



Research on the Development and Green Strategy of China's Express Delivery Industry Under Digital Transformation

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Abstract. Driven by digital technology, China's express delivery industry has made significant progress in operational efficiency, user experience, and market competition. The rapid development of the express delivery industry has also brought environmental pressure, with a large number of express packaging and delivery vehicles causing a burden on the environment. To address this challenge, express delivery companies actively adopt green logistics technologies such as electric delivery vehicles, intelligent delivery systems, and green packaging materials, establish a comprehensive packaging recycling system, and improve environmental efficiency through digital management. The support of government policies and cooperation within the industry have further promoted the green development of the express delivery industry. This article elaborates on the growth trend and market share distribution of express delivery business volume, emphasizing the importance of green strategies in the sustainable development of the express delivery industry. The green development of the express delivery industry requires joint efforts of technological innovation, policy support, industry cooperation, and user participation to achieve a win-win situation of business growth and environmental protection.

Keywords: digital transformation, express delivery industry, green logistics, operational efficiency, user experience

1 Introduction

In recent years, with the rapid development of information technology, digital transformation has become an important driving force for the development of various industries. As an important support for global e-commerce, China's express delivery industry has ushered in unprecedented development opportunities in the wave of digital transformation. According to data from the State Post Bureau, the volume of express delivery services in China has exceeded 150 billion in 2023, an increase of nearly seven times compared to 20.67 billion in 2015. This astonishing growth rate is not only due to the rapid development of e-commerce, but also inseparable from the widespread application of digital technology in the express delivery industry. The in-

depth application of technologies such as big data analysis, artificial intelligence, and the Internet of Things enables express delivery companies to more accurately plan logistics routes, improve delivery efficiency, and reduce operating costs. For example, SF Express has achieved intelligent sorting and path optimization by introducing big data and AI technology, effectively improving the timeliness and accuracy of express delivery services. At the same time, the rapid development of the express delivery industry has also brought enormous environmental pressure. The large amount of express packaging and high-frequency delivery vehicles have caused a significant burden on the environment. Data shows that in 2022, the national express delivery industry consumed approximately 15 billion plastic bags, 12 billion packaging boxes, and 24 billion meters of sealing tape. The extensive use of these packaging materials not only increases resource consumption, but also causes serious environmental pollution. In this context, promoting the green development of the express delivery industry has become a focus of attention for both the industry and the government. The government has introduced a series of policies to encourage express delivery companies to adopt green technologies and reduce carbon emissions. For example, the "Green Packaging Standards for Express Delivery" issued by the State Post Bureau clearly requires express delivery companies to gradually reduce the use of non degradable plastic packaging and promote recyclable and biodegradable green packaging materials. Express delivery companies are also actively exploring green development paths, such as SF Express promoting the use of electric delivery vehicles in multiple cities to reduce carbon emissions during the delivery process. The combination of digital transformation and green strategies not only provides new ideas for the sustainable development of the express delivery industry, but also provides useful references for the green transformation of other industries[1]. This article will analyze in detail the impact of digital transformation on the development of China's express delivery industry from the aspects of improving operational efficiency, optimizing user experience, and intensifying market competition. Combined with practical cases, a series of green strategies will be proposed to provide reference for the sustainable development of the express delivery industry..

2 The Impact of Digital Transformation on China's Express Delivery Industry

The impact of digital transformation on China's express delivery industry is multifaceted, covering key areas such as operational efficiency, user experience, and market competition.

2.1 The Improvement of Operational Efficiency

The application of digital technology has greatly improved the operational efficiency of express delivery companies. The widespread application of big data analysis and artificial intelligence technology enables express delivery companies to plan logistics routes more accurately. For example, SF Express has achieved intelligent optimiza-

tion of delivery routes by introducing AI technology and big data analysis, effectively shortening delivery time, reducing fuel consumption and operating costs. The application of IoT technology has made package management for express delivery companies more intelligent. By embedding RFID tags in packages, courier companies can track the location and status of each package in real-time, greatly improving the efficiency and accuracy of package management. Data shows that after applying these technologies, SF Express's package loss rate has decreased by 30% and delivery punctuality has increased by 20%.

2.2 The Optimization of User Experience

Digital transformation has significantly improved user experience. Express companies provide one-stop services through online platforms, allowing users to easily place orders, check package status, and schedule delivery times through their mobile phones or computers. Express delivery companies use big data to analyze user behavior and preferences, providing more personalized services. For example, JD Logistics has launched precise delivery services by analyzing users' historical orders. Users can choose specific time periods for delivery, greatly facilitating their lives. The application of intelligent customer service system enables users to receive timely and accurate answers when encountering problems, improving customer satisfaction.

2.3 The Intensification of Market Competition

The digital transformation has intensified market competition. The emerging digital logistics platforms are rapidly rising through technological advantages, posing huge challenges to traditional express delivery companies. As a digital logistics platform under Alibaba, Cainiao Network quickly captured the market relying on Alibaba's e-commerce ecosystem. By 2023, Cainiao Network's market share has reached 15%, creating strong competitive pressure on traditional express delivery companies. In order to address this challenge, traditional express delivery companies have increased their investment in digital technology and promoted the transformation and upgrading of their enterprises. SF Express has improved delivery efficiency and service quality by introducing AI and big data technology, maintaining its market leading position.

2.4 The Protection of Environment

Digital transformation not only improves the operational efficiency and user experience of the express delivery industry, but also provides new ideas for environmental protection. Through big data analysis and intelligent scheduling systems, express delivery companies can optimize delivery routes, reduce empty driving rates, and thus lower carbon emissions. SF Express has promoted the use of electric delivery vehicles in multiple cities, effectively reducing vehicle emissions[2]. Data shows that the use of SF electric delivery vehicles in 2022 reduced approximately 500000 tons of carbon dioxide emissions. The application of information technology platforms has improved

the transparency and efficiency of the packaging recycling system, and promoted the green development of the express delivery industry.

2.5 Driven by Innovation

The digital transformation has driven the innovative development of the express delivery industry. Express delivery companies continuously introduce new services and products through technological innovation to meet the diverse needs of users. For example, SF Express has launched drone delivery services to solve the delivery problem in remote areas. Data shows that the application of drone delivery has increased SF Express's delivery efficiency by 40% in remote areas. The application of blockchain technology has improved the transparency and security of express delivery services. Through blockchain technology, users can view the real-time transportation trajectory and status of packages, effectively preventing package loss and tampering.

In summary, digital transformation has had a profound impact on the development of China's express delivery industry. Through the application of technologies such as big data, artificial intelligence, and the Internet of Things, express delivery companies have not only improved operational efficiency and user experience, but also intensified market competition and promoted innovative development in the industry. During this process, the express delivery company actively explored the path of green development and made important contributions to environmental protection. The combination of digital transformation and green strategies provides strong impetus and broad prospects for the sustainable development of China's express delivery industry.

3 Data Analysis

3.1 Growth Trend of Express Delivery Business Volume

In recent years, the volume of express delivery services in China has shown a rapid growth trend. Figure 1 shows the growth of China's express delivery business volume from 2015 to 2023.

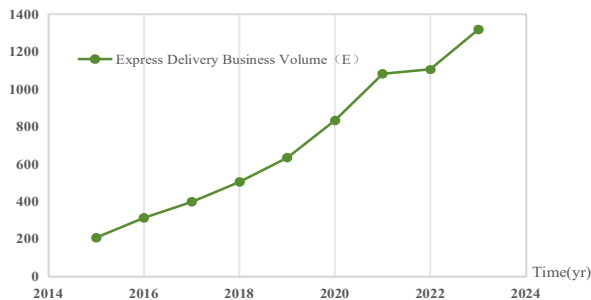


Fig. 1. Growth Trend of China's Express Delivery Business Volume (2015-2023)

From Figure 1, it can be seen that the volume of express delivery services in China has shown a sustained and rapid growth trend from 2015 to 2023. In 2015, the volume of express delivery services was 20.67 billion pieces, and by 2023, this number will increase to 132 billion pieces, with an average annual growth rate of over 30%.

3.2 Market Share Distribution of Major Express Delivery Companies in 2023

Figure 2 shows the market share distribution of major express delivery companies in 2023. From Figure 2, it can be seen that ZTO holds a leading position with a market share of 22.9%, and its business volume has reached 30.2 billion pieces. Yunda and YTO followed closely behind, with market shares of 15.92% and 15.81% respectively, and similar business volumes of 17.609 billion and 17.479 billion pieces, respectively. STO has a market share of 11.71% and a business volume of 12.947 billion pieces. SF Express has a market share of 10.8% and a business volume of 11.97 billion units, while J&T has a market share of 11.6% and a business volume of 15.34 billion units.

From the distribution of market share, ZTO clearly has a significant competitive advantage in the industry. However, the market share of Yunda, YTO Express, STO, SF Express, and J&T cannot be underestimated, indicating that the competition in the express delivery industry is extremely fierce, and the market share gap between major express delivery companies is not significant.

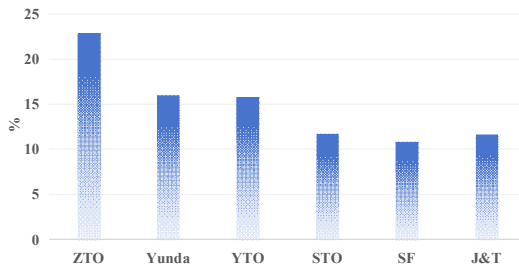


Fig. 2. Market share distribution of major express delivery companies in 2023

3.3 Green Development of Express Delivery Industry

Greening is the key to the sustainable development of the express delivery industry. Table 1 shows the investment and effectiveness of major express delivery companies in green logistics. From Table 1, it can be seen that SF Express has the highest investment in green logistics, reaching 5 billion yuan, followed by ZTO and JD Logistics. These investments are mainly used for the promotion of electric delivery vehicles, the development of intelligent delivery systems, and the application of green packaging materials. Green investment has brought significant carbon reduction effects. SF Express achieved a carbon reduction of 600000 tons in 2023, while ZTO and JD Logistics reduced their carbon emissions by 500000 tons and 550000 tons, respectively.

Table 1. Green Investment and Carbon Reduction of Major Express Delivery Companies in 2023

Express company	Investment amount (E)	Carbon emission reduction (10kt)
SF	50	60
ZTO	40	50
JD	35	55

4 Green Strategy for the Express Delivery Industry

The green development of the express delivery industry is not only a call for environmental protection, but also an inevitable choice for achieving sustainable development. In this industry, green strategies mainly include the application of green logistics technology, the establishment of recycling systems, digital management to enhance environmental efficiency, and policy support and industry cooperation.

4.1 Application of Green Logistics Technology

The application of green logistics technology plays a key role in promoting the greening of the express delivery industry. The promotion of new energy vehicles is one of the important measures. The high emissions of traditional fuel vehicles have always been one of the main sources of environmental pollution. The use of electric delivery vehicles and hybrid vehicles effectively reduces carbon emissions[3]. SF Express is promoting electric delivery vehicles in multiple cities, which not only emit almost no harmful gases during operation, but also significantly reduce noise pollution. Data shows that the use of SF electric delivery vehicles in 2022 reduced carbon dioxide emissions by approximately 500000 tons.

The development of intelligent delivery systems is also an important component of green logistics. Through big data analysis and artificial intelligence technology, express delivery companies can more accurately plan logistics routes, optimize delivery routes, reduce empty load rates, and thus reduce energy consumption and carbon emissions. For example, JD Logistics has achieved integrated management of warehousing and distribution through intelligent algorithms and big data analysis, effectively improving logistics efficiency and reducing energy waste during transportation.

4.2 Establishment of Recycling System

Establishing a comprehensive packaging recycling system is another important measure for the greening of the express delivery industry. The packaging materials of express packages are mostly disposable, which not only causes resource waste but also brings serious environmental pollution. Express delivery companies can promote the use of recyclable and biodegradable green packaging materials and establish a sound packaging recycling system by collaborating with packaging suppliers.

ZTO Express is at the forefront in this area. ZTO has set up packaging recycling stations in multiple cities, where users can return used packaging boxes to these recycling stations. ZTO is responsible for processing and reusing these packaging. In this way, the waste of packaging materials is reduced and environmental pollution is also minimized. Data shows that ZTO's packaging recycling station collected approximately 120 million packaging boxes in 2022, saving a significant amount of resources.

4.3 Digital Management Enhances Environmental Efficiency

Digital management not only improves the operational efficiency of the express delivery industry, but also provides new ideas for environmental protection. Through the application of information technology platforms, express delivery companies can achieve digital management of the entire process, thereby improving environmental efficiency. For example, the green logistics platform launched by Cainiao Network has achieved full lifecycle management of packages from production to recycling through big data and blockchain technology[4]. Users can check the logistics status and carbon emissions information of their packages in real time through the platform, and understand the environmental impact of their express delivery behavior.

The intelligent warehouse management system is also an important component of digital management. Through automated warehousing equipment and intelligent management systems, express delivery companies can effectively reduce energy consumption during the warehousing process. SF's intelligent warehouse management system achieves optimal utilization of warehouse space and energy consumption management through big data analysis and IoT technology, reducing carbon emissions in the warehousing process. Data shows that SF's intelligent warehousing system saved about 30% of energy consumption in 2022.

4.4 Policy Support and Industry Cooperation

The support of government policies and cooperation within the industry are also important factors in promoting the greening of the express delivery industry. The government can encourage express delivery companies to adopt green technologies and models by formulating relevant policies and regulations. The "Green Packaging Specification for Express Delivery" clearly requires express delivery companies to gradually reduce the use of non degradable plastic packaging and promote recyclable and biodegradable green packaging materials.

Collaboration within the industry is equally important. Express delivery companies can promote cooperation within the industry through industry associations, jointly develop green standards, and share green technologies and experiences. For example, the Green Logistics Alliance organized by the China Express Association brings together numerous express delivery companies to promote the green development of the entire industry through technical exchanges and cooperation. Under the promotion of the alliance, express delivery companies such as SF Express, ZTO Express, and Yun-

da have jointly developed and promoted multiple green logistics technologies, achieving significant results.

4.5 User Participation and Improvement of Environmental Awareness

The participation of users and the improvement of environmental awareness are also important driving forces for the greening of the express delivery industry. Express delivery companies can enhance users' environmental awareness and encourage them to participate in green logistics actions through various means. For example, SF Express has launched a green express points system, where users receive corresponding green points for every use of eco-friendly packaging or participation in packaging recycling activities. These points can be used to redeem eco-friendly products or offset express delivery costs[5]. Through this approach, SF Express not only enhances users' environmental awareness, but also promotes their enthusiasm for participating in green actions.

Green education and promotion are equally important. Express delivery companies can promote the concept and practice of green logistics to users through various channels such as social media, official websites, and offline activities, and enhance users' environmental awareness. Cainiao Network regularly publishes relevant information and cases of green logistics through WeChat official account and official website to show users the effectiveness and importance of green logistics, which has been widely recognized by users.

5 Conclusions

The digital transformation has brought unprecedented development opportunities to China's express delivery industry, but it is also accompanied by challenges in environmental protection and sustainable development. By applying green logistics technology reasonably, establishing a recycling system, improving digital management level, and strengthening policy support and industry cooperation, express delivery companies can effectively reduce their impact on the environment while achieving business growth, and promote the green development of the industry[6].

Under the dual promotion of digital transformation and green strategies, China's express delivery industry will usher in a brighter future. Express delivery companies should actively respond to this trend, achieve sustainable development through technological innovation and management optimization, and make greater contributions to environmental protection and economic development.

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References

1. Wang Ruoning. On the Current Status and Development Trends of Logistics Research in China [J]. China Navigation Weekly, 2021, (42): 50-51
2. Xia M. Analysis of Development Status and Existing Problems of Express Delivery Companies in China[J].Management,2024,7(2):
3. Li Min. Research on the Development and Green Strategy of China's Express Industry under Digital Transformation [J]. Logistics Technology, 2021, 44 (5): 67-69.
4. Fu-Rong X, Jiali W, Zhiqi S, et al. Synergistic Co-liquefaction of waste plastic express bags and low-rank coal based on supercritical water-ethanol system: Waste treatment and resource upgrading[J]. Journal of Cleaner Production,2023,425
5. Teng Yue The Green Development Report of China Post Express Industry (2019-2020) has been released to comprehensively promote green governance of express packaging and energy conservation and emission reduction in the industry. Environmental Economics, 2020, (21): 30-32
6. Guo Mingde, Li Hong. Spatial econometric analysis of influencing factors in China's express delivery industry [J]. Packaging Engineering, 2019, 40 (23): 196-202.

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