping experience.

3. Analysis on Problems

3.1. Reason on Reforming Smart Warehousing

The construction of Jingdong Smart Warehouse has converted traditional warehouses into smart warehousing, resulting in a successful overall logistics transformation. Because of the rise and quick development of the logistics business, as well as the ongoing escalation of market rivalry, the traditional logistics industry is continually shifting toward artificial intelligence. The Internet of Things has revitalized the logistics industry, and intelligent logistics systems based on IoT technology have introduced automation technology into traditional manual logistics systems with the goal of reducing error rates, improving logistics service efficiency, and, ultimately, improving logistics service quality [6]. Currently, the warehouse is dealing with an increasing number of problematic issues. These include minimizing inventory investment, enhancing inventory management and supervision, cutting logistics and distribution expenses, making better use of space, personnel, and equipment, and shortening the warehousing process and inspection time. These challenges have become critical for businesses looking to reduce expenses and increase their competitiveness.

In light of these issues, Jingdong implemented an intelligent warehouse reform, emphasizing the importance of transforming the old warehousing mode, which was defined by an inappropriate layout, problematic supply and demand matching, and excessive warehousing expenses [7]. To improve commodity storage and sorting, Jingdong deployed modern technology, such as automated vertical warehouses and intelligent sorting systems. Robots handle and stack products, while clever algorithms optimize storage places. This resulted in a significant increase in warehouse space utilization, a reduction in the time required to identify and move items, and a decrease in error rates.

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Therefore, the hasty intelligent transformation is one of the most important factors for Jingdong Logistics to move towards digitalization. In studying the future development of warehousing, Min Hua pointed out that the development of intelligence can save a lot of labor costs for enterprises [8]. This, in turn, leads to a significant improvement in overall logistics efficiency. Additionally, it lessens the time expended by warehouse personnel in completing tasks like order picking, packaging, and shipping [8]. To increase the return on assets, utilize storage equipment to the fullest extent possible [8]. Thus, it provides strong support for logistics delivery. The transformation of the traditional warehouse into intelligent warehousing demonstrates the efficiency improvement in time and warehouse layout, which ultimately contributes to the success of Jingdong's digital logistics transformation.

3.2. Reason on Intelligent Delivery System

Jingdong's intelligent delivery system gives it a significant advantage in the e-commerce industry. Previously, urban logistics distribution faced numerous challenges, including the inability to deliver on time during special periods, the difficulty of timely delivery during the 2020 novel coronavirus epidemic, and the need to prevent the spread of the virus, all of which significantly impacted delivery efficiency and safety. The diversification of urban distribution needs has increased the difficulty for urban distribution companies. Path planning presents numerous challenges, and there is currently no centralized statistical distribution route in place.

In this context, Jingdong has moved from traditional delivery methods to intelligent delivery. Jingdong has improved real-time route planning and optimization by using big data and artificial intelligence technology. Its specific approach is to consider multiple factors, such as order information, traffic conditions, and customer needs, and intelligently generate the best delivery route. Ultimately, it shortens delivery distances, reduces delivery times, and significantly improves delivery punctuality rates. It has also vigorously developed unmanned delivery technology, which played a key role in the 2020 pandemic.

Scholar Xie Yuxin and others found that intelligent distribution played a key role during the epidemic, highlighting its ability to prevent direct contact between people in an emergency environment [9]. The system incorporates a depth camera and radar detection module to analyze and map the surrounding environment [9]. The map-building model enables fully automatic navigation and transportation, effectively resolving the issue of conflicting delivery times [9]. Jingdong has accelerated its delivery efficiency, greatly improved consumer satisfaction, and ultimately realized its digital transformation success after a series of strategic transformations.

3.3. Reason on Logistics Visualization

Because Jingdong Logistics has established logistics visibility, it has built a bridge of trust with consumers, which is a key move towards digitalization. Transparency in information was challenging in the early logistics market, hindering the implementation of real-time tracking and monitoring. Jingdong Logistics has clearly defined a visible process for real-time consumer supervision. Jingdong Logistics has implemented a logistics visibility platform that enables real-time tracking and monitoring of the entire logistics process. The specific approach is to use Internet of Things technology to equip goods with sensors and tracking devices, and feed real-time logistics information to the system. The result is that customers can have real-time information about the location and status of their goods, enhancing the transparency and controllability of logistics services and facilitating the timely discovery and resolution of logistics problems.

Gunawan and others' investigations have demonstrated that modern logistics are more transparent, enabling real-time tracking to meet customer needs [10]. Logistics, a crucial enabler of economies

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and global trade, has been experiencing a significant level of digitalization. Supply chains can now capture an unprecedented volume of data, presenting substantial opportunities for optimizing capacity utilization, better addressing customer needs, mitigating risk, and even facilitating business model innovations [10]. Jingdong's openness and real-time tracking of logistics information have greatly improved consumer satisfaction and trust, leading to the huge success of Jingdong's logistics digital transformation.

4. Suggestion

4.1. Suggestion on Intelligent Warehousing

In the field of intelligent warehousing, Jingdong Logistics needs to continuously optimize its intelligent warehousing system so as to improve the storage density and cargo turnover of the warehouse.

Cross-border e-commerce logistics enterprises have the ability to utilize a range of big data technologies, including data collection, analysis, and other methods. These technologies enable them to gather and analyze consumer browsing history, purchase needs, and other relevant information. By combining this information with a variety of tools, they can accurately predict their commodity purchase needs and timely transport various products to the appropriate warehouse. This approach can significantly enhance the efficiency of goods delivery to consumers, thereby improving their overall consumption experience [11]. Therefore, Jingdong Logistics can consider introducing more advanced intelligent storage equipment and systems, such as automated three-dimensional warehouses, intelligent shelves, etc., in order to improve the warehouse's storage density and cargo turnover.

At the same time, Jingdong Logistics can use the Internet of Things technology to achieve real-time monitoring and management of goods in the warehouse, as well as improve the accuracy and traceability of goods. In addition, Jingdong Logistics can leverage Amazon's warehousing management experience to automate the handling and sorting of goods in the warehouse through the use of robots and automated equipment, thereby enhancing warehousing efficiency and accuracy.

4.2. Suggestion on Intelligent Distribution

In terms of intelligent distribution, Jingdong Logistics should strengthen the construction of intelligent distribution systems to improve distribution efficiency and service quality. By optimizing the algorithm, it can be solved the problem of traversing the shortest path among all customer points. The logistics distribution path optimization problem is characterized by increasingly complex constraints and optimization objectives. An intelligent algorithm can prevent premature algorithm and stagnation, enhance the pheromone's updating mode, and refine the customer point selection strategy, thereby enhancing convergence speed and global search ability. The intelligent algorithm has a significant practical impact on the logistics distribution route optimization problem. By optimizing the algorithm, companies can solve the problem of traversing the shortest path among all customer points.

The logistics distribution path optimization problem is characterized by increasingly complex constraints and optimization objectives. An intelligent algorithm can prevent premature algorithm and stagnation, enhance the pheromone's updating mode, and refine the customer point selection strategy, thereby enhancing convergence speed and global search ability. The intelligent algorithm has a significant practical impact on the logistics distribution route optimization problem [12].

Therefore, Jingdong Logistics can improve distribution efficiency and service quality by introducing more advanced intelligent distribution systems, such as drones and unmanned vehicles. At the same time, Jingdong Logistics can also apply big data analysis technology to optimize the

DOI: 10.54254/2754-1169/127/2024.OX18254

distribution route, improve the full load rate of distribution vehicles, and reduce distribution costs. In addition, Jingdong Logistics can also learn from SF Express's distribution management experience and improve real-time monitoring and scheduling of delivery vehicles by establishing an intelligent scheduling system to improve distribution efficiency and service quality.

4.3. Suggestion on Logistics Visualization

In order to improve the clarity and precision of logistics data, Jingdong Logistics should further strengthen its logistics visualization system. Thus, Jingdong Logistics may enhance the clarity and precision of logistics data by implementing more sophisticated logistics visualization technologies, such as the Internet of Things and cloud computing.

Simultaneously, Jingdong Logistics can utilize mobile Internet technology to offer consumers up-to-date logistical information and inquiry services, thereby enhancing customer happiness and loyalty. In addition, Jingdong Logistics may leverage the logistics visualization expertise of the Cainiao network to create a sophisticated logistics information platform. This platform will enable the tracking and monitoring of logistics information at every stage, leading to enhanced efficiency and service quality in logistics operations.

5. Conclusion

In short, the digital age has had a profound impact on all walks of life, driving change at an unprecedented pace. As an important part of the logistics industry, the momentum of digital development is particularly strong, and more and more enterprises are joining this transformation trend. The data show that the digital logistics market is growing exponentially, from 35.67 billion yuan in 2020 to 128.05 billion yuan in 2022, with a compound annual growth rate of 70.86%. This trend clearly demonstrates the critical importance of digitalization in driving industry development and innovation.

The widespread application of digitalization in various sectors, including manufacturing, retail, finance, healthcare, education, and agriculture, not only drives the development of intelligent production, personalized customization, omnichannel marketing, and intelligent inventory management, but also opens up new avenues for growth and competitiveness. By leveraging data-driven decision-making, process automation, and precision marketing, businesses can significantly improve operational efficiency, reduce costs, and optimize the user experience.

The e-commerce sector is at the forefront of the digital transformation, actively adapting to these developments in order to effectively cater to evolving customer demands and increasing buying capacity. The logistics business in China has experienced significant advantages from digital transformation, which has become an essential strategy for enterprises to maintain a competitive edge in the intense market competition.

In summary, digitalization unquestionably presents both opportunities and problems across all aspects of life. Nevertheless, the advantages in terms of increased productivity, reduced expenses, and an improved user experience significantly outweigh the difficulties. With the ongoing advancement of technology, the process of digitization will persist in molding the future of diverse industries, propelling them towards enhanced innovation and expansion.

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