

Research on Digital Green Management Path of Logistics Enterprises: A Case Study of JD Logistics

Haoqin Zhuo

*School of Economics and Management, Chongqing Jiaotong University, Chongqing, China
15736516790@163.com*

Abstract. Against the background of the in-depth advancement of the "dual carbon" goal, logistics enterprises are faced with requirements including energy conservation and consumption reduction, transportation optimization, packaging reduction and carbon emission management. Taking JD Logistics as the research object, this paper studies the digital green management path of logistics enterprises based on policy documents, corporate ESG reports, public industry reports and relevant literature, using literature analysis, case analysis and text induction methods. The study finds that JD Logistics integrates green management throughout its operation mainly through digital warehouse management, intelligent transportation scheduling, green packaging cycle management, supply chain carbon management and ESG governance mechanism construction; digital technologies play roles in data collection, process optimization, resource allocation, process monitoring and collaborative management. The path is summarized as digital infrastructure construction, operation process optimization, resource consumption reduction, carbon emission management strengthening and green supply chain collaboration. The paper concludes that logistics enterprises should combine digital tools with specific business links to improve the effect of green management, and further promote the low-carbon transformation of logistics enterprises.

Keywords: Digitalization, Green Logistics, Low-carbon Transformation, JD Logistics

1. Introduction

Since the proposal of the dual carbon goal, corporate green transformation has become a hot topic in the field of economic management. Logistics enterprises connect production, circulation and consumption. Their business covers warehousing, transportation, packaging, distribution, recycling and other links, with remarkable energy and resource consumption. In recent years, the booming e-commerce and supply chain services have expanded the business scale of logistics enterprises, and the environmental impact caused by resource consumption in logistics activities has become increasingly prominent. Therefore, how logistics enterprises reduce resource consumption and carbon emissions while ensuring logistics efficiency has become a key issue to be addressed in their green management. The *Guiding Opinions of the State Council on Accelerating the Establishment and Improvement of a Green and Low-carbon Circular Development Economic System* proposes to develop green logistics, promote green and low-carbon transport vehicles, support logistics

enterprises to build digital operation platforms, and encourage the development of smart warehousing and smart transportation [1]. The *14th Five-Year Plan for Modern Logistics Development* calls for promoting logistics enterprises to "migrate to the cloud, adopt digital technologies and pursue intelligent upgrading", strengthening the application of new technologies and equipment for green logistics, and promoting circular packaging and reducing excessive packaging [2]. This indicates that the green management of logistics enterprises has been closely integrated with digital operation, supply chain collaboration and resource recycling.

Digital transformation also provides new management tools for enterprises' green development. Chao Xiaojing holds that the digital economy can promote the integration of data factors with traditional production factors, improve the efficiency of factor allocation and pollution control, and support industrial modernization [3]. Wu Weihong et al. find that clean production technology innovation and end-of-pipe treatment technology innovation play a mediating role when digital transformation drives the green transformation and upgrading of manufacturing enterprises [4]. Yang Chundi discovers that the digital transformation of manufacturing enterprises improves carbon performance, in which green supply chain management and ambidextrous innovation are the core mechanisms [5]. Chen Yang et al. find that enterprise digital transformation can lift the level of enterprise green innovation, and affect the differentiation of enterprise green innovation through the mediating effect of ESG, environmental performance, social responsibility and governance level [6]. Díaz Fernández et al. find that employees' digital competence can moderate the effect of digital transformation in promoting social sustainability [7]. These studies imply that corporate green management should be supported by digital technologies, organizational capabilities and governance mechanisms.

The green and low-carbon transformation of the logistics industry is related to supply chain operation efficiency and environmental performance. Zhang Xu et al. construct an evaluation index system for regional green logistics level, and find that there are obvious differences in provincial green logistics levels across China, among which scientific and technological input, freight turnover and fixed asset investment in the logistics industry have significant impacts [8]. Li Xuhui and Nian Qingyu analyze the spatiotemporal evolution characteristics of the coordinated development of digitalization and greenization in China's logistics industry, and put forward three paths: digital innovation collaboration type, green agglomeration driving type and diversified collaborative innovation type [9]. The formation of green logistics capacity is associated with the adoption of new technologies and policy incentives. Taking Cainiao and JD as examples, You Meihong et al. argue that process visualization, packaging recycling and intelligent waste treatment supported by 5G applications contribute to the formation of enterprises' green logistics capacity [10]. Based on a game model of green product supply chain, Shang Wenfang et al. find that there is a synergistic effect between green production and green logistics, and government subsidies can promote the operation and improvement of green logistics under certain conditions [11].

Green supply chain management emphasizes embedding environmental management into all stages including procurement, production, logistics, sales and recycling. Lan and Huang find that green supply chain management of supply chain enterprises affects the green innovation of their peer enterprises, and competitive pressure and learning effect are significant transmission mechanisms for such impact [12]. Essuman et al. point out that corporate green supply chain management, green innovation and sustainable dynamic capabilities jointly affect corporate environmental performance, and governance quality can positively moderate the effectiveness of green practices [13]. Yin Weili et al. believe that exploratory green innovation and supply chain integration can improve supply chain resilience through knowledge acquisition, knowledge transfer

and knowledge application [14]. Zhang Jieying et al. find that technological progress and management optimization are important sources for improving the green development efficiency of platform enterprises, and identify three improvement paths of management-human-digital collaboration type [15]. Wang Xuhui and Xie Xun analyze the green and low-carbon transformation practices of JD Logistics, and propose that digital scientific and technological innovation can lead the green and low-carbon transformation of the logistics industry through three paths: capacity improvement, technological upgrading and industrial joint development [16]. On the basis of existing research, this paper further focuses on how digitalization is embedded in specific business links, such as warehousing, transportation, packaging and carbon management.

2. Analysis of digital green management practices of JD Logistics

JD Logistics is a representative logistics and supply chain service enterprise in China, with businesses covering warehousing, transportation, distribution and supply chain management. It has a solid digital foundation and sufficient public disclosure materials, which meets the requirements of case study. This paper analyzes its practices mainly based on policy documents, corporate ESG reports, public industry reports and relevant academic literature, using literature analysis, case analysis and text induction methods.

2.1. Digital warehouse management and green warehouse construction

Warehousing is a link with concentrated operation and energy consumption in logistics enterprises. JD Logistics promotes practices including intelligent warehousing, photovoltaic power generation, intelligent temperature control, energy-saving lighting and automated operations in warehouse management, integrating low-carbon concepts into warehouse operation. According to JD Logistics' 2024 Environmental, Social and Governance Report, the company continues to advance low-carbon practices such as green warehousing, green transportation, green packaging and supply chain carbon management, and incorporates such practices into its ESG governance system [17]. As reported by the State Post Bureau, by the end of 2024, 10 warehouses of JD Logistics had obtained "green warehouse" certification. The total installed capacity of rooftop photovoltaics in its warehouses reached 139.22 MW, with an annual photovoltaic power generation of over 61,000 MWh, reducing carbon emissions by 50,900 tons. In 2024, JD Logistics cut carbon emissions by more than 500,000 tons throughout the year through green supply chain construction [18].

These practices indicate that green warehousing requires digital systems to manage warehouse operations and energy use. Intelligent temperature control systems can adjust energy consumption according to warehouse environment and operation needs, energy-saving lighting equipment reduces power consumption, and automated operations cut down ineffective handling. The promoting effect of digital warehouse management on green management can be summarized as improving operation efficiency, strengthening energy monitoring and boosting green energy utilization.

2.2. Intelligent transportation scheduling and green transportation promotion

Transportation is one of the main sources of carbon emissions for logistics enterprises. JD Logistics reduces energy consumption and carbon emissions in green transportation mainly through the application of new energy vehicles, hydrogen energy route transportation, railway transportation and route optimization. The transportation link involves issues such as order allocation, path planning,

vehicle dispatch, loading rate control and abnormal handling. Digital systems help enterprises balance efficiency and low-carbon goals when handling large-scale orders in complex scenarios.

The key to green transportation lies in the combination of new energy vehicles, transportation structure adjustment and intelligent scheduling. New energy vehicles reduce emissions from urban distribution and last-mile delivery; railway transportation lowers unit carbon emissions of long-distance trunk transportation; intelligent scheduling cuts emissions caused by empty driving, detours and waiting. The actual operation of JD Logistics shows that digitalization can provide practical operation decisions to meet green transportation requirements.

2.3. Green packaging and circular management

Packaging is a link with high resource consumption in e-commerce logistics and express delivery. JD Logistics' green packaging efforts focus on packaging reduction, packaging recycling and promotion of degradable materials. Circular turnover boxes, environmental protection insulation boxes and reusable packaging materials go through processes of delivery, circulation, recycling, cleaning and reuse. Digital technologies are applied to record the use status, circulation path and recycling situation of packaging, so as to improve the management efficiency of circular packaging.

JD Logistics' green packaging practices reflect the "reduction-reuse-degradation" logic: reduction mainly refers to cutting raw material usage and reducing secondary packaging; reuse is realized through circular turnover boxes, environmental protection insulation boxes and carton recycling; degradation aims to reduce the impact of waste packaging by promoting degradable materials. It can be seen that green packaging is a systematic management covering packaging design, use and recycling.

2.4. Supply chain carbon management and ESG governance

The green management of logistics enterprises exerts an influence on upstream and downstream industries. JD Logistics extends green management to supply chain scenarios through green warehousing, green transportation, green packaging and supply chain carbon management. Supply chain carbon management requires enterprises to master carbon emission data of each business link. Digital technologies help enterprises collect data from warehousing, transportation, packaging, distribution and other business links, and organize, calculate and analyze such data.

For logistics enterprises, carbon data management on the one hand supports their own ESG disclosure, and on the other hand helps customers identify carbon emission sources in the supply chain and enhance low-carbon collaboration between upstream and downstream industries. Through ESG report disclosure and internal governance mechanism construction, enterprises integrate green management into their strategic, operational and performance management processes.

3. Path framework of digital green management for logistics enterprises

Combined with the case of JD Logistics, the digital green management path of logistics enterprises can be summarized into five parts: digital infrastructure construction, operation process optimization, resource consumption reduction, carbon emission management and green supply chain collaboration.

First, digital construction is the basic condition for green management. Intelligent warehousing systems, transportation scheduling systems, packaging management systems, supply chain

management platforms and carbon data management platforms help enterprises keep track of energy use, vehicle operation, packaging circulation and carbon emissions.

Second, optimization of logistics operation processes falls into the scope of green management. Digital technologies can optimize warehouse operation processes, transportation paths and vehicle distance management, and reduce ineffective handling, empty driving and detours; they can also trace the circulation of circular packaging, improve packaging reuse rate and strengthen information system sharing between upstream and downstream parties.

Third, reducing resource consumption is the direct effect of green management. Energy-saving warehousing cuts power consumption; green transportation reduces fuel consumption; packaging reduction lowers material consumption; circular packaging decreases the use of paper packaging.

Fourth, strengthening carbon emission management is an expansion and extension of green management. Logistics enterprises need to manage carbon data in links including vehicle fuel, warehouse electricity consumption, packaging materials, trunk transportation and last-mile distribution, as the basis for low-carbon decision-making and ESG disclosure.

Fifth, green supply chain collaboration is a newer and higher level of green management. With the characteristic of connecting upstream, middle and downstream links, logistics can drive the low-carbon transformation of customers, suppliers, merchants and consumers through green warehousing, green transportation, green packaging and carbon management services.

4. Management implications and conclusions

Based on the analysis of JD Logistics' digital green management practices, logistics enterprises should align digital system construction with green management, embed functions such as energy consumption monitoring, path optimization, carbon emission accounting and packaging recycling into their system applications, and leverage digital empowerment to drive transformation. Green logistics management should also penetrate into operation details. Focusing on warehousing energy conservation, transportation emission reduction, packaging reduction, circular recycling and supply chain collaboration, enterprises should promote the establishment of institutional constraint standards, decompose green requirements into processes and quantify them into operation indicators. Meanwhile, enterprises should build a data collection mechanism covering the whole process of logistics including warehousing, transportation, packaging and distribution, and conduct continuous monitoring and measurement of energy use, packaging consumption, vehicle operation and carbon emissions. The data can serve as the foundation for enterprise low-carbon decision-making and ESG information submission. Platform-based logistics enterprises can also give play to the platform effect to promote collaborative transformation across the supply chain. They can drive the joint transformation of logistics enterprises on both supply and demand sides through green logistics solutions, so as to continuously promote the spillover of green packaging, low-carbon transportation and carbon management services.

Taking JD Logistics as a case, this paper analyzes the practices and functional paths of digital technology enabling green management in logistics enterprises. The analysis shows that relying on specific practices such as digitalized warehouses, intelligent transportation scheduling, green circular packaging and supply chain carbon management, JD Logistics embeds green management goals into logistics operation through green data, green processes, green resources and green collaboration. Further analysis indicates that the key paths of green management for logistics enterprises include digital infrastructure construction, operation process optimization, resource consumption reduction, carbon emission management strengthening and green supply chain collaboration. This conclusion demonstrates that the low-carbon transformation of logistics

enterprises requires the implementation of digital tools in specific links such as warehousing, transportation, packaging, distribution and supply chain management. Follow-up research can combine interviews, questionnaires or multi-case comparison to further examine the practical differences among different types of logistics enterprises.

References

- [1] State Council of the People's Republic of China. (2021). *Guiding opinions on accelerating the establishment and improvement of a green and low-carbon circular development economic system*.
- [2] General Office of the State Council. (2022). *14th five-year plan for modern logistics development*.
- [3] Chao, X. (2023). Digital economy empowers Chinese-style industrial modernization. *Journal of Humanities*(1), 22–26.
- [4] Wu, W., Yang, F., Zhang, A., & Liu, Y. (2023). Digital technology transformation, digital governance capability and green transformation and upgrading of manufacturing enterprises: Research on the mechanism of action based on digital empowerment theory. *Science & Technology Progress and Policy*, 40(12), 32–41.
- [5] Yang, C. (n.d.). Can digital transformation of manufacturing enterprises improve carbon performance? — From the perspective of process and knowledge management. *Science of Science and Management of S. & T.*, 1–22.
- [6] Chen, Y., Zhang, C., & Zhou, Y. (2025). Digital transformation, ESG and enterprise green innovation differentiation: Substantive innovation or strategic innovation? *Study & Exploration*(10), 126–134.
- [7] Fernández, M. D., Prieto, J. C. R., & Cabrales, A. L. (2026). Digital transformation and social sustainability: The mediating role of employees' digital competencies. *Technovation*, 156, 103607–103607.
- [8] Xu, Z., Mingrui, L., Chunxue, Z., & Xumei, Y. (2023). Evaluation of regional green logistics level and obstacle factors under the background of high-quality development. *Economic Geography*, 43(5), 139–149.
- [9] Xuhui, L., & Qingyu, N. (n.d.). Spatiotemporal evolution and multiple paths of coordinated development of digitalization and greenization in China's logistics industry: Based on AIS theoretical framework. *Arid Land Geography*, 1–13.
- [10] Meihong, Y., Mengling, Y., & Meizhang, H. (2020). Analysis on the expansion mode of green logistics capability driven by 5G application: Taking Cainiao and JD as examples. *Journal of Commercial Economics*(19), 103–106.
- [11] Wenfang, S., Guangyuan, Z., Zaixin, H., & Tao, L. (2026). Research on logistics development strategy of green product supply chain under bounded subsidy. *Mathematics in Practice and Theory*, 56(4), 105–126.
- [12] Lan, M., & Huang, Y. (2026). Promotion or inhibition, imitation or surpassing: Green supply chain management and peer green innovation. *Technovation*, 154, 103566–103566.
- [13] Essuman, A. N., Karikari, F. A., Boateng, S. A., Asongu, S. A., & Fumey, M. P. (2025). An outlook at corporate environmental performance through the lens of green supply chain management, green innovation, sustainable dynamic capabilities, and governance quality in an emerging economy. *Business Strategy and the Environment*, 35(1), 1317–1334.
- [14] Weili, Y., Wenxue, R., Sen, L., & Zhe, Z. (2025). Ambidextrous green innovation and supply chain resilience: From the perspective of knowledge management process. *Journal of Management Science*, 38(2), 1–12.
- [15] Jieying, Z., Xianyuan, S., Siyi, L., Junwei, B., Yang, L., Haoyu, D., & Xinnei, X. (2025). Research on measurement and improvement path of green development efficiency of platform enterprises: Analysis based on super-SBM model and fsQCA method. *Price: Theory & Practice*(10), 76–82.
- [16] Xuhui, W., & Xun, X. (2024). Mechanism and path of digital science and technology innovation leading the green and low-carbon transformation of logistics industry: A case study of JD logistics. *Research on Economics and Management*, 45(5), 21–40.
- [17] JD Logistics. (2025). *2024 environmental, social and governance report*.
- [18] State Post Bureau of the People's Republic of China. (2025). Annual carbon reduction of over 500,000 tons: JD logistics' green supply chain drives low-carbon transformation. *State Post Bureau of the People's Republic of China*. <https://www.spb.gov.cn/>