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Research on the Construction Path of Green Supply Chain for E-commerce Platform Enterprises

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Abstract: Establishing a green supply chain is the core means for e-commerce logistics platforms to achieve green transformation. This paper takes Cainiao Network as the research object, analyzes its practical measures in building a green supply chain, refines the construction path and methodology with top-level management, strategy implementation and information disclosure as the main framework, and deeply dissects the key strategies of each link, so as to provide practical reference for the construction of green supply chains of e-commerce logistics platforms.

Keywords*: Green Supply Chain; Cainiao Network; E-Commerce Logistics; Energy Conservation And Emission Reduction*

I. INTRODUCTION

In recent years, the global e-commerce industry has continued to expand driven by digital technologies and changes in consumption habits. Statista data shows that the global e-commerce scale is expected to reach 8.034 trillion US dollars in 2027, while China's Ministry of Commerce data shows that China's online retail sales reached 15.4 trillion yuan in 2023, a year-on-year increase of 11%. The vigorous development of the e-commerce industry has driven economic growth, but it has also caused environmental problems such as logistics carbon emissions and increased packaging waste. It is estimated that carbon dioxide emissions from e-commerce logistics transportation will increase by 32% in 2030 compared with 2019, so green transformation has become an inevitable requirement for the development of the industry.

In this context, e-commerce logistics is facing enormous environmental pressure. On the one hand, the high energy consumption and high pollution of traditional logistics models have intensified the contradiction with the growing demand for environmental protection; on the other hand, the policy requirements for green development are constantly increasing, and enterprises urgently need to explore new development paths. As a leading e-commerce logistics platform in China, Cainiao Network connects millions of merchants, logistics enterprises and consumers, and its supply chain greening construction has industry demonstration significance. Cainiao Network was established in 2013. At that time, the e-commerce market was developing rapidly, and the demand for the express delivery industry was increasing. However, the logistics industry had problems such as low distribution efficiency, high cost, poor service quality, and environmental problems such as logistics carbon emissions and packaging waste were prominent. In addition, the national policy encouraging the development of the logistics industry provided a good environment for its establishment and development. Cainiao Network aims to solve industry pain points, improve logistics service levels, respond to the green development trend, and promote its own sustainable development. Building a green supply chain not only responds to the national "dual carbon" strategy, but also is the key to promoting the sustainable development of the enterprise itself. By analyzing the practical case of Cainiao Network, this paper systematically sorts out the construction path of its green supply chain, so as to provide reference experience for similar enterprises.

(I) Theoretical Basis of Green Supply Chain for E-commerce Logistics Platforms

1. Characteristics of Green Supply Chain for E-commerce Logistics Platforms

(1) Wide network coverage: Take Cainiao Network as an example, its logistics network covers more than 300 cities across the country and links more than 1,700 logistics partners. The huge network scale leads to a wide range of environmental impacts.

(2) Concentration of carbon emissions in logistics links: According to Carbonstop data, carbon emissions from logistics transportation, warehousing and packaging links account for 51% of the total supply chain emissions. Among them, the transportation link has become a key point for emission reduction because it involves massive trunk transportation and end distribution.

(3) Strong technical drive: As a digital logistics platform, Cainiao Network's intelligent scheduling system and data center consume a huge amount of electricity every year. In 2021, data center carbon emissions accounted for 23% of the total emissions of the e-commerce platform's supply chain, so the application of green technology has become crucial.

(II) Main Challenges in Green Supply Chain Establishment

1. Difficulty in collaborative transformation

Cainiao Network involves multiple subjects such as upstream suppliers, midstream logistics enterprises and downstream consumers. All parties have significant differences in their cognition and investment willingness in green transformation, resulting in high coordination costs.

2. Difficulty in data acquisition and integration

There are information barriers in each link of the supply chain. For example, it is difficult to uniformly collect data such as the carbon footprint of suppliers' products and the real-time carbon emission data of logistics enterprises, which affects the evaluation of emission reduction effects.

3. Significant cost pressure

The research and development of green technologies (such as new energy vehicles and intelligent warehousing systems) and facility upgrades require a large amount of capital investment, which may affect corporate profits in the short term.

II. CASE ANALYSIS OF CAINIAO NETWORK'S GREEN SUPPLY CHAIN PRACTICE

Founded in 2013, Cainiao Network, as an infrastructure

service provider connecting e-commerce platforms and logistics enterprises, has developed a unique practice model for its green supply chain construction around the "green logistics" strategy. In the early stage, Cainiao Network built the Sky Network, Ground Network and People Network, and later upgraded its strategy to "One Horizontal and Two Verticals", promoted the construction of digital infrastructure in the logistics industry, built intelligent logistics supply chain solutions, and created a global logistics network; launched a series of products and services for consumers, merchants and express delivery enterprises; empowered warehouse management, and promoted express delivery to villages and cross-border logistics.

III. CONSTRUCTION PATH OF CAINIAO NETWORK'S GREEN SUPPLY CHAIN

(I) Top-Level Management

1. Formulation of Strategic Goals

Cainiao Network adopts a target system combining qualitative and quantitative aspects: qualitatively, it puts forward the vision of "achieving 50% carbon emission reduction by 2030"; quantitatively, it defines phased indicators, such as the proportion of new energy vehicles in ownership reaching 50% and the utilization rate of green packaging reaching 90% by 2025. This kind of goal setting not only points out the direction, but also facilitates assessment and evaluation.

2. Construction of Management System

(1) PDCA Cycle Mechanism

In the planning stage, formulate the "Green Logistics Action Plan" and clarify the emission reduction indicators for each link; in the implementation stage, promote partners to implement through the "Cainiao Green Alliance"; in the inspection stage, evaluate the effect relying on the carbon footprint tracking system; in the adjustment stage, optimize the strategy according to data feedback.

(2) Organizational Structure Guarantee

Establish a Sustainable Development Committee (planning layer) and a Green Logistics Execution Department (execution layer). The former is responsible for strategy formulation, and the latter coordinates resource implementation, forming a management system with clear powers and responsibilities.

(II) Strategy Implementation

1. Construction of Green Logistics Network

(1) Intelligent Warehousing and Path Optimization

Through big data analysis of consumer distribution, 8 regional warehouses have been established nationwide, shortening the average delivery distance of goods by 30%; an intelligent path algorithm has been developed, which reduced carbon emissions by about 120,000 tons through optimized delivery routes in 2023.

(2) Deployment of New Energy Transportation Capacity

Jointly with automobile companies to customize electric delivery vehicles, by 2023, more than 50,000 vehicles have been put into use, covering 200 cities across the country, and the energy consumption per unit has been reduced by 40% compared with traditional fuel vehicles.

2. Innovation in Green Packaging

(1) Packaging Lightweight

Launched "slim tape" (width reduced from 50mm to 45mm) and "plastic-free cartons", reducing packaging material consumption by 23,000 tons in 2023.

(2) Promotion of Recyclable Packaging

Developed "Cainiao Box", a recyclable express box made of food-grade PP material, which can be reused more than 50 times, and has replaced more than 100 million disposable cartons cumulatively.

(3) Environmental Protection of Materials

Promoted biodegradable plastic bags, with a usage rate of 100% in pilot cities such as Hangzhou and Shenzhen, and plans to achieve national coverage in 2024.

3. Greening of Data Centers

(1) Application of Energy-Saving Technologies

Adopted liquid-cooled servers, reducing heat dissipation energy consumption by 70%; through the AI intelligent temperature regulation system, the PUE (Power Usage Effectiveness) of the data center has dropped to 1.1, reaching the international leading level.

(2) Utilization of Renewable Energy

Built a photovoltaic power station in the Zhejiang data center, with an annual power generation of 120 million kWh, meeting 30% of its own electricity demand.

4. Green Management of Suppliers

(1) Green Rating System

Evaluate logistics partners from the dimensions of environmental protection qualifications, carbon footprint, and green technology application. Grade A suppliers can obtain priority cooperation rights.

(2) Support for Capacity Building

Provided carbon accounting tools and green technology training for small and medium-sized logistics enterprises, with a total of more than 100,000 person-times trained in 2023.

5. Waste Recycling System

(1) Reverse Logistics Network

Cooperated with communities to set up 50,000 express packaging recycling points, and recycled 35,000 tons of packaging materials in 2023.

(2) Recycling of Old Items

Through the "Cainiao Green Box Return Plan", recyclable packaging is uniformly processed and then re 投入 into the logistics link, forming a closed loop.

(III) Information Disclosure

Cainiao Network releases the "Sustainable Development Report" every year, disclosing key data of the green supply chain:

1. Carbon emission reduction reached 850,000 tons in 2023
2. Cumulative use of green packaging exceeded 3 billion
3. The proportion of delivery orders by new energy vehicles accounted for 35%

Information disclosure not only enhances public trust, but also provides data support for its own improvement.

IV. CONCLUSIONS AND ENLIGHTENMENTS

The practice of Cainiao Network shows that the construction of green supply chain for e-commerce logistics platforms needs to build a closed-loop system of "strategy - execution - feedback". In terms of top-level design, it is necessary to clarify goals and establish organizational guarantees; in strategy implementation, focus on key links such as logistics, packaging and data centers, and break through difficulties through technological innovation and collaborative cooperation; at the same time, attach importance to information disclosure to form a continuous improvement mechanism.

In the future, with the advancement of the "dual carbon" goal and consumption upgrading, the green supply chain will become the core competitiveness of e-commerce logistics platforms. Enterprises should combine their own characteristics, explore differentiated paths, and promote the industry to develop in the direction of low carbon and recycling.

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