# ANALYSIS ON ACTIVITY-BASED COSTING APPROACH FOR JD LOGISTICS WAREHOUSING OPERATION (NANNING AREA)

NI ZHANG

An Independent Study Proposal Submitted to the Graduate School of

Naresuan University

in Partial Fulfillment of the Requirements

for the Master of Science in Logistics and Digital Supply Chain - (Plan B)

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Faculty of Logistics and Digital Supply Chain Naresuan University

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**Title** ANALYSIS ON ACTIVITY-BASED COSTING APPROACH FOR JD LOGISTICS WAREHOUSING OPERATION (NANNING AREA)

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## ABSTRACT

This study applies the Activity-Based Costing (ABC) method to analyze the logistics operating costs of JD Nanning Intelligent Logistics Park during 2022–2023 and proposes targeted cost-reduction measures.

The findings indicate that the park's total annual operating costs increased moderately from 100,801,612.1 RMB in 2022 to 101,421,155.9 RMB in 2023, with the warehouse management center accounting for the largest share (average 44.71% over the two years). The sorting and processing center's cost proportion rose significantly from 30.59% to 36.74%, while the transportation and distribution center's share declined from 25.24% to 18.02%. Concurrently, order volume grew from 20,752,226 to 23,155,985 orders. Compared with traditional costing methods, ABC yielded a lower per-order cost (2.81 RMB vs. 3.19 RMB), demonstrating higher accuracy in cost management. Monthly cost fluctuations showed peaks in warehousing and sorting during specific periods (e.g., June and year-end), while transportation costs remained relatively stable, especially in H2 2023.

The application of ABC enabled a clear identification of cost drivers across warehousing, sorting, and transportation by linking resources (labor, equipment depreciation, utilities, etc.) to specific activities (order processing, inventory handling, distribution, etc.). This approach accurately reflected resource consumption at each operational stage, facilitating precise evaluation of cost behavior amid operational changes (e.g., increased orders during promotions). The

insights derived from ABC provide a basis for formulating strategies to reduce operating costs and enhance efficiency in JD Nanning Intelligent Logistics Park.

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This research would not have been completed without the support, guidance, and encouragement of numerous individuals, and I would like to express my sincere gratitude to each of them.

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Thanks to my Thai graduate classmates, professors and faculty staffs for creating a harmonious and collaborative learning atmosphere. During my studies, they promptly helped me integrate into the local academic life and culture—either explaining regional customs, guiding me through campus routines, or sharing tips for balancing studies with daily life. Their warmth and thoughtfulness effectively eased the pressure of pursuing courses abroad, making the unfamiliar environment feel like a

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I also wish to thank the leaders and colleagues at JD Group and Logistics Nanning Intelligent Logistics Park. Their active cooperation made this empirical research possible: they provided valuable operational data, opened the door to on-site investigations, and shared practical experiences in warehousing and distribution with sincerity. The first-hand information and on-site observations obtained through their support formed the solid empirical basis of this study.

Finally, my heartfelt gratitude goes to my family members. To my parents, thank you for your unwavering support and understanding, even when I was too busy with research to accompany you. To my husband, thank you for taking on more family responsibilities, silently supporting me through the most challenging stages, and being my most solid backing. This achievement belongs not only to me but also to all of you.

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NI ZHANG

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# CHAPTER I
# INTRODUCTION

## Research Background

### Overview of China's Logistics Development

Modern logistics is an important indicator of a country's modernization level and comprehensive national strength. It has an extremely important impact on promoting the sustainable development of the national economy and transforming the economic growth model. Modern logistics is also a major factor in measuring the comprehensive strength of a modern country. It plays an important role in promoting economic development and is an "accelerator" of national economic growth. With the rapid development of e-commerce in the 21st century, China's logistics industry has also ushered in great development. The continuous increase in China's logistics demand is reflected in the continuous increase in the total social logistics volume. According to the logistics data of the National Bureau of Statistics of China, from 2019 to 2023 (Sources: State Post Bureau of The People's Republic of China, (National Bureau of Statistics of China, 2020, 2021, 2022, 2023, 2024), China's total social logistics volume will increase from 29.8 trillion yuan to 35.24 trillion yuan. In terms of growth rate, the average annual growth rate reached 5.44%. The scale of the logistics economy has maintained a momentum of sustained growth. New formats such as e-commerce logistics and online services continue to grow rapidly. China's logistics industry has grown stronger.

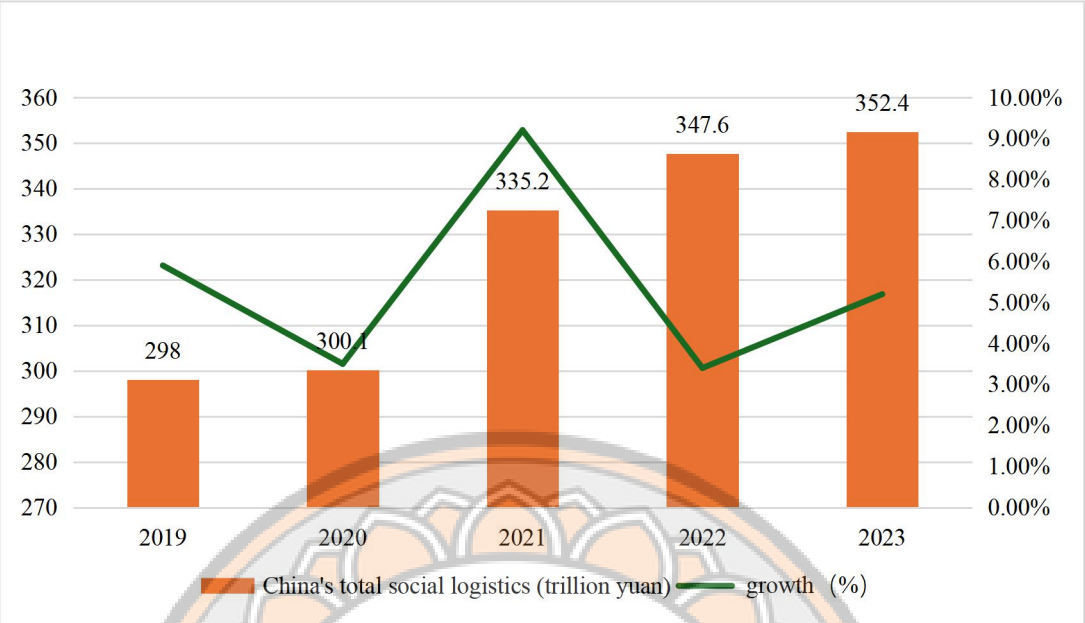



**Figure 1 Total Social Logistics Volume and Growth of China (2019- 2023)**

**Source:** China National Bureau of Statistics, author collation (2020, 2021, 2022, 2023, 2024)

The Chinese government departments are aware of the importance of the logistics industry to economic development and have given full guidance and support to the development of the modern logistics industry, especially providing a good development environment and development opportunities for the e-commerce logistics industry. The Chinese government has successively promulgated relevant documents such as the "14th Five-Year Plan for the Development of Modern Comprehensive Transportation System"(State Council of Republic of China, 2021) and the "14th Five-Year Plan for the Construction of Modern Circulation System" (National Development and Reform Commission, 2022) and introduced a series of measures to build a complete logistics infrastructure network system. It has proposed to accelerate the development of modern logistics services, build a modern logistics system, and accelerate the digitalization of the service industry in order to enhance the vitality of logistics enterprises, achieve logistics cost reduction and efficiency improvement, and improve the efficiency and benefit level of the industry.

However, compared with the logistics of developed countries, China's logistics industry is large but not strong, and there are many problems. In 2023,

China's total logistics social total accounted for 14.4% of GDP, a year-on-year decrease of 0.3% (National Bureau of Statistics of China, 2024), while developed countries such as the United Kingdom, the United States, and Japan were less than 9%, which is still a long way from the global average (12%) (National Development and Reform Commission & China Federation of Logistics & Purchasing, 2020, 2021, 2022, 2023, 2024). A series of data highlights that China still faces huge challenges in reducing costs and increasing efficiency in the logistics industry. Facts show that the continued rise in logistics costs has led to a high proportion of logistics costs in GDP, and efficient logistics cost control can save 15%-30% of logistics costs.

Especially in the field of e-commerce logistics, which is developing most rapidly, as the Chinese e-commerce market matures, more and more competitors are entering the e-commerce industry. The profit of selling products is getting smaller and smaller. Relying on sales volume and scale to gain cost advantage is becoming increasingly ineffective. Instead, it is relying on logistics and supply chain management. In many industries, logistics costs account for a large part of the total cost, which also means that it is feasible to significantly reduce the total cost by restructuring the logistics process. Logistics cost management is the core of logistics enterprise management and strategy. Cost accounting and cost structure analysis are the basis for enterprises to control costs. China's logistics industry has not yet formed a relatively complete system for cost accounting. Cost accounting is relatively extensive, and indirect cost accounting with a larger proportion has not been collected and allocated. As a result, although the management of most logistics companies is aware of their own high costs, they cannot accurately analyze the reasons for the high costs and thus fail to effectively control costs and improve efficiency. Researching and solving the cost control problems faced by enterprises in the logistics link of the e-commerce supply chain and strengthening the research on the optimization of logistics costs of e-commerce enterprises have become an important part of e-commerce enterprises to achieve profit expansion and improve corporate competitiveness. Logistics costs are composed of management costs, transportation costs, and warehousing costs, among which warehousing costs account for the largest proportion. Reducing the operating costs of enterprises in

warehousing and obtaining higher economic benefits can maintain the sustainable development of enterprises under high returns.

Therefore, under the guidance of China's dual circulation strategy with domestic circulation as the focus, the logistics industry will shift from high-speed development to high-quality development. In view of the current status of China's logistics industry, the current transformation and upgrading of the logistics industry should focus on reducing enterprise operating costs and improving enterprise operating efficiency (National Development and Reform Commission, 2022). In particular, the reasonable collection and analysis of logistics service costs, finding cost optimization measures, and effectively reducing the costs of e-commerce logistics companies can maintain the market competitiveness of enterprises by controlling logistics costs. This is of great practical significance for accelerating the development of China's modern logistics industry, improving industrial operating efficiency, achieving cost reduction and efficiency improvement for enterprises, improving the overall competitiveness of logistics enterprises, regions and even the country, and promoting mutual benefit and win-win results among various industrial sectors of the national economy.

Current Status of Warehousing and Logistics in China

First, from the perspective of market demand, with the rapid development of e-commerce, consumers have higher and higher requirements for express delivery and logistics services. According to data from the National Bureau of Statistics of China, the volume of express delivery business has grown rapidly in recent years. In 2020, China's express delivery business volume was 83.358 billion pieces, a year-on-year increase of 31.22%. By 2023, it will jump to 132.07 billion pieces, a year-on-year increase of 19.40%. (Figure 2: Business Volume of China Express (2018-2023)). This puts forward higher service requirements for warehousing companies, which need to provide faster, more efficient and safer logistics services.

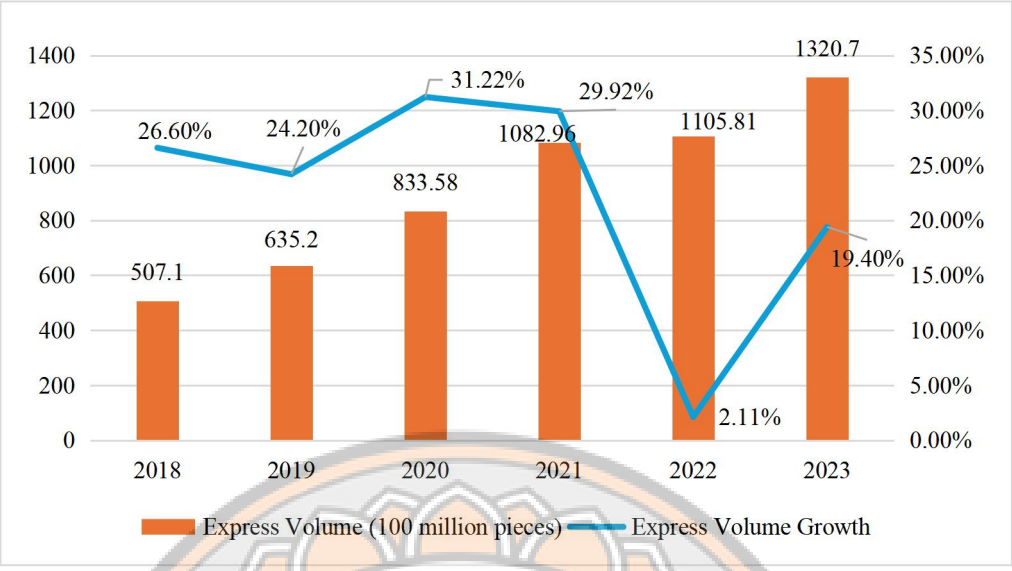



**Figure 2 Business Volume of China Express (2018-2023)**

**Source:** (State Post Bureau of The People's Republic of China, 2018, 2019, 2020, 2021, 2022, 2023), author collation.

With the booming development of e-commerce, the change in customer consumption habits, the large-scale entry of foreign companies into the domestic market, and the rise of various promotional activities, warehouses can no longer meet the needs of enterprises in terms of efficiency and accuracy simply through paper operations or simple system management. The efficiency of warehousing business, quality monitoring of high-value goods, and reverse logistics after large-scale promotional activities have gradually become the pain points and focus of e-commerce enterprise warehouse operators. In order to expand market share, enterprises need to innovate business management models, implement lean warehousing cost management, and reduce business operation costs, thereby enhancing the core competitiveness of enterprises.

Secondly, with the continuous development of AI and IoT technologies, warehousing companies are also facing the pressure of digital transformation. IoT technology has been widely used in the logistics industry. For example, intelligent warehousing systems can realize the automated storage and management of items in the warehouse, improving the efficiency and accuracy of warehousing. At the same

time, IoT technology can also realize real-time monitoring and tracking of logistics vehicles and goods, improving logistics safety and reliability.

Thirdly, policy changes have also had an impact on the operation of warehousing companies. For example, the "Law of the People's Republic of China on Promoting the Development of the Logistics Industry" implemented in 2020 clarifies the norms and standards that logistics companies should abide by, requiring logistics companies to improve service quality, ensure service safety, save energy and reduce emissions, and operate in compliance. This puts higher demands on warehousing companies, and it is necessary to strengthen the standardization and standardization of internal management and processes of enterprises.

Finally, from the perspective of corporate competitiveness, warehousing companies need to have higher benefits and service capabilities. China has entered an explosive growth in express logistics since 2007. According to data released by the National Bureau of Statistics, Since 2011 to 2023, China's express revenue amount from 0.075 trillion rapid growth to 1.2 trillion (State Post Bureau of The People's Republic of China, 2011, 2019, 2020, 2021, 2022, 2023, 2024), express total revenue accounted for the proportion of China's total logistics revenue also grew from 1.24% to 9.15% (Figure 3 The Proportion of Express Revenue of China (2011-2023)), the express logistics market size is getting bigger and bigger, the impact on the entire national logistics industry is also more and more prominent. China's total warehousing revenue reached 13.2 trillion yuan in 2023, a year-on-year increase of 3.9%. This means that competition among warehousing companies is becoming increasingly fierce, and they need to improve service quality and efficiency, reduce costs, and enhance core competitiveness.

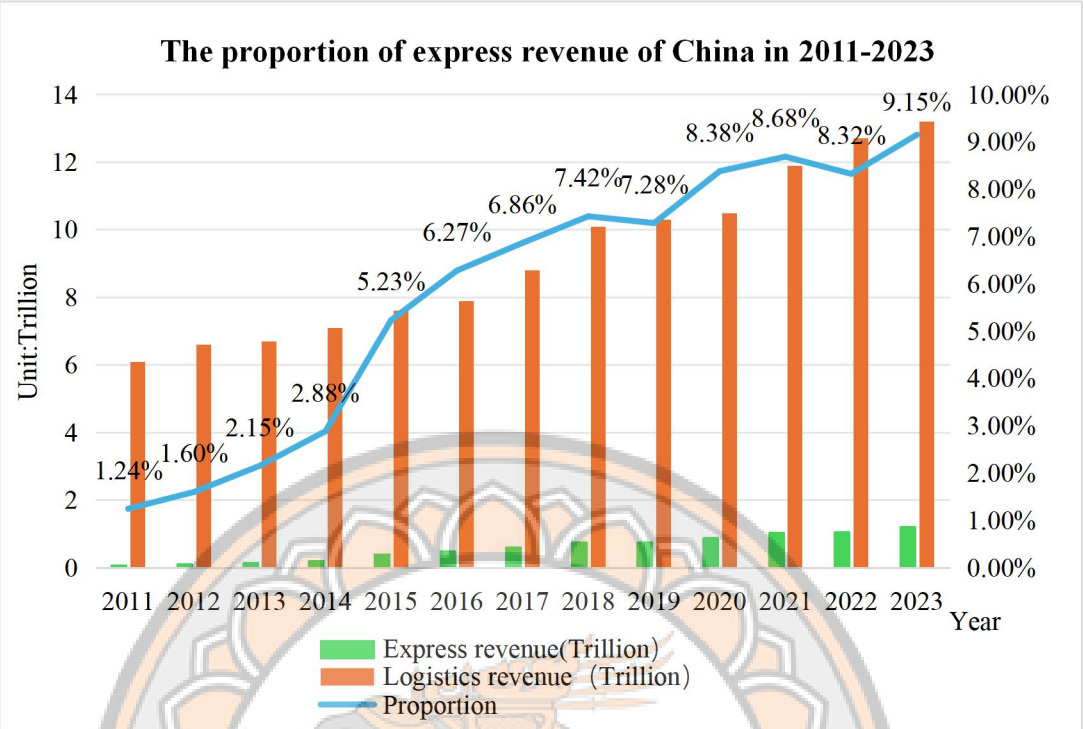



**Figure 3 The Proportion of Express Revenue of China (2011-2023)**

**Source:** author collation, (State Post Bureau of The People's Republic of China, 2011, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024), (China Federation of Logistics & Purchasing, 2011, 2012, 2013, 2014, 2015, 2016, 2019, 2020, 2022).

**Current Status of Logistics Cost Calculation**

Nowadays, most logistics enterprises still use traditional logistics cost accounting. Logistics costs mainly include labor costs, storage costs, packaging costs, transport costs, information processing costs and other logistics management costs. In terms of cost management, logistics enterprises are generally deficient in the following aspects.

High proportion of Indirect Costs and Lack of Rationalization in Their Allocation

When allocating logistics costs, logistics companies classify direct costs, such as direct labor and direct materials, in each logistics segment according to the sub-items under the corresponding logistics segment. However, indirect costs such as warehouse rent, utilities, and equipment depreciation are usually directly included in the major category of logistics costs or uniformly classified into larger sub-items.

Some companies allocate indirect costs to each logistics project by means of average distribution. For logistics companies with a relatively large proportion of indirect costs, this method fails to accurately calculate and manage the logistics costs of various logistics projects. The calculation results are unscientific and unreasonable, which is not conducive to the management's acquisition of real logistics cost information and affects the effectiveness of decision-making. Logistics companies using traditional cost methods to calculate logistics costs are prone to distorted logistics information and cannot provide accurate decision-making information for management.

Failure to Aggregate Costs Across Operating Centers

The operation process of logistics enterprises mainly includes specific operation steps such as order processing, loading and unloading, goods in and out of the warehouse, warehouse management, packaging processing, and goods transportation. The cost data of each operation step is very important for calculating the logistics cost of logistics enterprises and the logistics cost management of enterprises. In the process of logistics cost accounting, most logistics enterprises do not collect costs according to the operation Center and lack targeted analysis of the costs generated by each logistics link. On the one hand, they fail to better clarify the specific operations of each operation Center, and on the other hand, they cannot conduct targeted systematic analysis of each logistics link. The logistics cost consumption process cannot be fully reflected, which is not conducive to the cost management and accounting of each operation Center and the entire logistics operation.

Lack of Comprehensive and Effective Cost Management

The cost management of logistics enterprises lacks comprehensiveness. Logistics cost management is the "third profit source" of enterprises and an important source of profit for modern enterprises. However, effective logistics cost management does not rely solely on the management and financial departments, nor is it limited to calculating logistics costs. Instead, it requires the participation of all employees of logistics enterprises, from logistics cost budgeting to accounting, and then to the assessment and evaluation of logistics cost execution, which runs through the whole process management of enterprise logistics activities. From the current

management status of case logistics enterprises, first of all, enterprises have not established cost management execution and assessment systems for various departments. Except for management and financial department personnel, employees in other departments lack knowledge of logistics cost management and lack cost management awareness. Secondly, logistics enterprises have not carried out comprehensive management of financial processes including logistics cost budgeting, cost accounting, cost control and evaluation. Therefore, logistics enterprises cannot carry out comprehensive bottom-up management of logistics costs.

The boundaries between logistics projects are blurred, costs cannot be effectively aggregated, and the profit and loss situation is not accurately reflected

For third-party logistics companies, in order to improve resource utilization efficiency and reduce logistics costs, multiple logistics projects are usually managed in the same logistics Center. However, it is inevitable that the boundaries between logistics projects are blurred, and the costs of various logistics projects cannot be effectively aggregated, resulting in overestimation or underestimation of the logistics costs of individual projects. It is impossible to truly reflect the profit and loss situation of each logistics project, which is not conducive to scientific decision-making by the company's management.

**Current Status of Logistics Cost Accounting Methods**

In the e-commerce environment, the logistics service process is complex, and the indirect costs account for a large proportion. Traditional cost accounting cannot correctly reflect the logistics service costs. The information on logistics costs is scattered in various accounting subjects of enterprise cost accounting. The logistics costs allocated according to the current cost allocation method cannot fully reflect the overall picture of logistics costs. The hidden and ambiguous nature of logistics costs makes it impossible for enterprise decision makers to know the true situation of logistics costs, resulting in the difficulty of making reasonable decisions on the investment and benefits of enterprises in logistics due to the lack of accurate reflection.

Since the accounting structure currently used by most enterprises is a rigid allocation of common costs and indirect costs, it often distorts the actual benefits of products and customers. Since these traditional accounting methods were originally designed to calculate product costs, they are usually not suitable for analyzing benefits from customers and markets. Because logistics management is a process-oriented concept whose goal is to integrate the resources of the entire supply chain from suppliers to end customers, everyone is looking forward to whether there is a method to evaluate the cost and performance of the supply chain.

As an advanced cost management method, after half a century of development, the activity-based costing method has become mature in theory, and with the improvement of manufacturing technology and information technology, the activity-based costing method has been well applied in advanced manufacturing enterprises. Many scholars have also applied the activity-based costing method to the long-term high logistics costs. The application of the activity-based costing method in enterprises can not only give full play to the inherent advantages of the activity-based costing method in calculating the operation cost according to the resource driver and the product cost according to the operation driver but also improve the accuracy of the cost information from the level of cost control benchmark. More importantly, the establishment of an activity-based logistics cost control model can more objectively, truly and correctly reflect the various costs in warehousing management, which is conducive to the improvement of the enterprise's logistics and warehousing operations and also provide a reference for simplifying the process and saving costs in the operation process.

**Overview of JD Group's Warehouse**

Overview of the Development of JD Group and JD Logistics

JD group was founded in 2003, entered the e-commerce field in 2004, transformed into a comprehensive e-commerce in 2008 and launched daily necessities. It was listed on the Nasdaq in 2014 and is China's first large-scale comprehensive e-commerce platform to be successfully listed in the United States. The service covers more than 1 billion users in China, with more than 531.9 million active users and more than 2 million merchants on the JD.com platform. The total transaction volume in 2023 was 1084.7 billion RMB (JD Group, 2024), ranking 52$^{nd}$

among the Fortune Global 500 and 1st in China's private enterprises (cited from the 2023 China Top 500 Private Enterprises List, All-China Federation of Industry and Commerce). JD group takes its self-operated e-commerce platform as its development starting point. After 20 years of development, its business has now involved retail, technology, logistics, health, insurance, industrial and development, industry, private brands and international fields. It is China's largest self-operated e-commerce platform and supply chain service company(JD Group, 2023a).

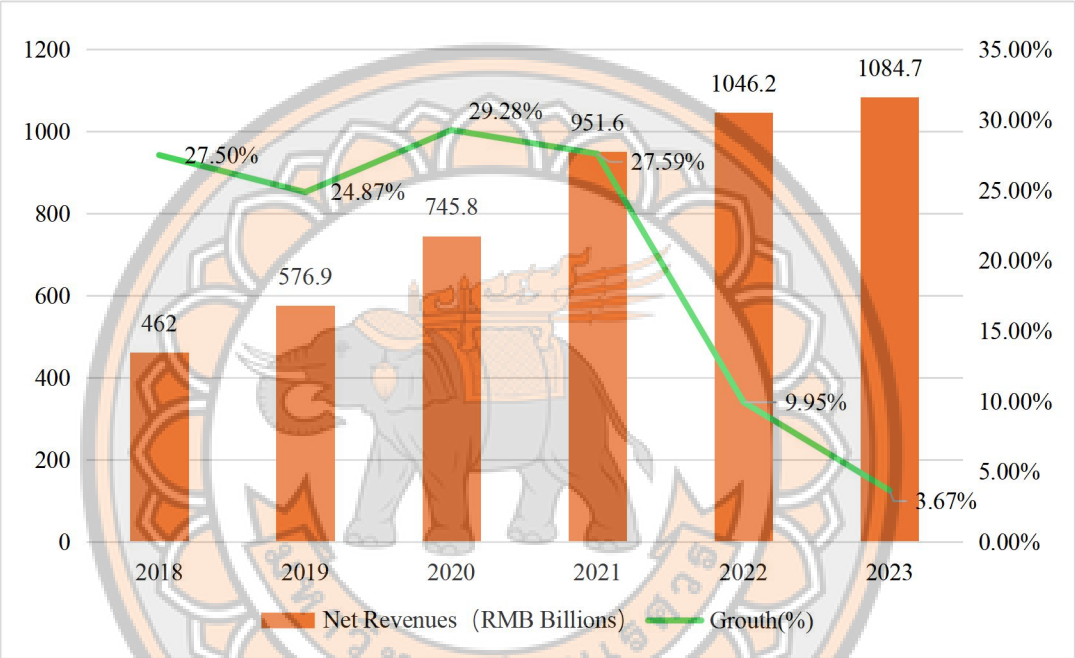



**Figure 4 JD Group's Revenue and Growth (2018 -2023)**

**Source:** JD Group's annual financial report (JD Group, 2020, 2021, 2022, 2023b, 2024), author collation.

In the context of the booming e-commerce era, high-quality logistics service levels are the premise and foundation for attracting customers and winning a wider market. JD Group was formerly JD.com (e-commerce platform), which initially focused on selling 3C digital products. In the early days of JD's development, many customer complaints were concentrated in the logistics link, such as slow delivery and serious damage to goods. With the rapid development of China's Internet and e-commerce companies, consumers are increasingly pursuing the concept of fast, efficient and safe, and pay more attention to the quality and experience of services. Logistics delivery is the only actual direct contact point with customers, so the quality of logistics has a huge impact on consumers' shopping

experience. JD founder Qiang Dong Liu realized that logistics would become the most critical link in e-commerce. Only self-built logistics can fundamentally solve these problems and improve user experience to meet future challenges.

JD Group began to build its own logistics in 2007 and officially established JD Logistics Group in April 2017. JD Logistics was listed on the main board of the Hong Kong Stock Exchange in 2021. JD Logistics is China's leading technology-driven supply chain solution and logistics service provider. With the mission of "technology-driven, leading global efficient circulation and sustainable development", it is committed to becoming the world's most trusted supply chain infrastructure service provider. Through self-operated logistics, JD Group has completely controlled the overall operation model of logistics, improved the operational efficiency of logistics, and enhanced its control over commodity distribution.

Current Development Status of JD Logistics

As one of the leading companies in China's e-commerce industry, JD Group's development path of investment and self-built logistics deserves attention and consideration. JD Logistics has always taken user experience as the core of construction and provided high-quality logistics services. After 3 development stages:

2007-2017, mainly serving JD.com's self-operated products and orders, built the world's first B2C full-process unmanned warehouse, played the role of corporate logistics, and provided stable e-commerce logistics services.

2017-2021, entered the social development stage, successfully transformed into a logistics company, and developed more than 300,000 external service customers.

Since 2021, it has entered the integrated supply chain service stage, decoupled its own solutions, products and capabilities in the supply chain field, created an integrated supply chain solution, served more customers and partners, and actively explored global development.

Currently, JD Logistics has become one of China's largest logistics service providers with the widest industry coverage and the best user experience. It manages and operates more than 1,600 warehouses in mainland China, with a storage area of

more than 32 million square meters; it has opened more than 1,000 domestic and international air cargo routes; more than 500 railway routes; it has opened nearly 90 bonded warehouses, direct mail warehouses, and overseas warehouses, with a total management area of nearly 900,000 square meters. With the development of technology, JD Logistics has 41 "Asia No. 1" intelligent logistics Centers for fully automatic logistics operations. The sorting efficiency and accuracy of "Asia No. 1" far exceed manual sorting. At the same time, it cooperates with high-tech products such as unmanned vehicles and drones to further exert the technical advantages it has mastered. In addition to hardware advantages, JD Logistics has a more advanced and efficient backend support system and information technology level than third-party logistics in the same industry. As of December 31, 2023, JD Logistics has nearly 350,000 self-owned distribution and other operators, operates more than 19,000 distribution stations and outlets, covering more than 300 prefecture-level cities in 33 provincial administrative regions in China. JD Logistics Group has built six major logistics networks, including warehouse and distribution network, same-city distribution network, large-scale network, cold chain network, and cross-border network. It can deliver 90% of self-operated orders within 24 hours, and more than 200 cities across the country can achieve "half-day delivery". JD Logistics spent 82.1 billion yuan on human resources in 2023, and the salary and welfare expenditures of front-line employees increased by 23.9% year-on-year. In 2023, the total investment in JD Logistics R&D reached 3.57 billion yuan, a year-on-year increase of 14.4%. The technical team has nearly 4,600 professional R&D personnel, striving to bring cutting-edge scientific breakthroughs into real-world applications, and constantly seek solutions for cost and efficiency balance and experience optimization through operation automation, operation digitization and decision-making intelligence.

Thanks to its self-built logistics system that has lasted for more than a decade, JD Logistics Group has, after operating independently, been able to provide high-quality e-commerce warehousing and distribution services efficiently and stably, bringing highly loyal customers to JD.com's e-commerce sales; on the other hand, it has also extended its logistics service capabilities to upstream and downstream links, providing professional supply chain services to a wider range of

companies such as fast-moving consumer goods, clothing, food, beverages, etc., becoming a distinctive "JD Army" in the logistics field.

Challenges of JD Logistics

Undeniably, the investment and layout of JD Logistics has helped the JD Group seize many consumer markets in the e-commerce market and gain a group of loyal users, thus supporting the continued growth of JD's e-commerce segment. However, for a long time, JD Logistics, as JD's cost center, has put some pressure on overall profits. JD's huge investment in logistics infrastructure construction, including warehouses, transport equipment, information systems, etc., has created many fixed costs, and when the e-commerce market develops and matures, and logistics companies enter into a new round of price competition, JD is faced with the major challenge of balancing its own logistics costs and efficiency. Therefore, in 2017, JD officially announced that JD Logistics would be fully open to the community in a branded operation. At this point, JD Logistics began to embark on the road of transformation and development of logistics enterprises from corporate logistics. After the transformation of open services, JD Logistics can transform its own logistics capabilities into a source of profitability, from purely serving JD Mall, to providing diversified logistics services to the community and charging the corresponding fees, which is expected to become a new profit growth point for JD. Nevertheless, after nearly five years of transformation and exploration, JD Logistics is still facing the following outstanding challenges when opening its services to the outside world:

Cost and profitability balance challenges

Cost recovery pressure: Although JD has invested a huge amount of money in logistics infrastructure construction and has resources such as warehouses, transport equipment and information systems, it is difficult to attract third-party merchants to use the business expansion at the initial stage of opening to the outside world. When the business volume does not reach the expected scale, it is difficult to quickly and effectively share fixed costs, unit logistics costs may remain high, affecting the overall cost recovery progress and profitability.

Profit model construction dilemma: logistics has long been JD as the internal cost center, the shift to open services and building a sustainable profit model

is not a one-step process. In the process of providing diversified logistics services to the community and charging fees, the need to accurately position the value of services and pricing strategy, while facing the uncertainty of market acceptance of the price, if the charge is too high may lead to customer turnover, too low it is difficult to achieve the profitability of the growth expected, how to balance has become a major problem.

Challenges of competitive pressure in the market

Tough share grabbing: The competitive pattern of the logistics industry has been solid, SF, SITO and other competitors with the long-term accumulation of market share, extensive customer resources and mature mode of operation to occupy a dominant position. After opening JD Logistics to the outside world, it needs to stand out in this red sea market and seize customer resources from competitors, the difficulty of which can be imagined, and every market share acquisition requires great efforts and costs.

Industry Trend Adaptation Challenges: Although the development of the e-commerce industry has led to the growth and diversification of demand for logistics services, open logistics services seem to be in line with the trend, but in fact, they are facing several adaptability challenges. For example, it is necessary to respond quickly to changes in different customer needs, adjust the service program in a timely manner, and ensure the efficiency and stability of its own operations while meeting the requirements for a comprehensive and flexible logistics solution, otherwise it will easily be eliminated in the fierce wave of industry change.

Resource Integration and Scale Expansion Challenges

Effective use of resources: Although JD Logistics has accumulated a wealth of resources, after opening to the outside world, it is not easy to integrate, optimize and make full use of resources such as warehousing space, distribution network and logistics technology. Different third-party customers have different business characteristics and needs, how to reasonably deploy resources to meet diversified needs, to avoid idle resources or mismatch, is a key issue to overcome, otherwise it will affect operational efficiency.

Scale Expansion Risk: Although open services aim to attract more orders and business volume to achieve scale expansion, there are risks associated with the

expansion process. With the rapid increase in scale, the complexity of management increases exponentially, including the difficulty of supply chain coordination and the pressure of personnel management. If we cannot effectively deal with these problems, not only will it be difficult to reduce costs and improve efficiency by leveraging the scale effect, but we may also suffer from rising operating costs and declining service quality due to management confusion, which will weaken the competitiveness and profitability of the company.

Challenges of Strategic Transformation and Business Expansion

Obstacles to strategic synergy: In the course of JD's transformation to a technology and service enterprise based on supply chain, the logistics open service, as an important strategic initiative, needs to be highly synergized with the Group's overall strategy. However, in practice, it may face synergy obstacles between various business segments, such as logistics and e-commerce business in the data sharing, process convergence and other aspects may be poor, affecting the overall efficiency of the supply chain, and thus hindering the strategic transformation process.

Business diversification dilemma: the transformation of open services seeks to break through the business limitations of JD Mall, expanding to different industries, different sizes of enterprise customer groups, to achieve business diversification. But different industries customers on logistics services, professionalism, customization requirements vary greatly, JD Logistics need to quickly build cross-industry service capabilities, in a short period of time to be familiar with and meet the needs of various types of business, otherwise it will encounter bottlenecks in the process of expanding the business, and it is difficult to achieve the expected growth in revenue and business boundaries to expand the goal.

Customer Experience and Brand Maintenance Challenges

Difficulty in meeting demand: As the requirements of different customers for logistics services vary greatly, JD Logistics faces a huge challenge in providing customized logistics solutions to meet the diversified needs of customers after the opening of JD Logistics. Customer needs may cover special cargo transport, emergency delivery, accurate inventory management and other aspects, JD Logistics needs to invest a lot of human, material and technical resources to design and

optimize the service solutions, and a slight carelessness may lead to a decline in customer experience.

Pressure on brand image building: Establishing a good brand image and enhancing brand influence among a wider group of customers is an important goal of JD Logistics in opening up to the outside world. However, in the process of serving many third-party customers, in the event of individual service failures or negative incidents, the amplification effect of social media and market opinion may cause serious damage to brand awareness and reputation, and the cost of repairing the brand image is high, and it may affect subsequent customer acquisition and business development.

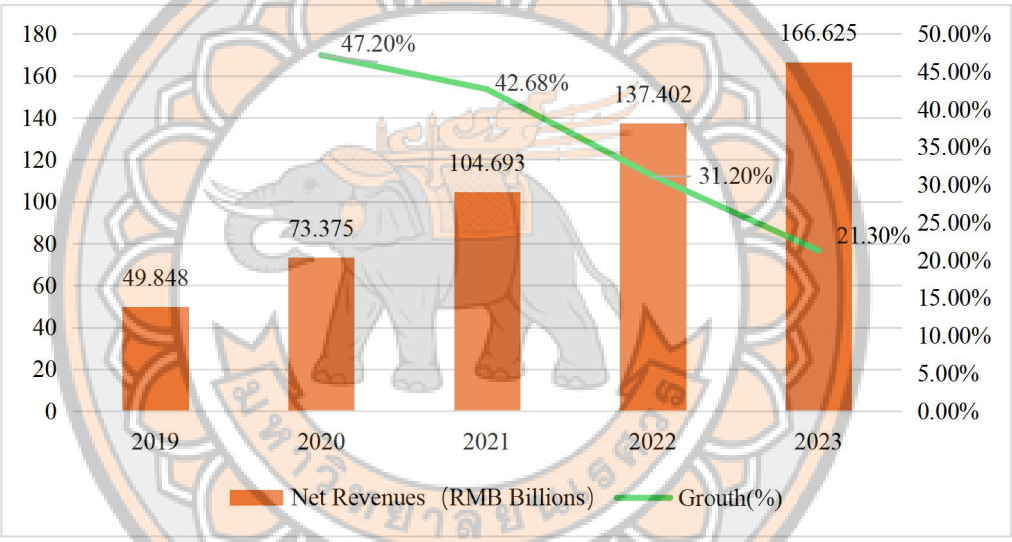



**Figure 5 JD Logistics' revenue (2019- 2023)**

**Source:** JD Group's official website

In addition, due to the fierce competition in the e-commerce courier market, the revenue growth rate of JD Logistics business has been slowing down year by year, which can be clearly seen from the comparative annual revenue data of JD Logistics, the net income of JD Logistics Company has continued to grow year by year, from 49.848 billion in 2019 to 166.625 billion RMB in 2023 (JD Group, 2020, 2021, 2022, 2023b, 2024). The growth rate, on the other hand, is on a downward trend, from a high growth rate of 47% in 2020 to 21% in 2023 on a yearly basis, reflecting a slowdown in growth despite the increase in revenue. The overall trend suggests strong revenue growth, but a gradual decline in the year-on-year growth rate, indicating a maturing market or challenges to operational expansion. Therefore, in the face of the pressure of

declining revenues, JD, in order to crack this development dilemma, JD Logistics has set a goal of achieving a 20% reduction in overall costs through a three-year period. It has become the latest strategic goal of the enterprise to shift to actively explore the maximum value of the logistics infrastructure network, improve the lean operation capability of the logistics system, reduce its own logistics costs, expand the opening-up efforts and seize the market share.

**Overview of JD Nanning Logistics Warehouse Park**

In recent years, JD Logistics has established several networks for warehouse storage, transportation, distribution, large commodities, cold chain, and cross-border. This kind of service, based on excellent customer experience and brand image, enhances the trust relationship between Chinese e-commerce and consumers and basically covers all regions, cities and population groups in China.

From a macro perspective, JD uses the advantages of its own warehouses to integrate business information in warehouse management and existing resources, uses the warehouse management optimization system to customize warehousing plans, bases itself on its own warehousing resources, and quickly integrates warehousing information systems based on its own warehousing resources. , to solve internal problems in the company's warehouse. JD has introduced a large number of automated machinery and facilities, so the amount of human labor has been reduced, which has greatly improved the efficiency of its overall procurement, warehousing and final delivery. From a micro perspective, the overall warehousing operation process is half manual operation and half automatic operation. This is the main mode of JD's warehousing operation process. The main contents include three processes: entering warehouse management, shipping out warehouse management, and internal warehouse management.

In 2019, JD Group invested in the construction of the JD Nanning Intelligent Warehousing and Logistics Park in Nanning, Guangxi, China. It is located in the northeast of Nanning, about 32KM from the city Center, and has a distribution radius of up to 500KM. The park covers an area of about 220 acres and was put into operation in July 2021. It has been in use for 3 years. As one of the self-operated high-standard warehouses under JD Logistics Group, the park mainly stores and distributes self-operated products on JD.com. Its categories cover household

necessities, retail water and drinks, rice, noodles, grains and oils, maternal and infant products, digital appliances, etc. There are three warehouse buildings in the park, with a total area of 68,000 ㎡. Warehouses 1 and 2 are storage centers, and Warehouse 3 is a sorting Center.

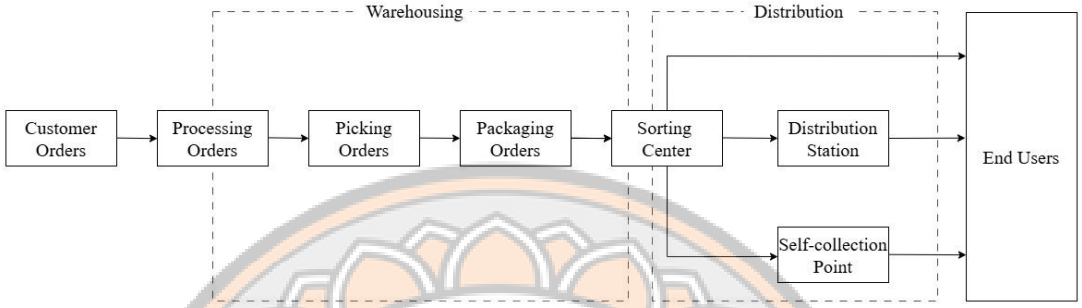



**Figure 6 JD Logistics Park Order Performance Operation Process**

**Source:** Author's collation, information come from JD official introduction (JD Group, 2023a)

To ensure efficient operation timeliness, warehousing and logistics operations in Nanning Park of Jindong are facing huge cost pressure. Storage fees, processing fees, distribution fees, procurement fees, operating expenses, etc. are all related management expenses that are mainly incurred in Jindong's warehousing and logistics costs. The unit logistics cost will decrease as the order volume increases, and the order volume and logistics costs are closely linked. And there is a great correlation between the logistics and warehousing costs of the order and the delivery costs. The main problems include the lack of independent cost control mechanism, weak awareness of procurement cost control, huge labor quantity, excessive labor costs, imperfect logistics system construction, and high return costs. Therefore, under the strategic goal of reducing costs and increasing efficiency, the local management team needs to consider the actual operating conditions, not only maintaining the original operating timeliness and service quality but also optimizing revenue results. In addition to further expanding external income, it is also necessary to accurately calculate and analyze the operating costs of each link.

Based on the above background, China's social logistics development momentum is strong, among them, the booming development of e-commerce drive the explosive development of the express logistics industry, express logistics market

volume is growing, however, China's total cost of logistics accounted for a relatively high GDP, of which, express logistics accounted for the proportion of China's total logistics revenues has exceeded 9%. In the increasingly competitive e-commerce courier industry, Jingdong Logistics as a typical self-built logistics company, the cost of the problem also plagued the further development of the enterprise, from the perspective of enterprise development, social development, need to continue to think and take measures to reduce the cost of enterprise logistics. Relying on the intelligent logistics park invested and constructed by Jingdong in Nanning as a research case, the authors put forward the following 2 questions:

1. How can we understand the operating costs of Jingdong Nanning Intelligent Logistics Park?

2. How can we help enterprises reduce their operating costs?

**Research Introduction**

**Research Goal**

This study aims to deeply explore the cost optimization and efficiency improvement issues faced by JD Nanning Logistics Park during its operation. With the rapid development of the e-commerce industry, logistics is the cornerstone to support its efficient operation, and its cost control and operational efficiency are directly related to the market competitiveness of enterprises. JD Nanning Logistics Park, as part of JD’s self-operated logistics system, its operating status directly reflects JD’s strategic execution effect in the logistics field. Especially in the context of the current industry's general pursuit of "cost reduction and efficiency improvement", how to effectively reduce costs and significantly improve operating efficiency in the park has become an urgent issue to be solved.

This article mainly studies and discusses the optimization strategy of logistics costs. To make the research assumptions and conclusions consistent with the real situation of the market, we choose the positive case study method, taking JD Logistics Nanning Park as the case study object, to conduct the current situation of logistics costs. Analysis thereby discovering the cost characteristics and existing problems of self-operated logistics enterprises and proposing optimization strategies.

**Research Objectives**

This article re-evaluates and refines the warehousing operation process and cost structure of Nanning Park through an in-depth discussion of the details of the warehousing operations of JD Company in Nanning Park, a leader in the logistics industry, especially through the precise application of activity-based costing. In view of the fact that previous studies have mostly focused on the overall warehousing costs of JD Group, while ignoring the unique impact of regional differences on cost composition, this study focuses on the specific case of Nanning Park and strives to reveal the true face of its operations from a micro level.

This article proposes the following research objectives:

1.To determine the current status of logistics operating costs of the JD Nanning Intelligent Logistics Park since its operation in 2022-2023.

2. To propose measures for reducing the operating costs of JD's Nanning Intelligent Logistics Park.

**Research Importance**

In today's era of globalization and informationization, the logistics industry is a key link connecting production and consumption, and its efficiency and cost control have a crucial impact on the competitiveness of enterprises. With the vigorous development of e-commerce, self-built logistics companies such as JD Logistics are playing an increasingly important role in warehousing, distribution and other supply chain links. However, the high cost of logistics has always been one of the bottlenecks restricting the further development of the logistics industry. Therefore, in-depth research on logistics cost optimization strategies not only has theoretical value but also has urgent practical significance.

The importance of the research is that by specifically analyzing the current logistics costs of JD Logistics Nanning Park, we can not only more clearly understand the main components and influencing factors of warehousing operating costs of self-built logistics companies but also propose practical ways to reduce them based on actual cases. Countermeasures for operating costs. This not only helps self-built logistics companies such as JD Logistics further enhance their competitiveness but also provides valuable cost control and optimization experience for the entire logistics industry. At the same time, the research results of this topic

will also provide new empirical support and perspective for the enrichment and development of logistics cost management theory.

Theoretical Significance

In the deepening of global economic integration, the concept of supply chain came into being, which strongly promotes the logistics service mode towards the path of network and informationization. In this process, the optimization of logistics costs occupies a pivotal position. Nowadays, the market competition has become more and more intense and has reached a white-hot degree. For e-commerce enterprises, if they want to stand in this cruel competition, reasonable and effective logistics cost optimization is the key.

Many scholars at home and abroad have carried out extensive and in-depth research and analysis around e-commerce enterprise logistics cost optimization. They clearly understand that cost optimization is of great importance to the survival and development of enterprises. Through the exploration of related theories and the summary of practical experience, e-commerce enterprises in logistics cost management provide a rich theoretical basis and guidance direction.

Taking the dynamic changes in the market as an example, with the increasing diversification of consumer demand and the increase in uncertainty in the market environment, e-commerce enterprises need to constantly adjust their logistics strategies to adapt to the rapid changes in the market. Reasonable logistics cost optimization can help enterprises flexibly respond to market fluctuations and improve their risk-resistant ability under the premise of ensuring service quality.

Another example, in terms of enterprise resource allocation, effective logistics cost optimization can enable enterprises to allocate resources more accurately and avoid waste and inefficient use of resources. By optimizing the logistics process and selecting suitable logistics partners, it can reduce the cost of transportation and warehousing and improve the efficiency of resource utilization, thus enhancing the overall competitiveness of the enterprise.

Practical Significance

With the booming development of high technology and the rapid rise of new industry e-commerce, e-commerce activities have become more and more convenient. However, this also makes the industry competition more and more

intense. The quality of logistics services largely affects the e-commerce enterprise customer experience, directly affects the degree of consumer recognition of the enterprise products, but also with the future development prospects of the enterprise are closely related.

In order to ensure that e-commerce enterprises can be sustained and rapid development, from logistics optimization to optimizing the cost of enterprise has become a feasible path. Only by continuously improving the service quality of logistics enterprises can more truly feel the quality of service.

In this thesis, JD Company, which has good operating conditions and a large scale in the logistics industry, is selected as a research case. Based on the actual operating conditions of JD Company, the company explores the hidden problems in its supply chain management and puts forward a scientific and efficient cost management program. A set of practical optimization measures are given to address JD's cost optimization problems, and the logistics operation process is improved and perfected in a targeted manner, aiming to enhance JD's competitive advantages. For example, by improving the warehouse management system, the inventory turnover rate can be increased, the cost of inventory backlog can be reduced, and the capital utilization efficiency of the enterprise can be improved.

It is expected that this study can provide some useful references in optimizing the cost of enterprises, improving the efficiency of enterprise operation and management, satisfying the needs of consumers and enhancing the competitive advantages of e-commerce enterprises, to contribute to the development of the e-commerce industry.

**Summary**

This article chooses JD Company, which is in good operating condition and has complete supply chain services in the logistics industry, as an example. Taking the actual operation of JD Company's Nanning Park as the specific object, it is sorted out the JD Logistics warehousing operation process and is formulated the warehousing operation link by using activity-based costing (ABC) with cost status, is analyzed the existing problems in Nanning park management from a deeper level, and is put forward improvement suggestions based on the idea of lean

management to enhance the competitive advantage of JD Company. Based on the above background, this article raises the following objectives:

1.To determine the current status of logistics operating costs of the JD Nanning Intelligent Logistics Park since its operation in 2022-2023.

2.To develop the measures how to reduce the operating costs of the JD Nanning Intelligent Logistics Park.

This paper hopes to accurately calculate the operating costs of enterprise logistics by applying the activity-based costing method, help logistics companies broaden their business ideas, stimulate more innovation, and achieve more effective sustainable development. It also provides a case reference for related research on the cost operation model of the e-commerce industry.

The rest of this paper is organized as follows. Chapter 2 reviews the relevant literature. Chapter 3 introduces the research method. Chapter 4 provides the relevant calculation process and analysis. Chapter 5 studies the strategy for achieving the goal based on the relevant analysis results. Chapter 6 summarizes the entire research process and puts forward the research conclusions.

# CHAPTER II
# LITERATURE REVIEW

This chapter is centered on the research objectives of this paper, and reviews relevant books, journal papers and other materials from three main aspects, such as logistics warehouse management, logistics costs and cost calculation methods. At the same time, some Chinese scholars also refer to the research status of JD Group's self-built logistics model and its logistics costs in the past years, so as to construct the research theory and research methodology of this paper, to support the research objectives of this paper.

## Logistics and warehousing management and related research

### Definition of Logistics and Warehousing

The National Council of Physical Distribution Management (NCPDM) pointed out in 1963: "Logistics refers to the wide range of activities that effectively move finished products from the end of the production line to the hands of consumers, and sometimes also includes the movement from the source of raw materials to the beginning of the production line." In 1976, it was pointed out that 'logistics activities include user services, demand forecasting, sales intelligence, inventory control, material handling, order processing, after-sales services, factory and warehouse location, spare parts and service guarantee, and scrap disposal'. This definition further expands the scope of logistics activities to include user services, demand forecasting, sales intelligence and other aspects. By 2005, the definition was updated to "Logistics management is the process of planning, executing and controlling the efficient and cost-effective forward and reverse flow and storage of goods, services and related information between the point of output and the point of sale in supply chain operations to meet customer requirements." (G. W. Wang, 2005) As can be seen from these definitions at different times, the definition of logistics by the American Council of Logistics Management (ACLM) has always centered on the core objective of satisfying consumer demand, while emphasizing the planning, implementation and control of the logistics process, and over time, the definition has become more focused on the operation of the supply chain as well as on the high efficiency and low cost of logistics.

Logistics activities refer to the specific operation of transport, storage, loading and unloading, handling, packaging, circulation processing, distribution and other functions in the logistics process (National Standardization Administration of China, 2006).

Warehouse management is a key link in the whole logistics management, the quality of its operation is closely related to the production and operation of the enterprise, warehouse management refers to the management of warehouses and warehouses in the storage of materials for management activities. It is a warehousing agency in order to make full use of the warehousing resources owned by the provision of efficient warehousing services carried out by the planning, organization, control and coordination process (X. Y. Liu, 2020), including inventory management, equipment management, operations management, personnel management and so on. Warehouse management is not only the comprehensive management of the materials stored in the warehouse, but also the management of the warehouse itself, it is a more complex process, including pre-planning, the process of control, adjustment, etc., in order to make the best use of warehouse resources, and can provide efficient storage services. Its main processes include booking into the warehouse, warehouse operations, daily management, issue orders out of the warehouse, etc., is the back-end support of the production and operation of enterprises (Y. Zhang, 2023).

Most of the time, due to the warehousing operation link is the largest investment in the whole logistics link, the physical space occupied by the most links, resulting in the warehousing operation cost is the key factor affecting the cost of logistics (Lee, L, & Billington, 1992), and the total cost of logistics is an important part of the total cost of the enterprise, which is directly related to the profitability of the enterprise.

Research on Warehousing Management

Warehousing logistics plays a very important role in promoting the healthy development of enterprises and is a key point in logistics operations. The main activity of warehousing logistics is to use warehouses to provide a series of value-added services such as on-site storage and cargo distribution for goods, which is an important form of logistics. Modern warehousing logistics uses modern

information networks and modern technologies, means and equipment to improve product turnover and reduce inventory levels in logistics activities such as inventory and sorting, which is very different from traditional warehousing. The development of warehousing logistics management is mainly to promote the improvement of the operating efficiency of e-commerce enterprises themselves, as well as the improvement of the company's service level, minimize costs, and optimize the entire logistics chain(Yue, 2023).

Warehouse management research has gone through three main phases: simple warehouse management, complex warehouse management and modern warehouse management. Warehousing theory began to become an emerging theory in 1957 (Thomas M, 1957) and in the 1990s 14 key issues in the supply chain warehousing management process were proposed (Lee et al., 1992). With the development of modern warehousing, related research has been very mature, in the field of warehousing management improvement strategy research, academia and industry have made significant progress, showing a multi-dimensional, multi-level exploration trend. The research on warehouse management improvement strategies has gradually developed from a single dimension to multi-dimensional and multi-level, covering a variety of aspects such as management process optimization, demand forecasting, decision support, information technology application, warehouse design and operation, supply chain management and the application of Internet of Things (IoT) technology. It mainly covers the following areas:

Information technology applications: For the digital transformation strategy of logistics and warehousing enterprises, the traditional warehouse management model should be transformed, combined with the positioning of enterprises in the market, user demand-oriented, application of big data technology, promote the automation of warehouse management, logistics warehouse management towards business-driven, intelligence-driven, data-driven transformation (Yi, 2021). In the e-commerce warehouse scenario, due to multiple SKUs and mixed product types, manual management cannot reflect the real-time status of the commodity inventory, the need to use information system tools to ensure that the data in the warehouse is correct, so as to achieve real-time and accurate judgement of the commodity material backlog or shortage (Ren, 2007). In

order to improve the low-cost, high-efficiency and standardized management of warehousing and logistics, the application of information technology is an important means of modernizing and transforming warehouse management (Mengbo K, 2017). Among them, the application of Internet of Things (IoT) technology in warehousing management can use technological innovation to solve the pain point problems in traditional warehousing management, and promote the transformation of warehousing management into precise, intelligent and electronic (Yu, 2011; l. Zhao, 2011).

Decision-making support: The premise of warehouse management is to take customer needs as a decision-making guide and to clarify the centrality of the management process (Fingar, 2010). It has been suggested that warehousing optimization and rational demand forecasting can be achieved by combining the strategies of pull and push demand forecasting methods (Ronald, 2015). Or adopt the concept of decision support system, full participation in the warehouse management decision-making, can enhance the effectiveness of the management model, and promote the democratization and transparency of the internal management of the enterprise (Hooshang, 2016), management optimization strategies can be upgraded through optimizing warehouse layouts, improving inventory turnover and strengthening information technology construction (Y. Wang, Shao, & Wang, 2020)

Warehouse design and operations: As a third-party warehousing company, the design and operation of the warehouse can have a significant impact on the overall logistics costs and functionality, so it is possible to improve efficiency by optimizing the layout and operational processes (W. B. Chen, 2019). Among the various factors of process design and optimization, the four factors of warehousing layout, storage strategy, storage principle and operation mode are the core key to optimization. The new storage layout needs to follow the turnover rate of goods, the frequency of entry and exit, the relevance of the goods assigned to the goods in the proximity of the goods, reduce the picking distance, improve the utilization rate of handling equipment, to achieve the minimum distance of flow in the warehouse and the maximum utilization of the storage space (He, 2016).

Equipment improvements：Electronic, intelligent is an important symbol of modern warehousing equipment, for logistics enterprises in the study of the digital

transformation of warehousing management, logistics enterprises, equipment information technology is one of the key points, need to be combined with the specific circumstances of each warehouse, clear refinement of the warehousing management process of logistics enterprises (Yi, 2021). Electronic logistics warehousing equipment is so that the equipment can be automatically diagnosed and automatically run under different working conditions, which can improve the effectiveness of the use of warehousing equipment. At the same time, attention should be paid to the humanized design of logistics and warehousing equipment, taking into account the human factors of operating performance, operating sensitivity and use of comfort, so as to enhance the safety and comfort of the use of warehousing equipment (Y. L. Wang, 2017). Automated warehouses can make the best use of space, saving nearly 70 per cent of floor space (J. Chen, 2016). To achieve mechanization, automation management, to ensure that the material handling warehousing reasonable and goods first-in-first-out. Modern industrial production has also prompted the development of automated warehousing to higher requirements, radio frequency data communications and other technologies are more used in transport equipment, mobile robots play an important role, system flexibility into the trend (Y. F. Sun, Sun, & Xing, 2010).

Personnel management :The current logistics and warehousing staff due to the uneven development of warehousing technology, enterprises more than a large number of human resources to support and broaden the development of enterprises, and ignore the reference to the new scientific and technological talent and the use of the introduction of new technology talent can output more simplified manpower operations program to reduce the occupation of human resources, thereby reducing the cost of manpower. Logistics industry talent shortage, whether from the technical aspects, management, operations and other aspects of the comprehensive aspects of these areas of work of high-end talent and innovative talent is relatively small, resulting in the actual enterprise labor force creativity limitations (Zeng, 2021). The requirements for warehousing personnel have also shifted from simple labor handling to contemporary professional workers of higher quality. Warehouse managers of logistics companies should have information management capabilities

and be able to automatically enter corporate warehousing information and update it in real time (Yi, 2021).

In summary, this paper argues that logistics is an important part of the supply chain operation process, around the customer's needs to complete the handling of items from the starting point to the end of the circulation, and through the implementation of transport, storage, handling and other logistics activities (services), to complete the order at low cost, so as to achieve the maximization of current and future revenue. The mission of logistics management is to serve customers in the most cost-effective manner, with the aim of achieving optimal coordination and coordination of logistics activities, thereby reducing logistics costs and enhancing the operational efficiency and economic benefits of logistics. In the past, the warehouse was usually viewed as a cost sector with no added value, but now it has become a link that can create added value but also become a key factor to enhance the competitiveness of enterprises, compared with other enterprises to form an advantage. Therefore, through the optimization of management processes, the application of information technology improve the design and operation of the warehouse, improve the introduction of high-quality personnel and other aspects of the optimization strategy of warehouse management, to help enterprises rationally allocate personnel, equipment, space and other resources, and gradually optimize the cost of the status quo.

**Logistics Warehousing Costs and Its Related Research**

Research Status of Logistics Warehousing Costs

As a core component of logistics costs, the management and optimization of warehousing costs play a vital role in improving the economic benefits and competitiveness of enterprises. Since the middle of the last century, with the gradual development of logistics management, scholars have begun to pay attention to and conduct in-depth research on logistics costs, especially the refinement and management of warehousing costs. Pioneers such as Heye Charles revealed the close connection between logistics costs and management by refining the total transportation cost, laying the foundation for subsequent logistics cost management theory (Heye, 1957). Lambert further breaks down logistics costs into various segments such as procurement, transport, and warehousing, clearly indicating the

importance of warehousing costs in the process of moving goods from production to consumption (Lambert & Enz, 2017).

In recent years, with the vigorous rise of e-commerce and cross-border e-commerce, the problem of warehousing costs has become increasingly prominent. Such as logistics cost management is fragmented, one-sided, focusing on the cost reduction of individual subsystems, or focusing on the reduction of individual costs, but seldom consider the impact of changes in the external environment on the internal system, but also lack of awareness of the entire supply chain from the perspective of the increase in performance (Zhen, 2012). For retailers and logistics companies, warehousing costs increase with business growth and need more attention to being given. Considering that warehousing cost management plays a key role in the total cost control of logistics companies (Ranasinghe, Harrison, Främling, & McFarlane, 2011). Strategies should be adopted to optimize warehouse management to reduce costs, thus creating a close link between logistics services and customer experience.

In the context of globalization, cross-border e-commerce and SMEs are also facing the problem of high warehousing costs, and logistics cost management is equally important, so it is necessary to help enterprises develop through diversified management modes and cost reduction paths (G. Chen, 2022; Yang, 2022). Logistics enterprises have weak awareness of cost management, cost accounting is not clear and other issues, which can apply ABC method as the basis of accounting theory, the enterprise resources as accounting content, to tracking the operation of its business activities (W. Zhao & Li, 2015). In particular, through the study of the application of activity-based costing method in warehousing cost accounting in logistics companies, it can reveal the deeper reasons for the rise and fall of costs and provide a scientific basis for enterprises to formulate effective management strategies (N. Sun & Wu, 2018). For data management, operation mechanization, information management and other specific factors affecting warehousing efficiency and cost, can be optimized accordingly (Ouyang, 2015). For example, with the help of information technology platforms and modelling, it is possible to budget and control the cost of warehousing and transport more accurately (Zhou, Wang, Li, & Pei, 2005).

In summary, warehousing cost management is not only a key link in logistics cost control, but also an important means for enterprises to improve operating efficiency and enhance market competitiveness. With the continuous advancement of technology and the updating of management concepts, warehousing cost management will pay more attention to refinement and intelligence, providing strong support for enterprises to achieve sustainable development. Therefore, in-depth research and effective management of warehousing costs are of great significance to the development of modern enterprises.

Research on Logistics Cost Management of E-Commerce Enterprises

In the context of the rapid development of e-commerce, logistics, as an indispensable part of the e-commerce ecosystem, has become the key to improving the competitiveness of enterprises and achieving profit growth.

Enterprises can improve their core competitiveness by innovating their business management model, implementing lean warehousing cost management, and reducing business operating costs. The use of lean management can help e-commerce enterprises to improve the accuracy of operations, reduce service costs, improve service quality, is the e-commerce enterprise ‘cost reduction and efficiency’ choice. For example, effective control of warehouse rent, personnel costs, consumable costs, etc., to optimize warehouse management. However, lean management is a long-term project, which requires the participation of all staff, awareness raising, continuous improvement, and ultimately the optimal allocation and use of resources to enhance the overall efficiency of the enterprise (Fang, 2021).

In the specific practice of the logistics model, the establishment of a complete logistics accounting system, optimize the logistics process, a reasonable choice of distribution routes and logistics model, is the key to effective control of logistics costs. These measures not only help to reduce unnecessary waste of resources, but also significantly improve the efficiency of the enterprise's logistics operations, thereby indirectly reducing the cost of storage (Lu, Yan, & Lu, 2013).

In the research for the self-built logistics model, the importance of supply chain synergy to improve the overall efficiency is verified by the model, especially the self-built logistics system shows significant advantages in promoting the synergy between the internal enterprise and the supply chain system (Y. Liu & Wang, 2019).

However, although the self-built logistics model has strategic significance, but its high operating costs should not be ignored, including capital, hardware and software facilities, warehouse technology, information systems, supply chain management capabilities and professional personnel and other aspects of the inputs (Yi Min, 2016). Through resource integration and cost optimization, the vertical integration of e-commerce logistics will become a development trend, highlighting the core position of warehousing costs in the overall logistics costs of enterprises, especially the need to improve the effective use of self-built logistics resources (Xiao Xia, 2019). Therefore, e-commerce enterprises in the choice of logistics mode, need to comprehensively consider their own actual situation and external environmental changes, flexible decision-making.

In summary, under the booming development of e-commerce, warehousing cost as an important part of the logistics cost of e-commerce enterprises, its management efficiency is directly related to the profitability and market competitiveness of enterprises. Research shows that the advantages of self-built logistics supply chain synergy are significant, and self-built logistics has strong control, but the initial investment is expensive and accompanied by high operating costs. Enterprises can take advantage of innovative business models to implement lean warehouse cost management, lean concepts to optimize warehouse rent, manpower and consumables costs to enhance efficiency. In logistics practice, the construction of the accounting system, optimizing the process, choosing a good distribution route and mode can reduce costs and improve efficiency. Therefore, e-commerce enterprises should weigh their own situation and the external situation when choosing logistics mode and comply with the trend of vertical integration of e-commerce logistics, pay attention to the core status of warehousing costs and optimize the use of self-built logistics resources, to achieve efficient logistics operations and sustainable development.

**Research on Activity-Based Costing and Application**

Since 1988, the activity-based costing (ABC) method created by Robin Cooper and Robert S. Kaplan has been popular in European and American enterprises and has produced obvious results (Cooper, Lambert, & Pagh, 1997). Simply put, activity-based costing is a cost calculation method based on activity. It

refers to an indirect cost allocation method that takes the activities as the object of indirect cost collection and collects resource costs to the operation through the confirmation, measurement, and collection of resource costs to the activities, and then collects the operation costs to the product or customer through the confirmation and measurement of the activity's driver. ABC provides a more accurate method for allocating indirect costs and auxiliary resources for operations, business processes, products, services, customers, etc.

The ABC method believes that the resources of the organization are not only consumed in the material production of products, but also in many auxiliary operations. Providing different products to different customers often requires the consumption of different auxiliary operations. The goal of ABC is to measure and calculate the value of resources consumed in providing operations for different customers and products (including the auxiliary operations) and appropriately allocate them to the products of each customer.

When using ABC to calculate logistics costs, it is usually found that the accounting results are much larger than those based on the traditional accounting system, which is indirectly regarded as the basis for the former to be superior to the latter (Song & Chang, 2005). However, according to the logical process of calculating logistics costs by ABC, at least one point can be proved, that is, since it starts from the operation level and classifies costs by activities, it is easier for enterprises to analyze cost structure, expose logistics process problems, and help enterprises improve management level. Therefore, there have been very mature research results on the theory and application areas of the calculation methods of the ABC method.

First, the accuracy of cost data is the basis of logistics cost management. When the results of logistics cost accounting are used to manage logistics costs, the management can be effectively improved, which helps managers to find problems in time and improves the management (La Londe & Masters, 1994). Because the use of ABC in enterprise logistics cost management can effectively eliminate ineffective costs, make the cost management process clear, so as to optimize the process, and play an important role in enterprise cost management (Gu, 2010). Build a cost management framework model through ABC costing, comprehensively evaluate the

implementation of each link in the model, split the enterprise cost, and implement cost management based on activity-based costing technology for each link, which can help enterprises to make activity management decision analysis (X. W. Zhang, Liu, & Zhang, 2022).

Secondly, the use of activity-based costing to construct a logistics cost calculation model for prefabricated components in the construction industry (Yuan & Ng, 2011), the agricultural sector (Carli & Canavari, 2013), the healthcare industry (F. R. Zhao, 2015), and the logistics industry have shown that, the application of cost management systems needs to be based on activities implementation, which is more favorable for activity sensitivity testing and cost allocation. This will provide business managers with information that is more relevant to reality and help managers and planners make better decisions. The ABC method is applicable to industries and companies with a high proportion of indirect costs (Duan, 2019), so it is well established for use in calculating costs in logistics companies.

Some studies have shown that operation management is conducive to selecting low-cost suppliers, promoting business process re-engineering, selecting high-quality customers, enhancing the strength of enterprises to cope with market competition, and improving scientific decision-making (Yanfang & Hui, 2010). Around the problem of resource allocation of warehousing operations, you can start from the actual enterprise, through the analysis and modelling of warehousing business processes, using the ABC method to analyze the cost of warehousing operations, to confirm the effectiveness of the method in the field of warehousing operations (Hu, 2013). The operation of logistics enterprises needs to reduce logistics costs to ensure the maximum benefit of resources, and the introduction of the ABC method can improve the internal operation mode of enterprises and enhance the core competitiveness of enterprises (Li 2018). Through the study of the cost of logistics enterprises, we can find out the necessity and feasibility of using the ABC method in enterprises, and put forward the cost management strategy on the basis of this (Y. Sun, 2020).

Summary: ABC as one of the methods of cost accounting, its theory, calculation methods, application scenarios have been more in-depth research, was confirmed for enterprises to carry out cost accounting, compared with the traditional

costing method, can provide more accurate and detailed information on the actual cost (G. Zhang, 2001). Because it is from the operational level, the cost by activity classification, the cost is more convenient for enterprises to analyze the cost structure, exposure of logistics process problems, conducive to the improvement of the management level of enterprises, therefore, applicable to the analysis and calculation of the current status of the cost of warehousing operations need to be studied in this paper.

Definition of Logistics Costs

In order to study logistics costs, people have made detailed classifications according to the occurrence area, function, payment form, nature, occurrence characteristics, controllability, and hierarchy of logistics costs. These classifications play an important role in the in-depth study of logistics costs (Gu, 2010).

Logistics costs are all the expenses and resource utilization incurred by an enterprise in the total physical flow process (CSCMP). Specifically, logistics costs are the sum of human, financial, and material resources expended in the physical movement of products, such as packing, loading and unloading, transport, storage, distribution and processing, distribution, and so on (National Standardization Administration of China, 2006). Enterprises are profit-oriented economic organizations. The goal is to minimize inputs to maximize returns, cost management can minimize input costs to achieve the purpose of expanding returns, logistics costs are one of the most important costs of e-commerce enterprises to carry out business activities. Therefore, logistics cost management can improve the economic efficiency of logistics activities.

Logistics cost management refers to the planning and co-ordination of expenditures related to the logistics chain, and the object of logistics cost management is not the cost of logistics (X. C. Zhang, 2019). Logistics costs are made up of management costs, transport costs, and storage costs, with storage costs accounting for the largest proportion of costs (Yang, 2022). Reducing the operating costs of enterprises in warehousing, to obtain higher economic benefits, can maintain the sustainable development of enterprises in the case of high income. Warehousing control is of great significance to the development of enterprises.

**Research Status Using JD Group as a Case**

In the current state of research for JD as a case study, academics have widely recognized the unique position of JD as a self-owned e-commerce platform in China, especially the development path of its self-built logistics system, which has become the focus of in-depth discussion by many scholars. Although JD has significant advantages in its self-built logistics system, it also faces challenges such as a high proportion of procurement costs, a long recovery cycle for warehousing inputs, a high cost of reverse distribution logistics, and an unreasonable manpower cost structure (Jin, 2022; Yan, 2023), and therefore needs to improve the efficiency of warehousing management and optimize the cost structure.

Big data technology plays a key role in JD's supply chain cost control (Yu Jian Long, 2023), Through big data to achieve visual management of the supply chain and intelligent decision-making, significantly improve the response speed and decision-making accuracy of the supply chain, effectively reduce the cost of warehouse management, for the optimization of JD's warehouse management to provide a strong support at the technical level.

From the perspective of business model, there is no doubt that JD Logistics, as an important asset of the JD Group, still needs to deal with the challenges of capital, supply chain management, and management innovation in the process of sustained high-speed development (Hao Bo, 2020). Can be coped with through the scientific division of warehouses, optimization of management, enhancement of warehousing scale effect and other strategies, especially the optimization of warehousing management is of great significance in the overall strategy of JD.

In summary, academic research on JD's self-built logistics system and its warehouse management has formed a more comprehensive understanding, which not only reveals the challenges it faces, but also proposes corresponding solution strategies and technical support. These research results not only enrich the theoretical system of JD case study but also provide useful reference and inspiration for other enterprises in the optimization of warehouse management.

**Summary**

This paper mainly summarizes the literature on five research directions: logistics warehousing management, warehousing costs management, e-commerce logistics cost management, activity-based costing (ABC) and JD company management. After sorting out and analyzing the existing research, the following aspects of the existing literature are reviewed.

First, in the research on logistics warehousing management, the international academic community has formed a relatively comprehensive and complete research on warehousing management. The research areas cover warehousing operation strategy optimization, warehousing layout, equipment technology application, personnel training, etc. There are many studies on warehousing management, which have also been widely used. Through theoretical analysis and research practice, some scholars only put forward suggestions for improvement of warehousing management issues, while some scholars optimize warehousing management and improve warehousing efficiency through relevant technical methods. Scholars from different countries have different research contents and research methods. Through the study of relevant literature, we understand the role and importance of different methods in warehouse management optimization. Whether it is for the logistics and warehousing links within the enterprise or as a third-party warehousing logistics service research, it emphasizes that the level of warehouse operation management is closely related to the control of warehouse costs. Multiple cases and analyses have confirmed that the optimization of warehouse operations can significantly reduce operating costs and help enterprises improve operating efficiency. This article combines the research and analysis of JD's actual warehouse management status and analyzes it from the perspective of warehouse operations. It is precisely because the warehouse link is the most heavily invested and most complex part of the supply chain management chain that enterprises need to accurately calculate and deeply analyze the warehouse link operations and their costs to achieve the goal of controlling costs.

Second, from the perspective of logistics cost research, international scholars have realized the impact of logistics costs on enterprises earlier, carried out research on logistics costs, and clearly divided and defined logistics costs. In the

mid-20th century, scholars have been constantly proposing the concept of logistics costs. In the early 21st century, foreign scholars introduced cost management methods into enterprises for research. They realized that reducing the cost of the logistics industry has great economic significance for the entire industry. Effectively reducing costs can maximize the economic benefits of enterprises. On this basis, they built a data model and proposed relevant cost management theories based on the data model. Finally, through the efforts of many scholars, the formation and maturity of logistics cost management theory was catalyzed.

With the rapid development of China's e-commerce, Chinese scholars began to study the cost issues of China's logistics enterprises in the early 21st century, and found that compared with Western countries, Chinese logistics enterprises spent more on transportation costs and warehousing costs. Many researchers pointed out the key role of warehousing cost management in the total cost control of logistics enterprises, and proposed strategies to optimize warehousing management to reduce costs. With the continuous advancement of technology and the updating of management concepts, warehousing cost management will pay more attention to refinement and intelligence, providing strong support for enterprises to achieve sustainable development. Therefore, in-depth research and effective management of warehousing costs are of great significance to the development of modern enterprises.

Based on the previous warehousing costs, the focus is on studying the cost of enterprise products in the warehousing link. In the express logistics industry, warehousing is both a service and a cost. The warehousing cost studied in this article refers to the operating cost of providing warehousing management services under logistics service companies. Therefore, JD Logistics is selected as a case to analyze the operating cost of its warehousing operation link to seek solutions to optimize the cost-of-service products.

Third, in terms of e-commerce logistics cost management, although the research on logistics cost management has formed a relatively complete theoretical system, the methods and contents of logistics cost management have changed greatly in the e-commerce environment. Due to the late start of e-commerce in China, the research on e-commerce logistics costs has not yet formed a complete theoretical

system. Existing research mostly starts from the perspective of e-commerce companies and conducts cost management analysis on the overall operation process of e-commerce companies and pays less attention to the cost management of e-commerce companies in the warehousing and logistics links. In general, the research on operation cost theory and logistics cost theory has been relatively complete. However, how logistics companies can achieve effective cost management in the e-commerce environment is a problem worthy of research and exploration.

This paper takes mature self-operated logistics enterprises as research cases to further study the logistics cost management issues under the e-commerce environment and provides reference for the application of operation-based costing by logistics enterprises, so as to enrich the research on the application of operation-based costing by logistics enterprises under the e-commerce environment.

Fourth, through the analysis of the research on cost management methods, it is found that the concept of operation-based costing was first conceived in the United States and attracted the attention of the academic community. After China introduced the operation-based costing in the 1990s, theoretical research has developed rapidly, including the concept principle of operation-based costing, operation classification, cost driver determination, and operation-based costing process; from the application research of operation-based costing, the application scope of operation-based costing has been continuously expanded, and the application fields have extended from manufacturing to medical, education, and logistics, and the design of the application system of operation-based costing has also become mature. The maturity of the theoretical system provides a solid foundation for the application of the method, and the academic community tends to apply the cost management method to enterprise examples for research. As a cost accounting method that has been deeply studied by the academic community and has been applied in practice in many industries, the application of operation-based costing in the field of logistics is also very common, especially suitable for warehousing operations and transportation links with more indirect costs. Scholars believe that the high proportion of indirect costs is a characteristic of logistics companies and affirm the feasibility of logistics companies using the operation-based costing method in the logistics chain composed of major links such

as transportation, loading and unloading, warehousing, and handling. By analyzing the causes of cost management problems in specific enterprise cost management status and establishing models or optimizing and improving current cost management methods in a targeted manner, scholars are prompted to conduct more in-depth exploration and improvement of enterprise cost management methods, and many new management models have entered the vision of enterprises. On this basis, this paper chooses the operation-based costing method to conduct cost accounting for case companies, which is feasible, and can also enrich the application research of the operation-based costing method in self-operated logistics companies.

Fifth, the research and analysis of JD.com. As China's largest self-operated e-commerce logistics company, JD.com has been studied from different angles by many scholars. Some analyzed the business model of JD.com Logistics from the perspective of the value chain, and some studied the operation and management issues of JD.com Logistics from the perspective of the supply chain. Obviously, as JD.com's business model tends to stabilize, the logistics system has shifted from the initial warehouse network construction to the stage of fine operation, and how to reduce the cost of logistics links has become a prominent issue. JD.com is also facing fierce market competition, and it needs to accurately calculate the invested funds and resources in order to find effective measures to solve the problem. Most scholars believe that the advantages and challenges of the self-built logistics model are equally significant. Compared with the third-party logistics model, the company's initial investment in cost is greater and the operational management capabilities are higher. Therefore, how to accurately calculate and effectively control the logistics costs under the self-operated model is a more complex and arduous task. This article aims to help reduce JD.com's logistics costs, takes the cost control of the warehousing operation as the specific research object, and explores JD group 's lean operation and cost control measures.

# CHAPTER III
# METHODOLOGY

## Research Design

Research Content and Scope

This article focuses on improving the logistics costs and efficiency of enterprises and takes the JD Nanning Intelligent Logistics Park invested and built by JD Group as a case study. Since the park has been put into use since July 2021, this article selects the logistics operation cost data from 2022 to 2023 as the basic data for the research. By analyzing the logistics cost and efficiency of the logistics operation process in the park, we can gain an in-depth understanding of the operational details of warehousing, sorting, transportation and other links, explore possible cost optimization space and potential management problems, and put forward optimization suggestions.

Research Approach

The study of this paper is divided into six chapters:

Chapter 1: Introduction. Outline the background of the research problem, the purpose of the research, make a description of the status quo of China's logistics warehousing, logistics cost management problems, the status quo of JD Logistics, and briefly outline the research content, methodology.

Chapter 2: Literature review and related theoretical foundations. Explain the theoretical basis related to the research, by summarizing the related researches to make a literature review, make a summary of the current research situation.

Chapter 3: Description of research content, methodology and technical route. Specifically describes the research content and research methodology of this paper, especially introduces the theory of Activity-based Costing method, data collection and the specific application steps in the research.

Chapter 4: JD logistics cost calculation and analysis. First, describe the business situation, management structure, and operation process of JD Logistics and calculate the order cost; secondly, use the activity-based costing method to conduct

specific accounting for the highest cost department and calculate the cost of each operation Center after reasonably allocating the indirect costs according to

the activity-based costing method; compare and analyze the data based on the evaluation and accounting results.

Chapter 5: In line with the cost reduction objective, evaluates strategies for achieving cost reduction targets and proposes options for improving cost control and optimizing management processes.

Chapter 6: Summarize the whole research process and put forward research conclusions.

The research route of this paper is shown below:

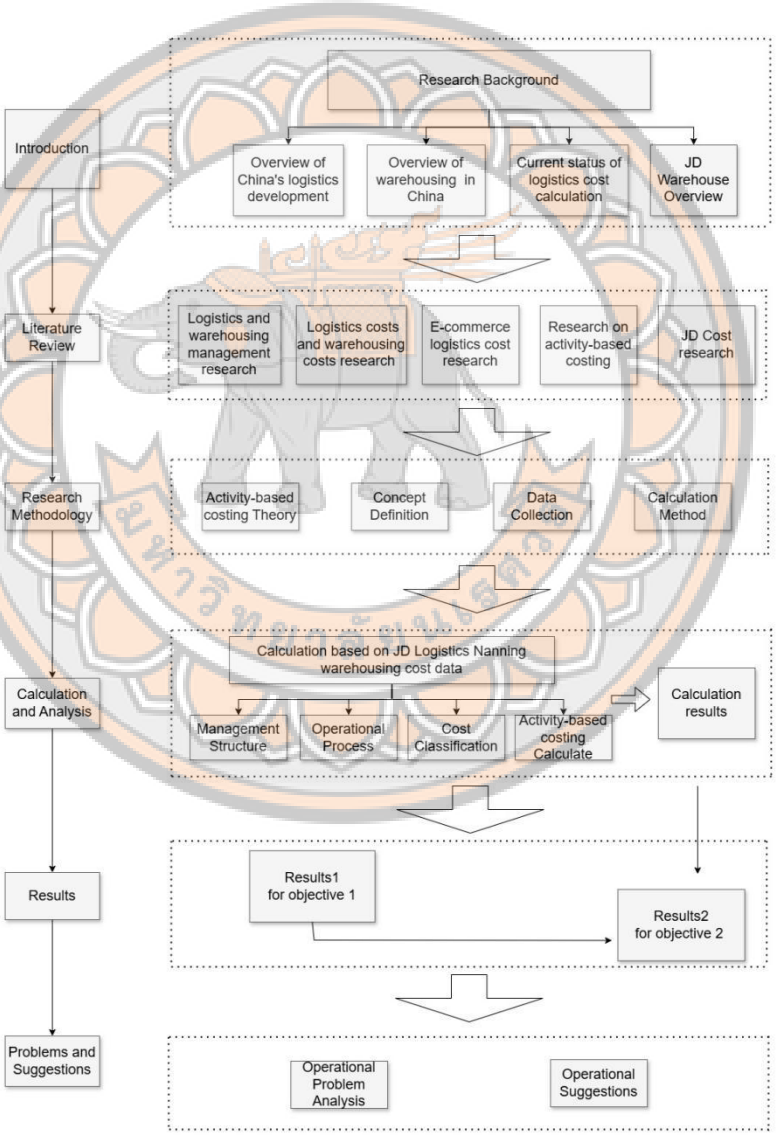



**Figure 7 Research Framework**

**Theory of Activity-based Costing method**

Determination of Methodology

Methods commonly used in logistics cost analysis include Activity-Based Costing (ABC), Life Cycle Costing (LCC), Cost-Benefit Analysis, Value Engineering, Linear Programming, etc. Combined with the case object selected in this paper, cost optimization is the focus of the research, so the linear programming method (Linear Programming) is used. Engineering, Linear Programming (Linear Programming), etc. Combined with the case object selected in this paper, cost optimization is the focus of the research, so combined with the previous research, the Activity-based Costing method is selected for analysis.

Theory of Activity-based Costing

According to the definition of Kaplan and other scholars, Activity-based Costing method uses different activities to attribute the consumption of costs and expenses, and then apportions the costs based on the amount of work incurred by each product. Compared with the traditional cost method, Activity-based Costing method is more rigorous in the allocation of indirect costs and other resources and is a kind of accounting method based on the activities the basis of accounting, allocating costs and expenses to the various operational aspects of products, services or cost objects. Activity-based Costing method can dynamically track the operation activities of the enterprise, analyze the cost consumption, accurately reflect the cost information, assist the enterprise to make accurate decisions, and improve the competitiveness of the enterprise.

**The Basic Principle of Operation Cost Method**

The basis of the study of Activity-based Costing method is activity, which refers to the principle of 'activity consumes resources, output consumes activity', according to the resource motive of resource cost tracing or allocation to the various activities, calculate the activity cost, and then according to the activity motive, the activity cost tracing or allocation to the various cost objects, and ultimately complete the cost of costing cost management method. The allocation of direct costs is basically the same as the traditional costing method, and can be charged directly, while the allocation of indirect costs is done by using activities as the basis of allocation. Both traditional costing methods and Activity-based Costing method are

carried out in two steps, only the allocation path of indirect costs is different. Under the traditional costing method, a single motive is used for allocation, and indirect costs of different natures are grouped together according to departments, and then indirect costs are allocated to various products based on production, with direct labor hours or machine hours as the allocation standard, and the allocation path of indirect costs is 'resource → department → product'. Under the Activity-based Costing method, the allocation of overheads is divided into two stages, the first of which is the allocation of overheads to the relevant activity cost pools in accordance with the consumption of resources, and the second is the allocation of activity costs in the activity cost pools to products in accordance with the different cause-and-effect relationships between the consumption of the activities and the products. Therefore, the allocation path of indirect costs under Activity-based Costing is 'resources → activities → products.

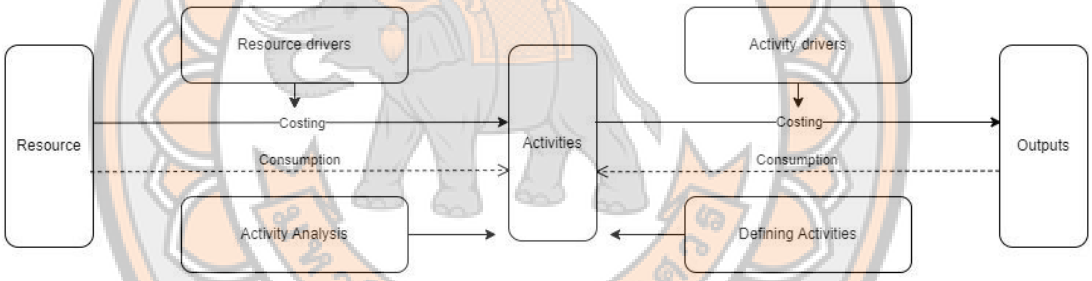



**Figure 8 Activity-Based Cost Basic Principle Diagram**

**Concepts Definition**

As the adoption of the activity cost method has changed the basis of overhead allocation under the traditional model, and a series of new concepts have arisen as a result, it is necessary to study the activity cost method to first elaborate on the important concepts involved. The main concepts involved in Activity-based Costing are resources, activities, cost drivers, resource drivers, activity drivers, etc. Resources are allocated to each activity Center through resource drivers to form activity cost pools; activity cost pools are then allocated to each product through activity drivers to form the cost of the final product.

Activities

Activities refer to the various business activities that an enterprise performs to provide products or services and that are expressed in the form of resource consumption.

Resources

Resources refer to all human, material and financial resources consumed in the operation process that can generate costs. When a resource is only used by one operation, the cost calculation is simple, but when a resource can be used by multiple operations, the consumption of resources must be properly allocated to the corresponding operations through cost drivers.

Cost Driver

Cost drivers are the causes that induce costs to be incurred and are the drivers of activity costs or product costs, which determine the costs to be incurred. Selection of appropriate cost drivers is the core content of Activity-based Costing, which is related to scientific, correct and cost-effective activity cost aggregation and allocation. In Activity-based Costing, cost drivers are divided into resource drivers and activity drivers. Since it involves the most basic concepts, cost drivers must choose quantifiable standards, such as direct labor hours, machine hours, number of parts, number of production preparations, number of item handling times, number of ordering times, etc.

Cost drivers can be divided into resource drivers and activity drivers.

Resource drivers: the reason for resource consumption operations, which is the basis for allocating resources to operations.

Operation drivers: the reason for allocating operation costs to final products or services, and the intermediate tool connecting resource consumption and final output. By calculating the consumption of operation drivers, the quantitative relationship between operation costs and final services can be revealed, and thus how to control the balance between operation costs and final services can be explored. Since the warehousing business is a link in the entire logistics service, the final output in the warehousing business process is the operations at all high levels in the warehousing business.

Activity Center

An activity Center usually consists of one activity or a group of activities of similar nature. An activity Center is a component of a business process.

Cost Objects

Cost objects are the objects to which activity costs are ultimately aggregated, such as products, services, customer orders, etc. The cost object of a warehousing and logistics activity can be understood as the entire warehousing service, or the upper-level activity obtained by aggregating the costs of each lower-level activity.

The warehousing business is divided into several independent and interrelated operations. These operations consume resources in different forms and act as final costs in different ways. Therefore, each warehousing business process can be regarded as the final cost object, such as the incoming business process, the in-stock business process, and the outgoing business process.

According to the basic operation principle of the ABC method "products consume operations, operations consume resources", the basic research steps for the logistics business process cost analysis in this article are shown in picture:

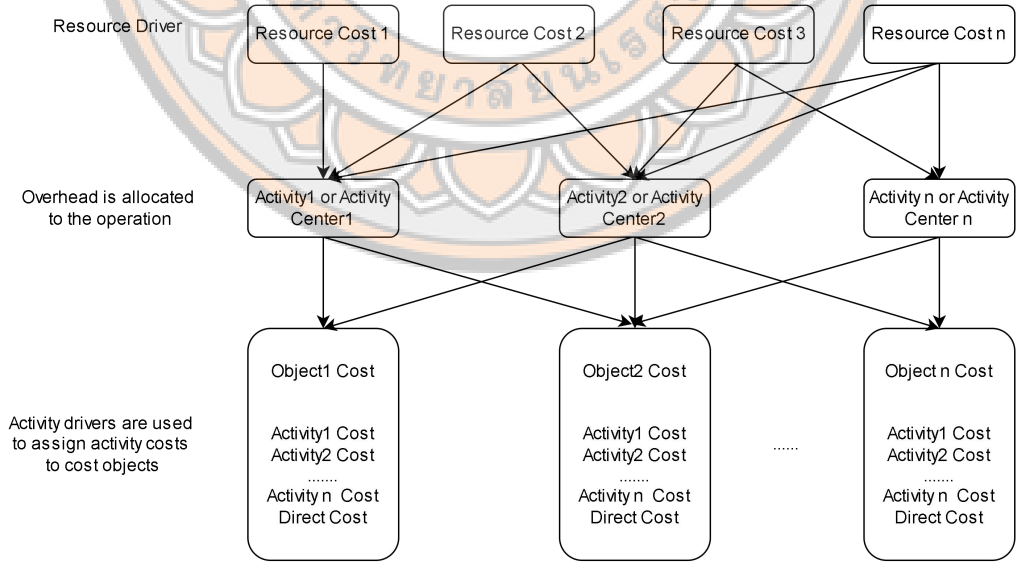



**Figure 9 Activity-Based Costing Method Basic Principle**

**Data Collection**

In order to achieve the research objectives, this paper collects data through multiple channels to achieve a more accurate operating cost approval using the activity-based costing method. The way of data collection covers indirect data and direct data acquisition. In terms of indirect data, with the help of JD Group's official financial report, basic information such as the overall cost type, amount and proportion of JD Logistics Group can be obtained, and at the same time, management information such as its business content, management structure, and the cost of self-built logistics capital and the current status of development can be mined from official reports and previous research literature, as well as information on the historical changes in the cost structure and the development of revenues of JD Logistics. In addition, statistics on regional economic development, China's logistics costs, and China's express parcel volume were obtained from the National Bureau of Statistics of China and report data released by official associations. Direct data was obtained through in-depth interviews with employees and managers, field visits to the daily operation and management of the study sites, and access to business systems to obtain relatively complete operational and production data over the study period. After the collected data are classified and statistically processed, they will form effective sample data that can be used for the calculation of the operation cost method, thus providing solid data support and basis for the in-depth analysis of the composition of operating costs and optimization strategies of JD Logistics.

Secondary Data

Enterprise Official Financial Report

Jingdong Group was officially listed on the NASDAQ stock exchange in the United States, so its financial reports have been made public since 2014, and Jingdong Logistics was listed on the main board of the Hong Kong Stock Exchange on 28 May 2021, so its financial reports have been made public since 2021. Financial reporting data is usually released in the following ways:

① Through the official websites of stock exchanges: Jingdong Group publishes its quarterly and annual financial reports, which detail the company's revenues, profits, and other key financial metrics, on the U.S. Securities and

Exchange Commission's (SEC's) EDGAR online database as well as on the official website of the Hong Kong Stock Exchange.

② Investor relations section on the official website of BOCOM: On the investor relations page of BOCOM's official website, the latest financial news, announcements, financial documents and performance reports are published to facilitate investors' enquiry and understanding of the company's financial status.

③Conference call: After the release of the financial results, Jingdong's management will hold a conference call to communicate with investors and analysts, interpret the results of the financial results, and answer related questions to further explain the company's financial performance and business development.

④Release to the media: the main information and highlights of the financial report are released through various financial media, news media, etc. With the help of media dissemination, the company's financial status and operating results are made known to a wider range of the public to enhance the company's transparency and market attention.

We can obtain relatively comprehensive basic information about Jingdong Group's development history, business model, strategic planning, investment income, service products and other basic information through the above-mentioned channels and the enterprise financial report itself. Through the official reporting information of the enterprise, management information such as business content, products, pricing, management structure, etc. of the research subject enterprise can be obtained.

Official Statistical Reports and Related Literature

This paper involves statistics on regional economic development, China's logistics costs, China's express parcel volume and other statistics, selected from the National Bureau of Statistics of China, official associations issued by the report data. Literature related to the study of JD can be obtained from the historical cost structure changes, revenue development and other pre-analysis information on JD Group and JD Logistics.

**Table 1 Data Collection and Collation**

| Access | Information | Raw Data | Sample Data |
|---|---|---|---|
| Annual corporate financial reports, public news reports, industry advisory reports | Enterprise basic information, development history, development strategic planning, business model, main business, management mode | Amount of total revenue, amount of total expenses for the year, major components of revenue, major components of expenses, operating activities affecting revenue | \ |
| ERP system | Organizational structure, cost breakdown, order quantity, number of equipment, number of employees, etc. | Housing costs, staff wages, utilities, warehouse space, consumables, office expenses, etc. | Monthly Cost Amount by Department<br>Monthly Rental Operating Area<br>Number of Employees<br>Employee Wages<br>Number of Equipment Vehicles<br>Number of orders |
| field interview | Equipment Usage<br>Site management process<br>Employee operation process<br>Material usage | Length of time equipment has been in use<br>Inventory of goods<br>Handling times<br>Employee scheduling and working hours | Monthly hours of equipment use<br>Cargo Inventory<br>Number of packages<br>Transport distance |

Primary Data

Management and Employee Interviews

In-depth interviews with relevant employees and managers of the enterprise, to obtain the actual management process of the case study subjects, record their experiences and thoughts on the current operation and management, and identify potential problems and opportunities for improvement.

Fieldwork

The authors conducted field visits to the study case sites to visually inspect and observe their daily operational processes and management and collect corresponding data on the use of operational equipment, staff scheduling, water and electricity consumption, and so on.

Internal System Data

Through employees within the business who are authorized to assist in providing raw data such as historical cost amounts, area, number of pieces of equipment, etc. for the relevant departments, the complete orders and operational cost data from the year 2022 to 2023 can be obtained by accessing the business system.

Data collation

Through the above channels, it is possible to obtain the following data (in part), which after sorting and processing the raw data form the initial data of the samples can be used for calculations.

**Table 2 Sample Data Collection**

| No | Raw Data Item | Data source |
|---|---|---|
| 1 | Amount of total revenue of JD logistics | Annual financial reports |
| 2 | major components of revenue and expenses by year | |
| 3 | Components of operating activities JD logistics | |
| 4 | Order quantity | ERP system |
| 5 | Number of equipment | |
| 6 | Number of employees by department | |
| 7 | Labor salary value | |

| | | |
|---|---|---|
| 8 | Inventory of goods | |
| 9 | Rental cost | |
| 10 | Warehouse Rental area | |
| 11 | Depreciation of equipment | |
| 12 | Number of vehicles | ERP system |
| 13 | Transport mileage | |
| 14 | Transport volume | |
| 15 | Transport weight | |
| 16 | Daily operating expenses | |
| 17 | Insurance premiums | |
| 18 | Amortization of turnover materials | |
| 19 | Number of packages | |
| 20 | Monthly hours of equipment use | Field interview |
| 21 | Cargo Inventory | |
| 22 | Handling times | |
| 23 | Employee scheduling and working hours | |

**Calculation Process**

The Calculation Process of Application by Activity-Based Costing

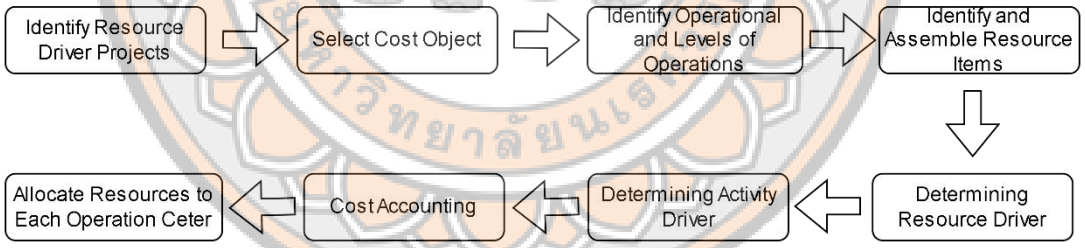



**Figure 10 Activity-based Costing Analysis Flowchart**

Determine the Resource Items of Logistics Enterprises

The logistics enterprise is regarded as a system for material exchange with the outside world. All human, material and financial resources entering the system are included in the scope of resources to achieve full coverage of the accounting scope. According to the actual situation of the case study enterprise, the resource items are divided into personnel costs, construction costs, warehouse rental, equipment depreciation, transportation and distribution fees, order consumables, house usage fees, daily operating expenses, etc.

Selection of Cost Object

According to the nature of the services of JD Logistics, it is determined that the cost object of the operation cost method of logistics enterprises is the cost generated by each order in the process of fulfilment logistics, i.e., the logistics cost generated by each logistics sub-project under the centralized management of Jingdong Logistics in a certain accounting period is the cost object.

Determine the Operation Center and All Levels of Operation

According to the business process and characteristics of JD logistics enterprises, explore to the specific level of operation, mainly including warehouse management, sorting and processing, transport and distribution and other operation centers.

**Table 3 Operation Centers and Operational Activities**

| Operation Centers | Operational Activities |
|---|---|
| Warehouse Management Center | Goods inbound, Storage and Custody（Storage Costs）, Inventory Counting Costs, Goods out of stock（Outbound Cost ） |
| Sorting and Processing Center | Parcel sorting, bagging and loading operations |
| Transportation Center | Transport vehicle scheduling, transport distribution |

The main operations of a warehouse management center include inbound and outbound handling of goods, Storage and Custody（Storage Costs）, and inventory.

The main operations of the sorting and processing center include sorting operations and packaging operations.

The main operations of the transport and distribution center include transport vehicle scheduling, transport and distribution.

Identification and clustering of resource items

Each item of JD Logistics constantly consuming resources in the course of its operations, and the operations and operation centers in logistics activities are identified to define the consumption of resources in each segment.

Determine the status of the enterprise's resource items in the following table:

**Table 4 Operation Resources**

| Operations Centers | Resources Items |
|---|---|
| Warehouse Management Center | Building costs, consumable costs, labor costs, equipment maintenance. |
| Sorting and Processing Center | Building use costs, daily operating costs, depreciation of sorting equipment, personnel costs, order consumables. |
| Transportation Center | Vehicle purchase, transport and distribution costs, depreciation of transport equipment, personnel Costs. |

According to the financial data of JD logistics enterprises in the logistics costs and expenses of the details of the specific logistics link oriented, resource consumption is divided into warehouse management costs, sorting and processing costs, cost of goods transport and distribution costs. And it is divided into direct costs and indirect costs, as follows:

**Table 5 JD Nanning Intelligent Logistics Park Operation Cost Structure**

| Operations Centers | Direct Costs | Indirect Costs |
|---|---|---|
| Warehouse Management Center | storage rentals, construction costs, etc. | depreciation of warehousing equipment, staffing costs, consumption of warehousing |

| | | |
|---|---|---|
| | | resources, etc. |
| Sorting and Processing Center | order consumables, etc. | housing costs, depreciation of sorting equipment, personnel costs, daily operating expenses, etc. |
| Transportation Center | transport and distribution costs, purchase of vehicles, etc. | personnel costs, depreciation of transport equipment, etc. |

Determination of Resource Drivers

Resource drivers, as the driving factor of consumption in logistics enterprises, are the basis for allocating resources to each logistics cost pool. Reasonable resource motivation is the key to accurately allocating resource items to the operation center or cost objects, and determine the resource items and motivation as shown in the table below:

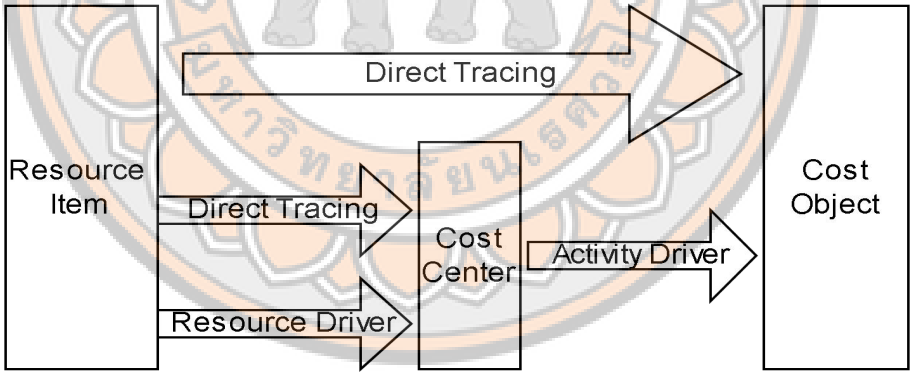



**Figure 11 Resource Allocation Flow Chart**

**Table 6 Resource Drivers**

| Operations Centers | Resource | Resource Drivers |
|---|---|---|
| Warehouse Management Center | Building costs | Area (㎡) |
| | Warehouse rent | Area (㎡) |
| | Depreciation of warehouse | Time (months) |

| | | |
|---|---|---|
| | equipment | |
| | Warehouse manager's salary | Number of people (person) |
| | Building costs | Area (㎡) |
| Sorting and Processing Center | Depreciation of sorting equipment | Time (months) |
| | Sorting staff wages | Number of people (person) |
| | Order Consumables | Number of orders |
| | Daily Operating Expenses | Number of people (person) |
| Transportation Center | Acquisition of transport vehicles | Number of vehicles (vehicles) |
| | Depreciation of vehicles and equipment | Time (months) |
| | Wages of transport employees | Number of people (person) |
| | Transport costs | Mileage (kilometers) |

Determination of activity drivers

The operation motive is the criterion for allocating the cost of each logistics operation center to the cost object. The operation centers are identified according to each of the three operation centers of the logistics company, and the cost of the operation center cost pool is allocated to the logistics cost object.

**Table 7 Activities Drivers**

| **Operations Centers** | **Activities** | **Activity Drivers** |
|---|---|---|
| Warehouse Management Center | Goods warehousing (Inbound Costs) | Volume of goods in stock ($m^3$) |
| | Storage and Custody (Storage Costs) | Average value of goods in stock (RMB) |
| | Inventory count | Number of inventory counts (times) |
| | Goods out | Volume of goods out of stock ($m^3$) |

| | | |
|---|---|---|
| Sorting and Processing Center | Sorting operations | Volume of goods sorted (pieces) |
| | Packaging | Number of orders packed (units) |
| Transportation Center | Transport Vehicles | Mileage of transported goods (km) |
| | Transport and Distribution | Weight of transported goods (tones) |

Cost Accounting

Accounting was carried out using sample data to calculate the average monthly cost and total cost of each operation center.

**Table 8 The Indicator and Calculate Formula**

| No. | Indicator | Formula |
|---|---|---|
| 1 | Resource driver allocation ratio | Total number of resource items/total number of drivers for each operations center |
| 2 | Consumption of each resource by operation center | Resource driver allocation rate ×the number of resource drivers of each operation center |
| 3 | Activity driver allocation rate | Costs of operation center / the number of operating factors of each operation center |
| 4 | Costs allocated from the operation center to the cost object | Activity driver allocation rate × total number of its activity drivers for the cost object |
| 5 | Total cost of the object | The sum of the costs allocated to the object by each activity Center + the cost of resources traced directly to the cost object |

Get the Result and Analysis

Firstly, the average cost per unit was calculated in the traditional way, and secondly, the cost was further calculated in accordance with the activity-based

costing method, and the cost was re-approved and analyzed in a comparative manner.

The results of Calculation

According to the purpose of the study, this paper needs to use sample data to carry out multiple rounds of calculations to obtain the following calculations through aggregation, statistics, and arithmetic.

The results for the objective 1

(1) Calculate the annual and monthly cost per order. Since the main product of Jingdong Logistics is logistics warehouse and distribution supply chain services, it is necessary to calculate the cost per order, which is used as a basis for determining the pricing of the product.

(2) Calculate the total annual and monthly costs, the composition of each cost, and its proportion for each operation center.

In order to improve the external competitiveness of Jingdong Logistics, from the internal perspective, it is necessary to have a clear understanding of the cost composition of each link, the composition of each cost and its proportion, to accurately target the links with a high proportion of the proposed improvement measures.

(3) Compare the average cost per unit across the three operational Centers, including:

Longitudinal comparison (for the same operational Center, showing cost trends over 2 years in line graphs, 3 graphs in total).

Cross-sectional comparison (across the three Centers, comparing costs incurred over 12 months in a bar chart, 1 chart per year for 2 years).

The results for the objective 2

Through the above calculation and analysis results, taking the annual total cost reduction as the target, the operation links and operation centers with the highest occupancy costs can be identified, and the management and operation measures for the departments with the highest cost share in the operation centers can be optimized. According to the theory and strategy of warehouse operation management, we propose optimization measures in response to the operation links with the highest cost share from the perspective of the operation process.

# Chapter IV

# THE CASE COSTING PROCESS

## Overview of Study Cases

This study examines the Jingdong Nanning Logistics Park, located in Nanning, the capital city of Guangxi Zhuang Autonomous Region, China. As the first large-scale logistics hub independently invested in and developed by Jingdong (JD.com) in Guangxi, the park represents a critical component of the company's strategic logistics expansion in the region. It plays a pivotal role in JD.com's self-operated e-commerce logistics system, aiming to enhance regional logistics efficiency and stimulate local economic growth. The selection of the Jingdong Nanning Logistics Park as the focal point of this research is grounded in its distinctive geographical advantages, strategic significance, and operational maturity. Positioned as a vital transportation hub linking Southwest China and Southeast Asia, Nanning possesses considerable potential for logistics development. The establishment of the logistics park significantly reinforces JD.com's service capabilities not only in Guangxi but also across the broader southwestern region of China, while simultaneously invigorating the local economy. Following two years of operational development, the logistics park has successfully established a relatively comprehensive logistics service system. It has demonstrated robust performance in managing large-scale promotional events and has accumulated valuable experience in logistics operations, positioning itself as a model for future regional logistics infrastructure.

**Figure 12 Location of JD Nanning Intelligent Logistics Park**

**Operation and Management Status**

This research investigates the operational structure and cost management of the Jingdong (JD) Nanning Intelligent Logistics Park, focusing on its role in regional logistics within Guangxi Province, China. The park is tasked with receiving inventory from upper-tier storage Centers and direct merchant supplies and subsequently distributing these goods to five secondary sorting Centers across Guangxi. From there, distribution extends to approximately 150 terminal delivery nodes, forming a comprehensive logistics network.

As a relatively independent and functionally integrated logistics park, JD Nanning Park oversees three core service processes: warehousing, sorting, and transportation. However, these functions are managed separately by three distinct second-tier departments within the broader JD organizational structure. This fragmented administrative arrangement hinders unified cost analysis from a supply chain management perspective. To address this issue, the present study treats the logistics park as a single analytical unit, integrating the operational and management costs across warehousing, sorting, and transportation. This approach enables a more holistic assessment of current cost structures and offers insights into potential cost optimization strategies.

**Calculation of Applying Activity-Based Costing (ABC) method**

1. Identification of Logistics Resource Categories

The logistics operation is conceptualized as a system facilitating material exchanges between the enterprise and external entities. All human material, and financial inputs entering the system are categorized as resources, ensuring comprehensive cost accounting. Based on a thorough review and classification of raw cost data from JD Nanning Park, the key resource categories identified include personnel expenses, infrastructure investment, warehouse rental, equipment depreciation, transport and delivery expenses, order-related consumables, property and rental costs, and utilities such as water and electricity.

2. Selection of Cost Objects

In accordance with the service-oriented nature of JD Logistics, the cost object is defined as the cost associated with fulfilling a single customer order. Thus, the logistics cost for each order—incurred during a specific period across all

operational activities managed within the park—serves as the basis for cost calculation.

3. Determination of Operation Centers and Activity Levels

The core operational structure of JD Nanning Park consists of three primary Centers: warehousing, sorting and processing, and transportation and distribution. These Centers are responsible for key logistics activities such as inventory control, inter-provincial goods exchange, and intra-provincial last-mile delivery.

By analyzing the management structure of JD Nanning Logistics Park, it can be seen that its management departments are set up to follow the supply operation and management links, and the departments set up in the park cover 3/4 of the whole operation link, including the warehousing department, short-distance transport department, sorting department, and the final distribution link is not set up in the park, so this determines that the operation cost calculation of the park involves the operation of the Center as three.

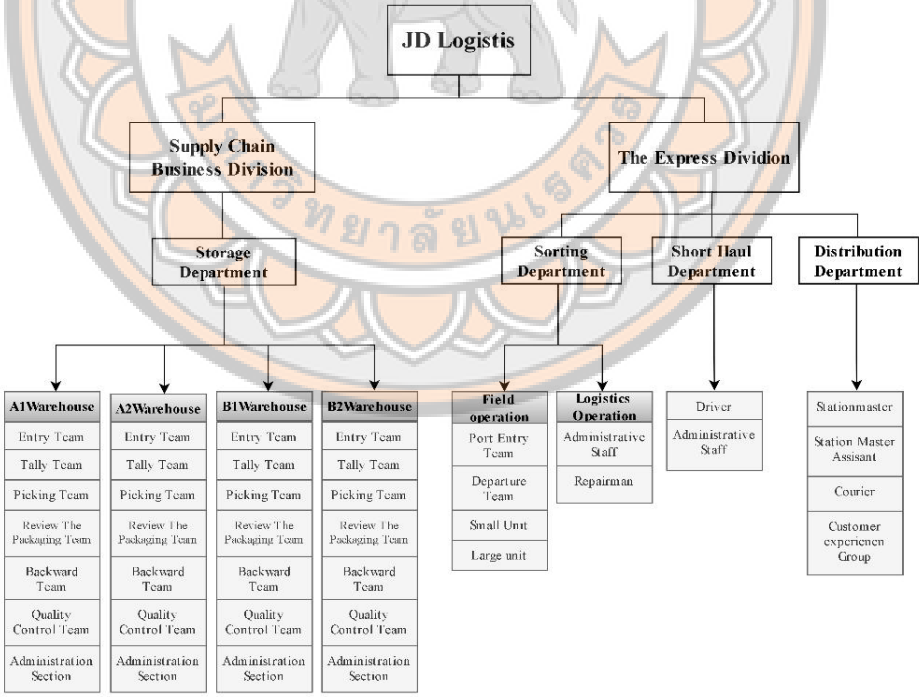



**Figure 13 JD Nanning Logistics Park Management Structure**

Through field visits and the production process within the enterprise, this study reconstructs and analyzes the logistics workflow of the JD Nanning Intelligent

Logistics Park (Figure14), the starting point of the whole logistics operation process starts from the receipt of goods into the warehouse until the end of the distribution of goods to the hands of the consumer, and the costs incurred in the process are the operating costs. Overall, there are four major links, i.e. warehouse, picking, transport and distribution, and this paper focuses on analyzing and calculating the operating costs of the three links of warehouse, picking and transport in the park. At the same time, consumers shopping through the e-commerce platform, orders transferred to the warehouse for picking, packing, export operations, sorting and distribution is called the order fulfilment process, this process is the main source of the park to consume the cost and obtain income, therefore, JD e-commerce platform of various promotional activities, bringing fluctuations in sales orders, these fluctuations will be through the change of the number of orders on the park's operating costs to have a direct impact.

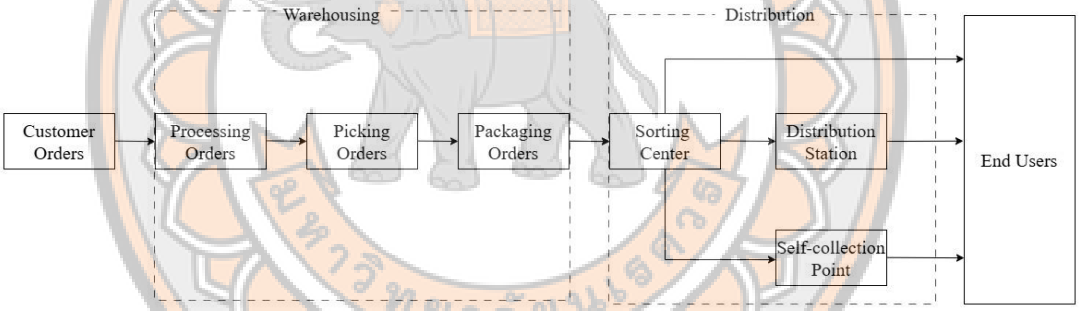



**Figure 14 Order Fulfillment Flow of JD Intelligent Logistics Park**

To facilitate the calculation, the operation process in this paper mainly refers to the first-level process in the warehouse operation to meet the order fulfilment, describes the complete operation process through the flow chart, and simplifies and collates to get the corresponding operation activity table (Table 7). The main activities of the Warehouse Management Center include order acceptance information processing, transport of goods on and off the shelves, warehousing and storage, and regular inventory; the main activities of the Sorting Center include sorting and processing; and the main activities of the Transportation Center include transport vehicle scheduling, loading and reviewing, goods reproduction, and transportation and distribution.

**Table 9 Operating Centers and Activities**

| Operating Center | Activities |
|---|---|
| Warehouse Management Center | Goods inbound, Storage and Custody (Storage Costs), Inventory Counting Costs, Goods out of stock (Outbound Cost) |
| Sorting and processing Center | Sorting operations, packaging operations |
| Transportation Center | Transport vehicle scheduling, transport distribution |

4. Identification and clustering of resource items

Each item of JD Logistics is constantly consuming resources in the operation process, and the consumption of resources can be separately attributed to each operation center based on the identified operation center and operation activities. Resource items consumed by Jingdong Nanning Intelligent Logistics Park include rent and property costs, utilities, property-related expenses, decoration costs, office expenses, equipment depreciation and maintenance, equipment depreciation, working capital materials, self-owned-transportation equipment depreciation, bonuses and incentives, labor wages, order consumables, in-order cargo compensation, out-of-order cargo compensation, insurance premiums, equipment and material leasing fees, three-way freight, self-owned vehicle usage fees, labor outsourcing, temporary workers, recruitment and education compensation, employee performance, loading and unloading costs, construction costs, consumable costs, and other costs. The allocation to the operation centers is as follows.

**Table 10 Resources Consumption of Operation Centers**

| Operation Center | Resource |
|---|---|
| Warehouse Management Center | Rental property costs, utilities, equipment depreciation, packaging supplies, staff wages ..... |

| | |
|---|---|
| Sorting and Processing Center | Rental property costs, utilities, depreciation of logistics equipment, staff costs, packaging consumables, loading and unloading ..... |
| Transportation Center | Transport and distribution costs, vehicle depreciation, insurance ..... |

According to the principle of ABC operation cost method, in the operation process of the whole park, the cost of resources consumed can be divided into direct cost and indirect cost according to the relationship with the object of operation, and the indirect cost is mainly reallocated according to the order in the process of logistics operation.

**Table 11 Cost Structure of JD Nanning Logistics Park**

| Operation Center | Direct Costs | Indirect Costs |
|---|---|---|
| Warehouse Management Center | Packaging supplies, personnel wages | Depreciation of equipment, labor costs, utilities, etc., construction costs |
| Sorting and Processing Center | Packaging supplies, personnel wages, etc. | Facility costs, rent, property costs, equipment depreciation, utilities, labor costs, etc. |
| Transportation Center | Personnel wages, etc. | Loading and unloading costs, training costs, depreciation of transport equipment, insurance costs, etc. |

5. Determination of resource drivers

Selection of appropriate resource drivers for each operations center and establishment of resource-to-operations correspondence. Resource drivers are the

direct basis for the consumption of resources by operations and reflect the causal relationship between the volume of operations and the number of resources consumed. Resource drivers are the basis for allocating consumed resources to each logistics center. Reasonable resource drivers are the key to the accurate allocation of resource items to operation Centers or cost objects. Through the collection of data from 2022-2023, the following table is shown the resource item drivers and its value.

**Table 12 Resource Drivers of JD Nanning Logistics Park**

| Operation Center | Resource | Value（RMB） |
|---|---|---|
| Warehouse Management Center | Building Costs | 10545178.81 |
| | Warehouse Rental | 12494398.88 |
| | Depreciation of warehouse equipment | 5252630.43 |
| | Warehouse manager's salary | 22526317.82 |
| | Warehouse resource consumption | 5956296.63 |
| Sorting and Processing Center | Housing costs | 7883979.305 |
| | Depreciation of sorting equipment | 196716.315 |
| | Sorting staff wages | 25050887.82 |
| | Order Consumables | 736835.41 |
| | Daily Operating Expenses | 137939.795 |
| Transportation Center | Transport staff wages | 14432260.52 |
| | Transport costs | 25157258.61 |

From the table above, it can be seen what resources and amounts were consumed by each operating Center, and thus it can be calculated that the average annual cost of the warehousing center, sorting center and transport Center are 567,74822.56RMB, 34,006,358.64 RMB and 395,89519.13 RMB respectively.

6. Determine the Activity Driver

Rationally allocate the costs attributed to the activity center (through the allocation of resource drivers) to individual cost objects, specifying the “quantity” and “cost” of the activities consumed by each cost object. The activity driver is the criterion for allocating the cost of each logistics operation center to the cost object,

and the cost of the operation Center cost pool is allocated to the logistics cost object according to the workload of each activity.

Based on the cost data collected for 2022-2023 for each department, it contains data on storage volume, transport mileage, etc., and weight of goods.

By collating and calculating these data we get a table of activities drivers (Table 13), which is used to calculate and determine the resource driver rates for each operational center (Table 14):

**Table 13 Activities Drivers of JD Nanning Logistics Park**

| Operation Center | Main Operations | Driver | Numerical value |
|---|---|---|---|
| Warehouse management Center | Goods Inbound | Volume of goods in stock ($m^3$) | 3248764 |
| | Storage and Custody (Storage Costs) | Average value of goods in stock (RMB) | 1.159 |
| | Inventory Counting | Number of inventory counts (times) | 24 |
| | Goods out of stock | Volume of goods out of stock ($m^3$) | 3248764 |
| Sorting and Processing Center | Sorting operations | Number of goods sorted (pieces) | 174640993 |
| | Packaging | Number of orders packed (units) | 147363723 |
| Transportation Center | Transportation Vehicles | Transportation mileage (kilometers) | 17654157.34 |
| | Transportation and Distribution | Weight of transported goods (tons) | 668499586.3 |

**Table 14 Resource Drivers Rate for Operation Centers**

| Operation Center | Main Operations | Resource driver rate |
|---|---|---|
| Warehouse Management Center | Goods warehousing (Inbound Costs) | 20% |
| | Storage and Custody (Storage Costs) | 50% |
| | Inventory Counting Costs | 10% |
| | Goods out of stock (Outbound Cost ) | 20% |
| Sorting and Processing Center | Sorting operation | 50% |
| | Packaging | 50% |
| Transportation Center | Transportation Vehicles | 30% |
| | Distribution operations | 70% |

7. Allocation of resources to individual operations Centers

Based on the data in Tables 11, 12 and 13, the unit cost of each activity for each operation center can be calculated separately according to the ABC costing method.

Warehousing Center:

①In-bound cost : the volume of incoming goods as the resource driver of goods in storage operations, the total volume of goods in storage for the year is 3248764m3，Inbound operations cost 20 per cent of the total cost of the warehousing Center，then the cost per unit of incoming operation =（56774822.56×20%）÷3248764=3.495RMB / m3.

②storage operations cost: the volume of warehousing and storage units is 21,954,106 units, and the cost of storage and storage operations accounts for 50 % of the total cost of the storage Center, then the cost of storage and storage operations per unit is（56774822.56×50%）÷21954106=1.293 RMB/order.

③Inventory counting operations cost: Using the number of inventory counts as the resource driver for inventory counting operations, the number of counts

for the year is 24, and the cost of inventory counting operations accounts for 10 per cent of the total cost of the warehousing center, the cost per unit of inventory counting operations is（56774822.56×10% ）÷24=236561.761 RMB/time.

④Out-bound cost:Taking the volume of goods out of storage as the resource driver for goods out of storage operations, the total volume of goods out of storage is 3940783.91 cubic metres, and the cost of out of storage operations accounts for 20 per cent of the total cost of the warehousing center, then the cost of the unit out of storage operations is（56774822.56×20%）÷3940784 =2.881RMB/m3.

Sorting Center:

①Sorting operation cost:the quantity of goods sorted as the resource driver of the sorting operation, the number of goods sorted per year is 7,368,862, the cost of the sorting operation accounts for 50% of the total cost of the sorting center, then the unit cost of the sorting operation is（34006358.64 ×50% ）÷73681862=0.231RMB /unit.

②Packaging cost:Taking the number of orders for packaging as the resource driver for packaging operations, the number of packaging orders for the year was 873,204,997, and the cost of packaging operations accounted for 50% of the total cost of the Sorting Center; then the cost per unit of packaging operations was（34006358.64 ×50% ）÷87320497=0.195 RMB/order.

Transportation Center:

①Vehicle dispatch operations cost: using transport mileage as the resource driver for vehicle dispatch operations, with a total annual transport mileage of 8,862,389.5 kilometers and the cost of vehicle dispatch operations accounting for 30 per cent of the total cost of the Transportation Center, the unit cost of vehicle dispatch operations would be（39589519.13×30% ）÷8862389.5=1.340RMB/km.

②Distribution operations cost:using the weight of goods transported as the resource driver for transport and distribution operations, the total weight of goods transported during the year was 930,448,979.5, and the cost of transport and distribution operations accounted for 70 per cent of the total cost of the transport

Center, so that the cost per unit of transport and distribution operations was （39589519.13×70% ）÷930448979.5=0.030 RMB/kg.

Based on the calculations above, we get the following table (Table 15):

**Table 15 Cost of Each Sub-operating Activity**

| Operation Center | Main Operations | Motivations | Numerical value | Operation Center Cost (￥) | Resource Driver Rate (%) | Activity Costs |
|---|---|---|---|---|---|---|
| Warehouse Management Center | Goods warehousing (Inbound Costs) | Volume of goods in stock (cubic meters) | 3248764 | 56774822.56 | 20% | 3.495 |
| | Storage and Custody (Storage Costs) | Average value of goods in stock (dollars) | 21954106 | | 50% | 1.293 |
| | Inventory Counting Costs | Number of inventory counts (times) | 24 | | 10% | 236561.761 |
| | Goods out of stock (Outbound Cost ) | Volume of goods out of stock (cubic meters) | 3940784 | | 20% | 2.881 |
| Sorting and Processing Center | Sorting operations | Number of goods sorted (pieces) | 73681862 | 34006358.64 | 50% | 0.231 |
| | Packaging | Number of orders packed (units) | 87320497 | | 50% | 0.195 |
| Transportation Center | Vehicle Dispatch operations | Transportation mileage (kilometers) | 8862389.5 | 39589519.13 | 30% | 1.340 |
| | Distribution operations | Weight of transported goods (kg) | 930448979.5 | | 70% | 0.030 |

8. Operation Center Costing

According to the above data, the monthly cost of the three operation Centers and each activity is calculated based on the ABC cost method.

First of all, through the collation of the data of Jingdong Nanning Intelligent Logistics Park in 2022-2023, we can get the monthly operation operation volume, and get the following table (Table 16) for the inbound goods (cubic meters), the number of warehouse storage orders, the number of inventory counts, the outbound goods (cubic meters), the number of packaging orders, the number of transport miles, and the volume of goods transported lose statistics:

**Table 16 Cost Data of Each Operational Activity by Month in 2022-2023**

| Time | Inbound goods ($m^3$) | Inventory unit | Inventory frequency | Outbound goods ($m^3$) | Sorting (order) | Package (order) | Transport mileage (km) | Volume of cargo transported (kg) |
|---|---|---|---|---|---|---|---|---|
| January | 155022.7 | 2088101 | 2 | 237012.4048 | 6395061 | 7776887 | 694786.372 | 43660315.16 |
| February | 79486 | 1421509 | 2 | 120984.2674 | 4235158 | 4868960 | 568523.68 | 21665088.05 |
| March | 98634.4 | 1617997 | 2 | 156460.3516 | 5018170 | 5984887 | 790324.041 | 29006374.15 |
| April | 91966.6 | 1655893 | 2 | 237012.4048 | 4837516 | 5732019 | 694786.372 | 43660315.16 |
| May | 100796.1 | 1672610 | 2 | 157407.0098 | 5392907 | 6328271 | 725106.299 | 29220253.36 |
| June | 123681.1 | 1952399 | 2 | 195164.6039 | 5926544 | 7143155 | 848101.514 | 34583659.56 |
| July | 102837.9 | 1625940 | 2 | 237012.4048 | 5027832 | 5990402 | 694786.372 | 43660315.16 |
| August | 108921.2 | 1679494 | 2 | 174766.9386 | 5157437 | 6200339 | 797730.399 | 32080389.89 |
| September | 128091.2 | 1640498 | 2 | 197606.1737 | 5547783 | 6686009 | 849304.253 | 35134514.19 |
| October | 117799 | 1682145 | 2 | 186392.6528 | 5459620 | 6489013 | 810612.7 | 32547718.15 |
| November | 154527.7 | 1895422 | 2 | 235870.9271 | 6593740 | 8017593 | 875051.216 | 40023164.56 |
| December | 217527.8 | 1820218 | 2 | 314384.6372 | 6869069 | 8170529 | 1047148.627 | 43059626.83 |
| 2022 | 1479291.7 | 20752226 | 24 | 2450074.777 | 66460837 | 79388064 | 9396261.845 | 428301734.2 |
| January | 164685.8 | 2001631 | 2 | 140379.353 | 6573027 | 7849323 | 671487.88 | 21915530 |
| February | 115787.6 | 1622267 | 2 | 100714.3 | 5568316 | 6425208 | 537759.7 | 15716728.91 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| March | 92496.4 | 1798342 | 2 | 553 105150.3 624 | 4718565 | 5479081 | 553430.94 | 17426064.81 |
| April | 119063.2 | 1741146 | 2 | 103032.6 997 | 5775050 | 6796598 | 805291.48 | 17746891.03 |
| May | 128205.3 | 1832185 | 2 | 109151.1 334 | 6287255 | 7425854 | 657784.83 | 18868888.23 |
| June | 165623.9 | 2006980 | 2 | 138198.2 189 | 7454093 | 9006404 | 690317.08 | 23545312.26 |
| July | 130532.4 | 1711770 | 2 | 110179.2 205 | 6173170 | 7297311 | 641709.4 | 18838362.32 |
| August | 138494.5 | 1865009 | 2 | 113839.9 844 | 6579788 | 7777466 | 642157.1 | 18762446.06 |
| September | 171220.8 | 2166633 | 2 | 141304.7 169 | 7517230 | 9003465 | 747900.74 | 23829591.73 |
| October | 152108.2 | 2111131 | 2 | 122194.7 173 | 7095764 | 8300048 | 727690.81 | 19544283.06 |
| November | 200595.6 | 2277672 | 2 | 156801.3 363 | 8886604 | 1042039 6 | 852268.46 | 23417473.42 |
| December | 190658.6 | 2021219 | 2 | 149763.0 356 | 8274024 | 9471775 | 730097.07 | 20586280.21 |
| 2023 | 1769472. 3 | 23155985 | 24 | 1490709. 134 | 8090288 6 | 9525292 9 | 8257895.4 9 | 240197852 |

(1)Cost of the warehouse center: the warehouse center is divided into four operations: goods in, Storage and Custody（Storage Costs）, inventory and goods out of the warehouse, from the data in Table 7, the allocation of costs to the four operations of the unit cost of 3.495 RMB / m3, 1.293 RMB / single, 236,561.761 RMB/ times, 2.881 RMB / m3, can be derived from the four operations of the warehousing center of the cost of the activities of the four links per month as follows:

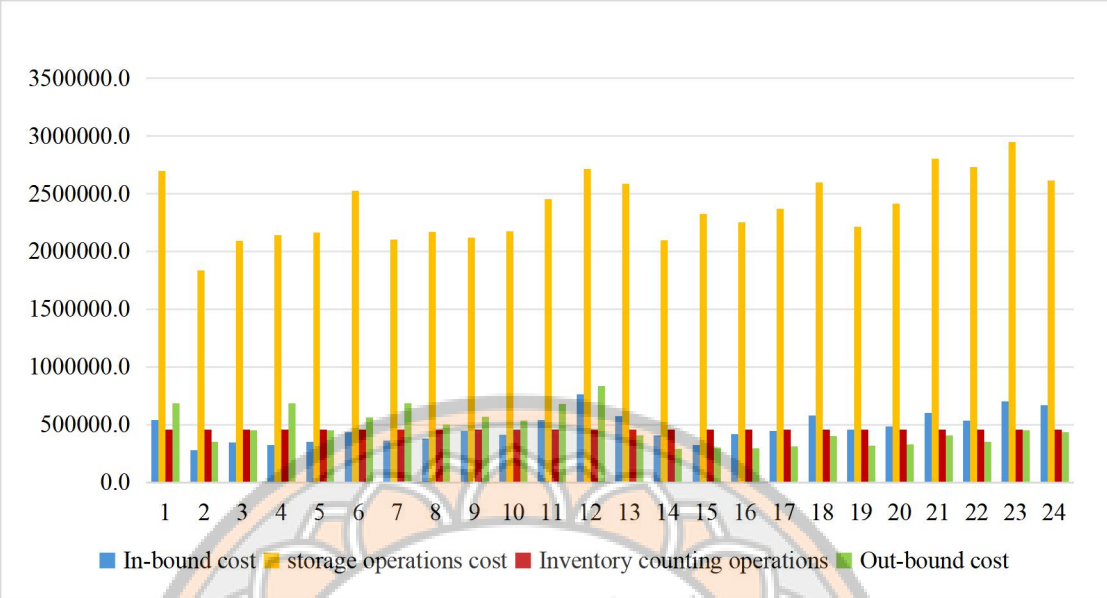



**Figure 15 Warehouse Center Cost (Unit: RMB)**

(2) Cost of the sorting center: the sorting center is divided into two operations, sorting operations and packaging operations, from the data in Table 14, the allocation of resources to the two operational aspects of the unit cost of 0.231 RMB / piece, 0.195 RMB / single, resulting in the sorting center of the two operational aspects of the monthly cost of the table below:

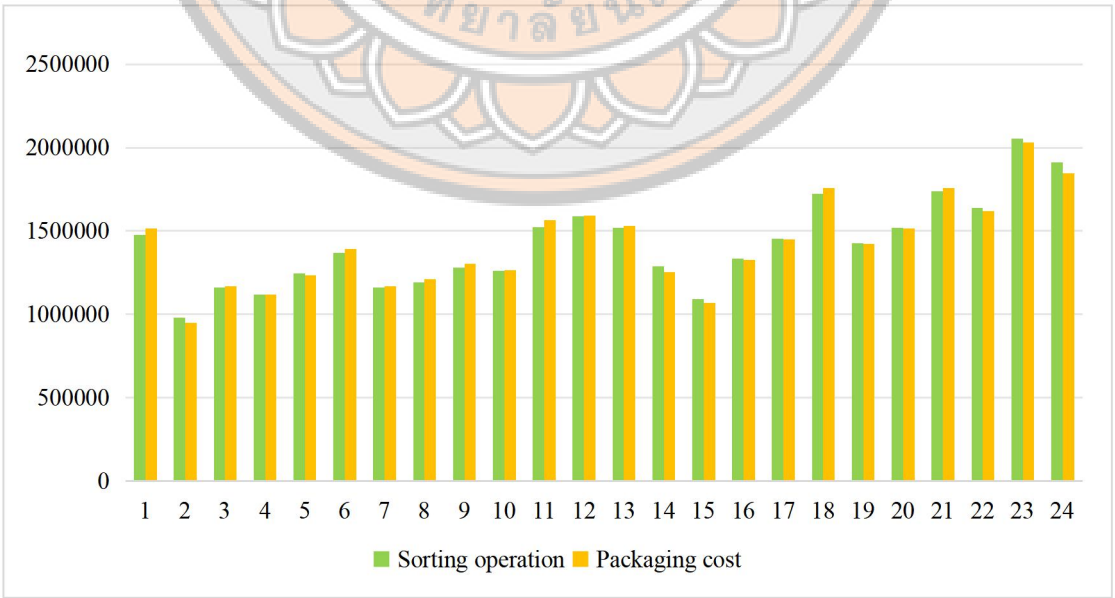



**Figure 16 Sorting Center Cost (Unit: RMB)**

Cost of the transport center: the transport center is divided into two operations, transport vehicles and transport distribution, from the data in Table 14, the unit cost of allocating resources to the two operations is 1.340 RMB / kilometer, 0.030 RMB / kg, calculated as the transport center of the two core operations of the monthly cost of the operation and the total cost per month are as follows:

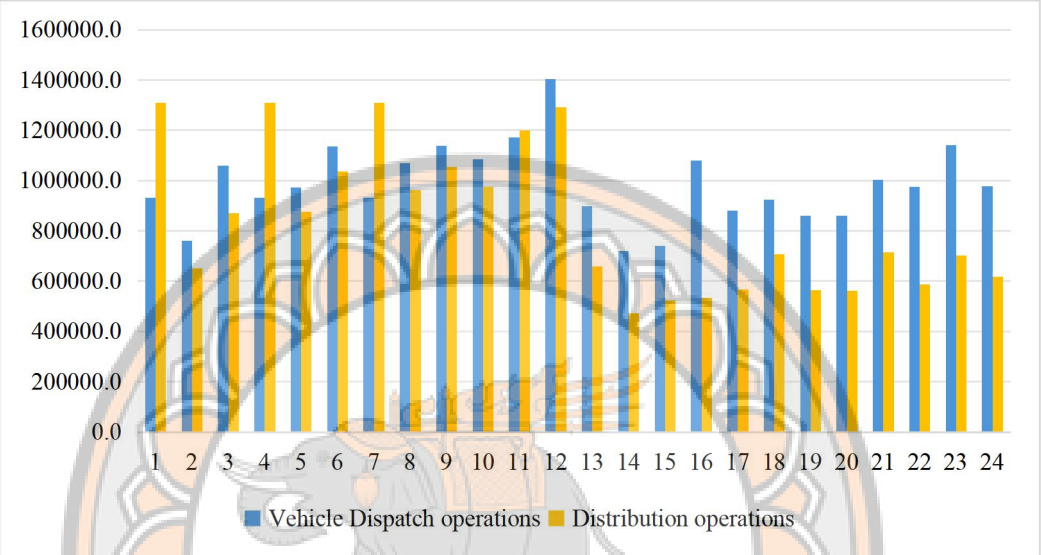



**Figure 17 Transportation Center Cost**

# CHAPTER V
# CALCULATION RESULTS AND ANALYSIS

**Calculation results**

1.Total operational cost and structure of logistics park

According to the calculation, the total cost of the logistics park is rising from 127217146.66RMB to 131946244.70 from 2022 to 2023, among that the total annual operating costs rise from 100,801,612.1 RMB to 101,421,155.9 RMB slightly.

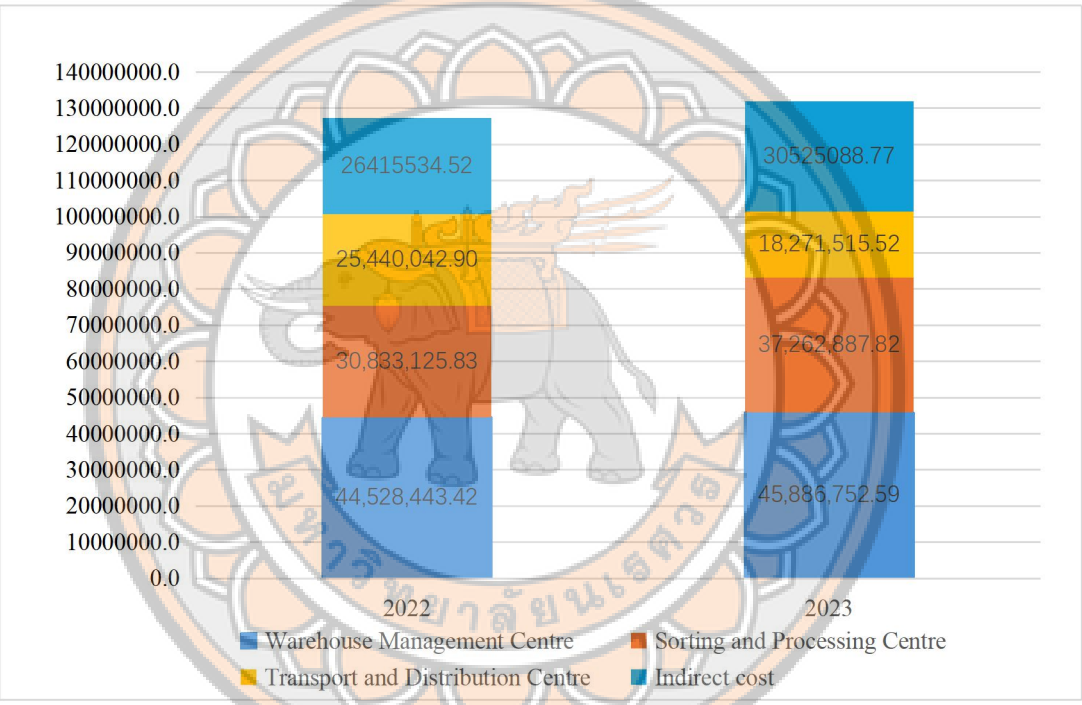



**Figure 18 Total Cost of JD Nanning Logistics Park (2022-2023)**

Among them, the warehousing Center accounts for 44.17% of the total cost in 2022 and 45.24% in 2023, with an average annual share of 44.71%, making it the department with the highest cost share for 2 consecutive years.

The cost share of the three operation Centers shows a relatively stable distribution, by comparing the cost of each operation Center, among which, the cost share of the warehousing Center is 44.17% in 2022, and 45.24% in 2023, with a slight increase, which indicates that the cost of the warehousing Center accounts for a relatively large proportion of the total cost and is relatively stable. Although the proportion of a small increase but still need to pay attention to the efficiency of

warehousing operations, whether there is a decline in the utilization rate of storage space, equipment maintenance costs increase and other issues, to further explore the potential to reduce warehousing costs, such as optimizing inventory management, improve the layout of warehousing and so on.

The cost share of sorting Centers rose more significantly from 30.59% in 2022 to 36.74% in 2023. This may be due to the increase in sorting workload as a result of the growth in business volume, which will lead to an increase in labor costs, equipment investment costs, and so on. The cost share of transportation and distribution Centers declines from 25.24% in 2022 to 18.02% in 2023, a more significant decrease. This may be due to the effective cost control measures adopted by the park in the transportation and distribution chain, such as optimization of transportation routes, improvement of vehicle loading rate, and rational arrangement of distribution plans, thus reducing transportation and distribution costs. This is a positive achievement in cost control and experience can continue to be gained to maintain and further optimize cost control in the transportation and distribution chain.

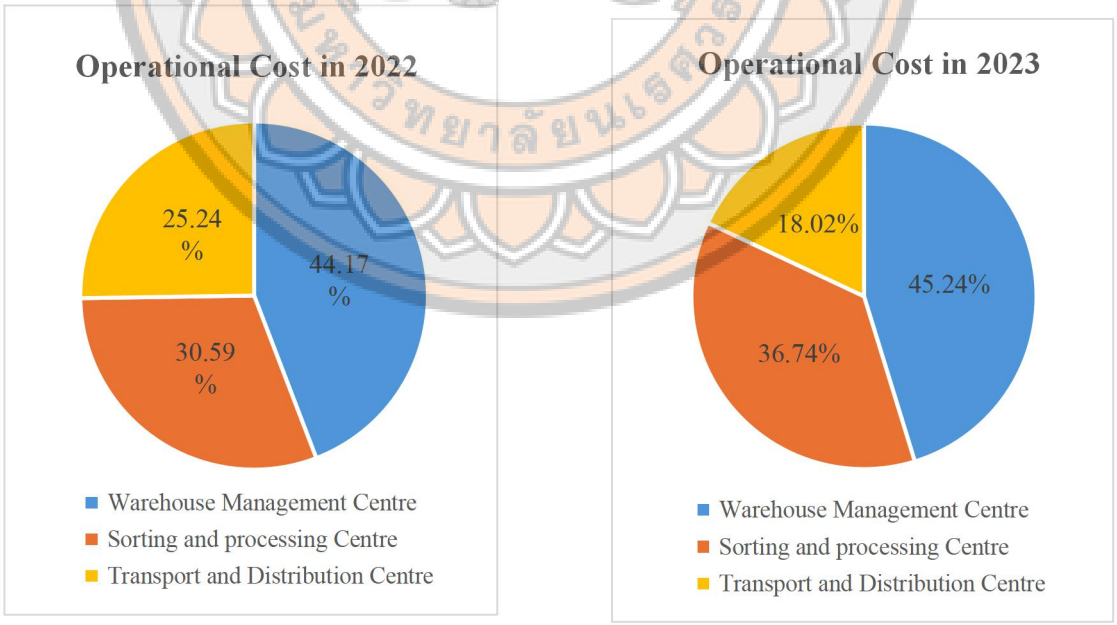
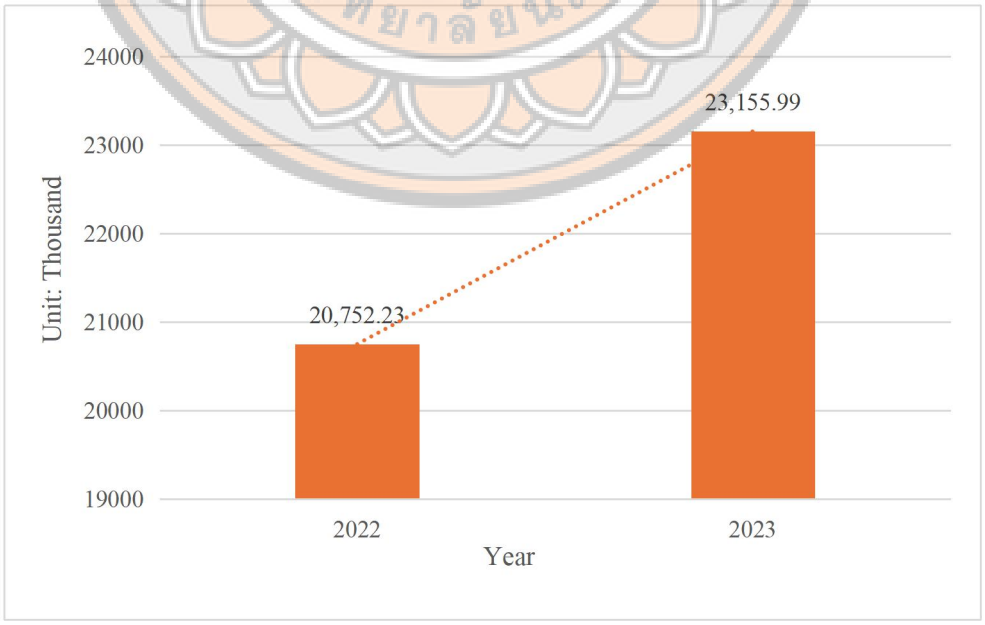



**Figure 19 Operational cost share by operation Center in 2022-2023**

2.Amount of operating costs for one order

Order cost refers to the cost value calculated using single order volume as the smallest cost unit. The order cost for the month is obtained by dividing the monthly operating costs of each operation center by the number of orders and adding them together. The annual order cost can be obtained by calculating the average. According to the data from each operation center, using the traditional calculation method, the annual order cost for two years is 3.19 yuan/order, while using the activity-based costing method is 2.81 yuan/order.

As shown in Chart (Figure 20), the total order volume at the logistics park increased from 20,752,226 orders to 23,155,985 orders in 2023, representing an increase of approximately 2.4 million orders. After recalculating the costs of key operational processes using the operational cost method, the annual total cost can be determined. By allocating this total cost across the total order volume, it can be concluded that each order incurs an average cost of 2.81 yuan in the warehousing, sorting, and transportation processes. However, as shown in Figure 21, the average cost per order decreased from 2.92 yuan to 2.7 yuan annually. This indicates that as order volume increases, the average cost per order decreases without significant new capital investments. Therefore, when designing supply chain integration services, JD




Logistics can set service pricing based on this cost.

**Figure 20 Volume of Outbound Order of JD Nanning Logistics Park (2022 -2023)**

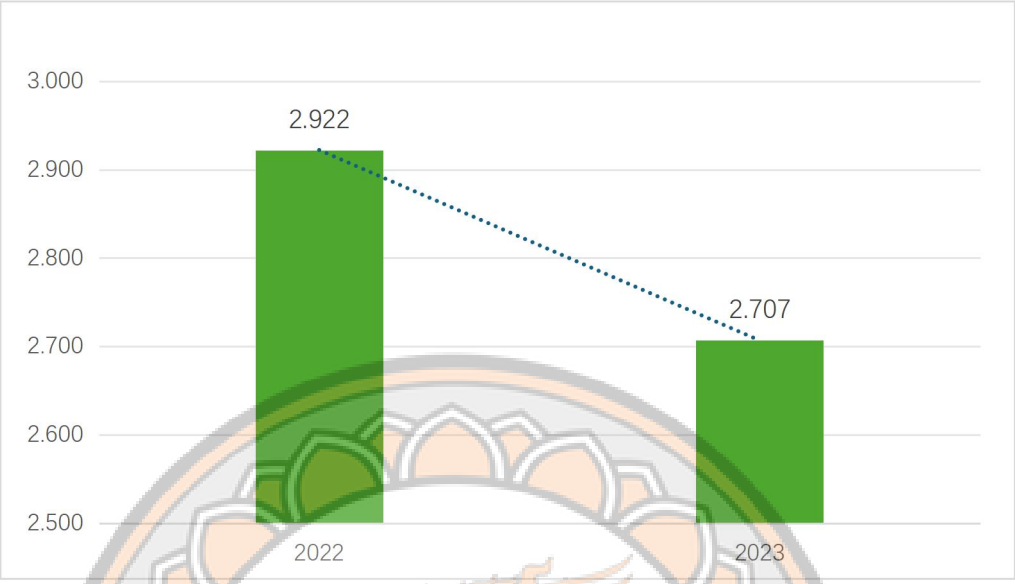



**Figure 21 Order cost of JD Nanning Logistics Park (2022 -2023) (Unit: yuan)**

3.Costs by Operation Center

(1) Cost of the warehouse center

Overall, compared to 2022, the proportion of storage costs decreased in 2023, while the proportion of outbound costs has increased. The proportion of other cost items has also been adjusted to varying degrees, reflecting changes in the cost structure of warehouse Center operations.

The figure is a circular graph illustrating the cost - consumption share of a warehouse center by different activities between 2022 and 2023. Overall, storage costs accounted for the largest proportion in both years, while outbound costs saw a notable increase and Goods warehousing (Inbound Costs) , storage costs, and inventory - counting costs experienced decreases. In 2022, storage costs had the highest share, at 65.25%. Inbound costs came to 13.48%, inventory - counting costs accounted for 12.28%, and outbound costs represented 9.36%. By 2023, storage costs still held the largest share but decreased to 60.26%. Inbound costs declined to 11.61%, and inventory - counting costs dropped slightly to 11.91%. In contrast, outbound costs experienced a significant rise, reaching 15.85%.

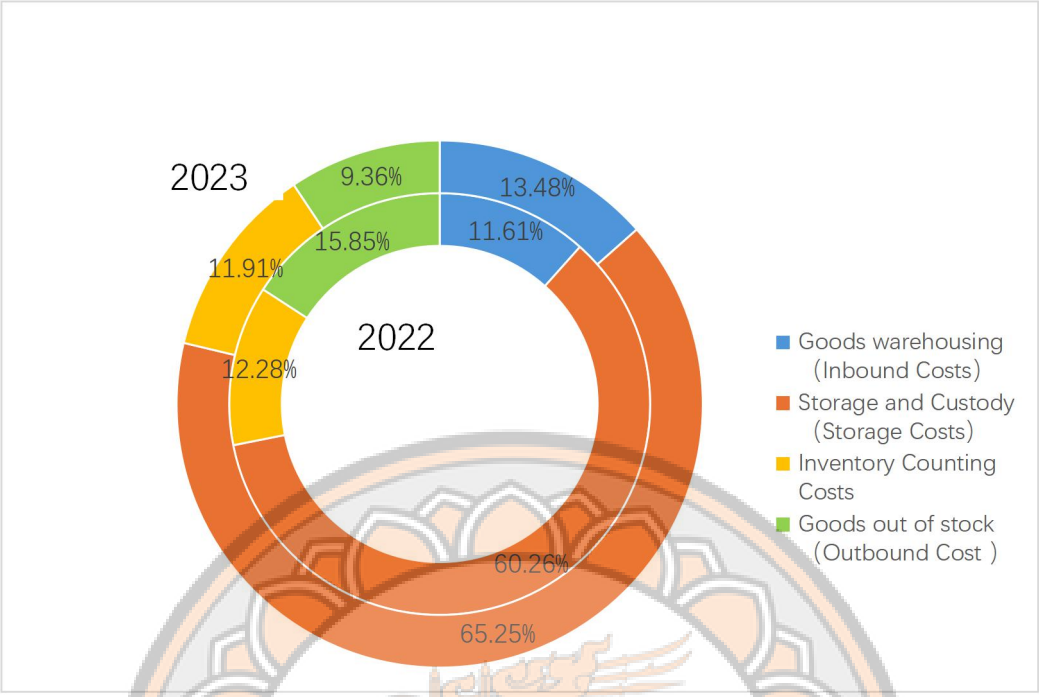



**Figure 22 Warehouse Management Center Operational Activity Cost**

From a resource consumption perspective, labour costs and site-related costs account for a high proportion of warehouse center costs. In 2022, warehouse salaries accounted for a higher proportion of total costs, reaching 50.6%, while warehouse rent and construction costs combined accounted for approximately 51.7%. This indicates that warehouse center operations are highly dependent on human resources and site facilities, and that controlling labor costs and site costs is critical to reducing total warehouse center costs.

(2) Cost of the sorting center

Overall, sorting operations and packaging costs each account for half of the monthly costs of the sorting center and remain relatively stable throughout the year. This indicates that the sorting Center's internal cost control is relatively effective, as its workflow is relatively fixed. However, the sorting Center's share of the total costs of the park has continued to rise, from 30.59% to 36.74%. We can conclude that as order volumes increase, the consumption of packaging materials, machine operating time, and employee working hours will also increase accordingly, leading to a noticeable upward trend in sorting center costs compared to other parts of the park.

In the cost composition of the sorting Center, personnel cost and equipment depreciation also occupy an important position. In 2022, the proportion of sorting personnel salary to total cost is about 73.67%, and the depreciation of the sorting equipment, although the amount is relatively small, is also a part of the cost. In addition, the cost of order consumables should not be ignored, and the cost of order consumables accounts for about 2.17% of the total cost. This indicates that the sorting Center in cost control, in addition to focusing on personnel and equipment costs, but also need to optimize the use of order consumables to improve the efficiency of resource utilization. In order to reduce personnel costs, more efficient sorting equipment and processes can be used to improve sorting efficiency and reduce personnel requirements. For order consumables, it is possible to negotiate with suppliers for more favorable purchase prices or optimize packaging design to reduce the use of consumables.

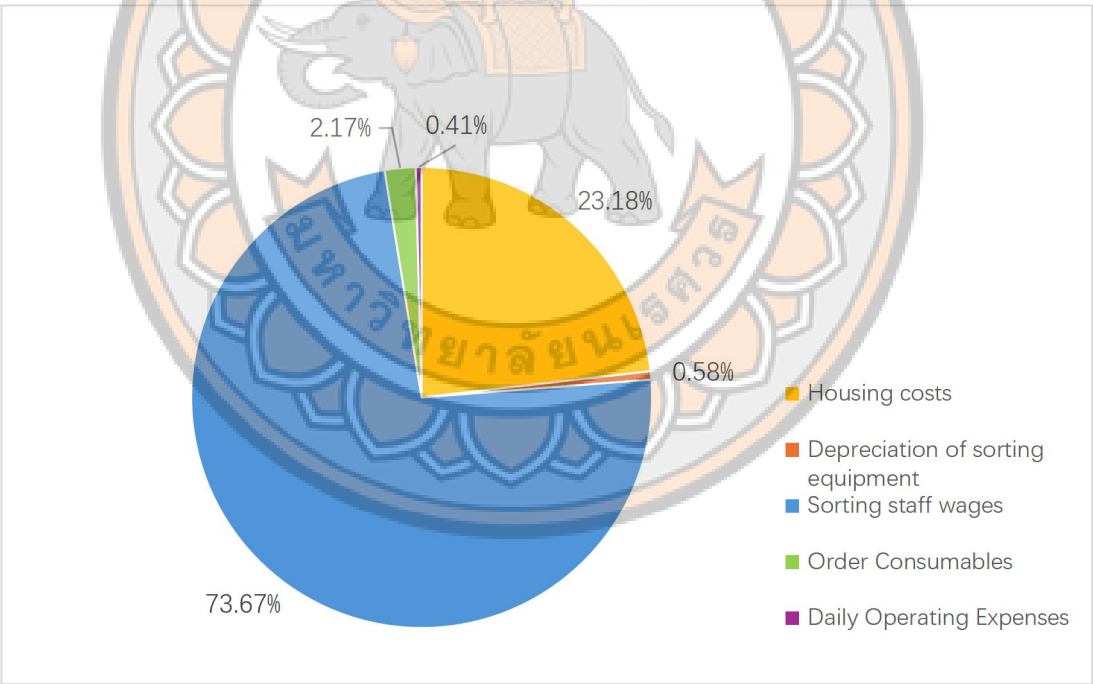



**Figure 23 Sorting Center Operational Activity Cost**

(3) Cost of the transportation center

In terms of the operational structure of the transportation center, transportation costs and personnel wages constitute the primary components of the Center's cost structure. Transportation costs account for approximately 63.55%, while driver labor costs account for approximately 36.45%. As vehicle fleets, routes,

and transportation distances stabilize, the overall transportation cost ratio within the park decreased from 25.24% in the first year to 18.02% in the following year. It can be inferred that the key to controlling transportation center costs lies in optimizing transportation routes, improving vehicle loading rates, reducing transportation costs, and reasonably scheduling personnel work to enhance work efficiency and lower labor costs. In terms of personnel management, drivers' working hours and tasks can be reasonably scheduled to improve work efficiency, avoid idle personnel, and prevent resource waste.

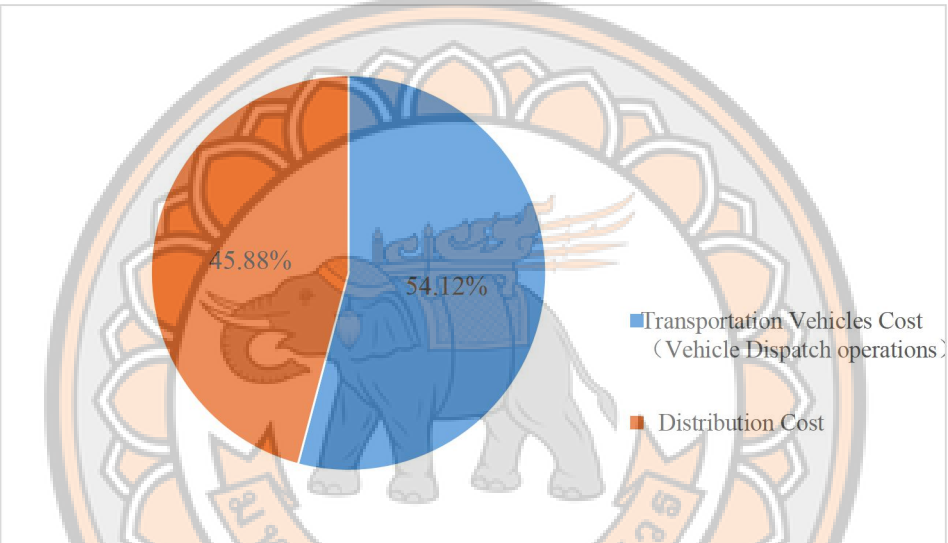



**Figure 24 Transportation Center Operational Activity Cost**

4.Cost of monthly operation

Based on the data in each operation Center, the monthly costs of the operation of the entire logistics park, can be collated as follows:

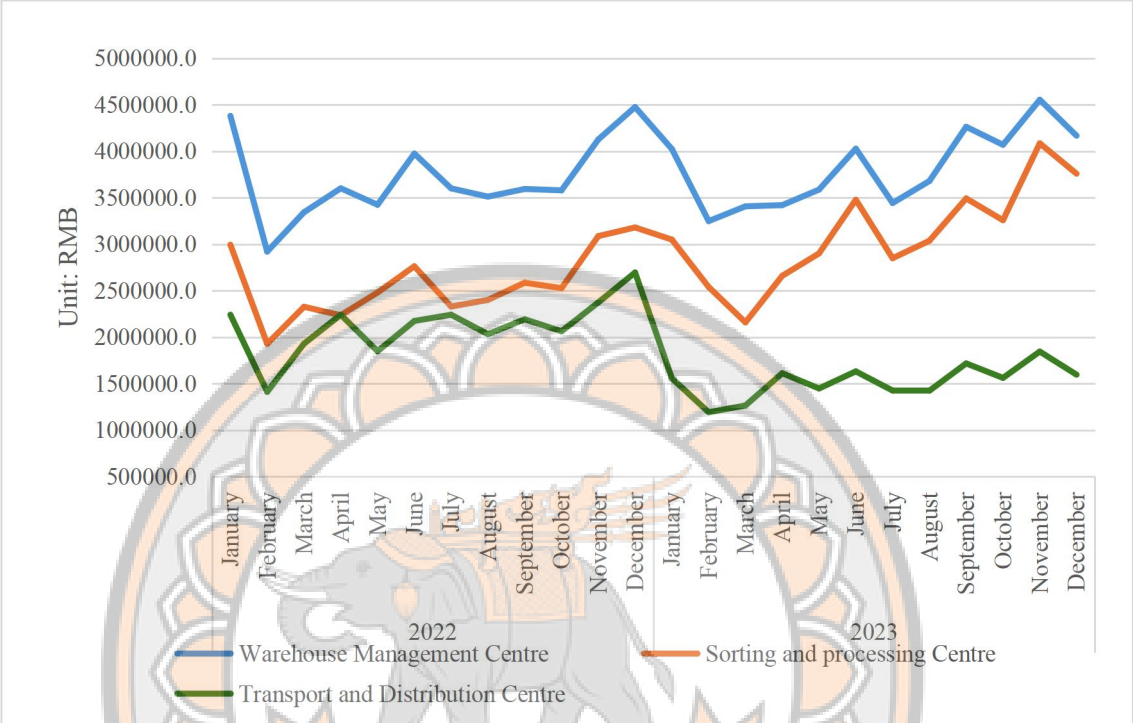



**Figure 25 Monthly Cost by Operation Center (2022-2023)**

Overall, the warehouse management center consistently incurs the highest costs, while the transport and distribution center has the lowest. All three Centers show fluctuating cost patterns across the two - year period.

In 2022, the Warehouse Management Center (WMC) starts with a high cost in January, around 4.5 million RMB. It dips to about 3.2 million RMB in February, then gradually rises, fluctuating between 3.5 - 4.5 million RMB for most months. A peak is seen in November, reaching approximately 4.8 million RMB. In 2023, the WM C continues its high - cost trend. Starting at 4 million RMB in January, it fluctuates between 3.5 - 4.5 million RMB, similar to 2022 but with a slightly higher overall level. Peaks are observed in months like August and November, reaching up to 4.8 million RMB.

The Sorting and Processing Center (SPC) begins at roughly 3 million RMB in January 2022. It has minor ups and downs throughout the year, staying in the range of 2.5 - 3.5 million RMB. By December, it reaches around 3.2 million

RMB, showing a slow upward drift. Compared to 2022, SPC costs are generally higher, with a more significant rise in the second half of the year, peaking at around 3.8 million RMB in August.

For the Transportation Center (TC), costs are the lowest in 2022, ranging from 1.5 - 2.5 million RMB. It starts at 2 million RMB in January, dips to 1.5 million RMB in February, and has small fluctuations. A notable peak occurs in November, hitting about 2.8 million RMB. In 2023, TC with costs between 1 - 2 million RMB, unlike 2022, there is no sharp peak in November of 2023, and costs stay relatively stable in the latter part of the year.

**Analysis of Peak Cost Factors**

Through the analysis of the monthly cost data of each operation center in 2022-2023, it is found that the costs of the warehousing center, the sorting center and the transportation center fluctuate significantly in different months. Overall, the cost of each operation center is generally higher in June, November and December each year, which is mainly affected by the dual impact of the peak season of e-commerce promotions and seasonal factors.

1. Impact of e-commerce promotions

November and December of each year is the peak season for promotions in the e-commerce industry, such as the “Double Eleven” and “Double Twelve” shopping festivals, during which the order volume of JD increases significantly, which directly leads to a sharp increase in the business volume of the operation Centers, which in turn drives significant fluctuations in costs. (1) Warehouse Center

(1) Warehouse Center

Increase in the volume of goods in and out of warehouses: During the promotional season, the surge in the volume of orders led to a significant increase in the volume of goods in and out of warehouses. For example, in November 2022, the volume of goods in storage reached 154,527.7 cubic meters and the volume of goods out of storage reached 235,870.9271 cubic meters, far exceeding the average of other months.

Increased demand for warehousing space: the rise in the volume of goods stored may require the temporary rental of additional warehouses, increasing the cost of warehousing rentals.

Increased investment in manpower and material resources: in order to cope with the large volume of goods in and out of storage, the warehouse center needed to invest more manpower in handling and management, while the frequency of equipment use also increased significantly, resulting in higher manpower costs and equipment depreciation costs.

(2) Sorting Center

Increased picking and packing workload: the growth in order volumes has led to a significant rise in the number of goods picked and the number of packing orders. For example, the number of goods picked in November 2022 reached 6593740 pieces and the number of packing orders reached 8017593 units.

Increase in temporary labor costs: In order to complete picking and packing tasks in a timely manner, the sorting center need to recruit a large number of temporary workers, while equipment running time is extended, resulting in a significant rise in personnel costs and equipment depreciation costs.

Increase in consumables and training costs: The increase in order volume has led to a rise in the use of order consumables, while the addition of temporary laborers has increased training costs, and their work efficiency is relatively low, further affecting costs.

Increase in equipment maintenance and upkeep costs: equipment is prone to breakdowns over a long period of time, requiring an increase in maintenance and upkeep costs.

(3) Transportation Center

Increase in the volume of transported goods and transported kilometers: the volume of transported goods and transported kilometers increased significantly during the promotional season. For example, in November 2022 transportation mileage reached 875,051.216 kilometers and the total volume of transported goods reached 400,231,164.56 kilograms.

Increased investment in transportation resources: In order to meet transportation demand, transportation center may need to increase the number of transportation vehicles, hire more drivers, or even use expedited transportation services, resulting in higher transportation and labor costs.

Increase in vehicle wear and maintenance costs: frequent use of vehicles accelerates their wear and tear, increasing repair and maintenance costs.

Increased transportation mode adjustment costs: To ensure on-time delivery, transportation center may choose faster but more costly modes of transportation, such as air transportation or expedited ground transportation, further pushing up transportation costs.

2. Impact of seasonal factors

In winter, especially in November and December, some areas may be affected by bad weather, such as rainfall and freezing, which not only increases the difficulty and risk of cargo transportation, but also has a significant impact on the cost of storage and transportation links.

(1) Transportation Center

Cost of additional protective measures: In order to cope with inclement weather, transportation centers may need to take additional protective measures, such as installing anti-skid chains on vehicles and increasing the protection of cargo packaging, etc., which increases transportation costs.

Transportation Delays and Expedited Costs: Adverse weather may lead to transportation delays, and to deliver goods on time, it may be necessary to choose more expensive expedited transportation methods, further pushing up transportation costs.

Increased vehicle repair and maintenance costs: Vehicles are more prone to breakdowns due to intensive use in inclement weather, requiring more frequent repairs and maintenance and increasing maintenance costs.

(2) Storage Center

Increased operating costs of heating facilities: the need to increase the operating hours of warehouse heating facilities in winter to maintain the appropriate temperature and humidity in the warehouse and to safeguard the quality of goods, which will lead to an increase in costs such as utility bills.

**Comparison and factor analysis of cost results between Activity-based costing and traditional costing methods**

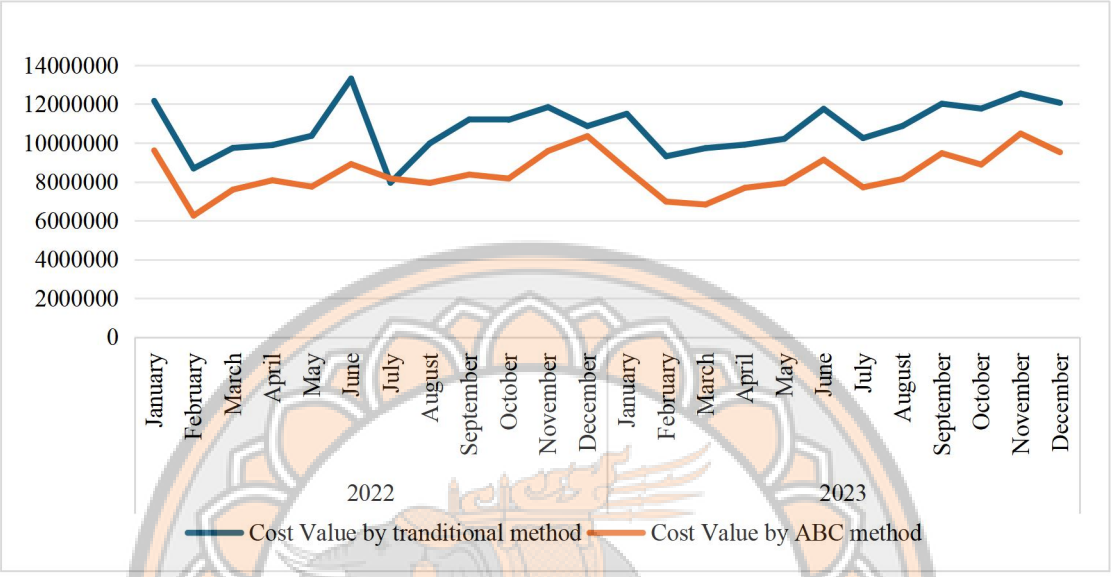



**Figure 26 Comparison of Monthly Cost by Traditional Method and ABC Method**

Comparing the cost calculated by ABC with that calculated by the traditional method (Figure 26) reveals obvious differences between the two. For example, in January 2022, the total cost of the warehouse center calculated by ABC was ¥4,380,137.1, while the total cost calculated by the traditional method was ¥4,216,827.3. Similarly, the total cost of the sorting center calculated by ABC was ¥2,993,752.056, while the total cost calculated by the traditional method was ¥3,905,055. The total cost of the transport and distribution center calculated by ABC is ¥2,240,823.193, while the total cost of the transport and distribution center calculated by the traditional method is ¥4,043,117.5. This variation is prevalent across months and operations centers.

Analysis of variance factors

The main reason for the difference between ABC calculated results and traditional costing results is the difference in the cost allocation method. The traditional costing method usually adopts a single allocation standard, which may be applicable when the cost structure is relatively simple and the indirect cost accounts for a relatively small proportion, but for enterprises such as JD Logistics, which have

complex business and a large proportion of indirect cost, the single allocation standard cannot accurately reflect the actual cost consumption of each operation Center and cost object. The activity-based cost method takes the activity as the core, and by determining the resource drivers and activity drivers, the resource costs are accurately allocated to each activity center, and then the activity Center costs are allocated to the cost objects. In the warehousing center, the ABC method takes into account the resource consumption characteristics of different operations, such as goods inbound, Storage and Custody (Storage Costs), Inventory Counting Costs, and Goods out of stock (Outbound Cost), etc., and allocates the cost by taking the volume of goods inbound, the average value of goods in stock, the number of inventory counts, and the volume of goods outbound, etc., as the operation drivers, so that it can more accurately reflect the cost of the various operational aspects of the warehousing Center. While the traditional costing methods may only be based on a single standard allocation of costs such as labor hours or floor space, cannot distinguish between the cost differences of different operational aspects, resulting in inaccurate cost allocation. For example, in traditional costing, if only labor hours as the allocation standard, for the month with large differences in the amount of incoming and outgoing operations, the cost may be distributed evenly, which cannot accurately reflect the actual cost consumption.

# CHANPTER VI
# CONCLUSIONS AND RECOMMEDATIONS

## Conclusion

This study aimed to (1) To determine the current status of logistics operating costs of the JD Nanning Intelligent Logistics Park since its operation in 2022-2023, and (2) To propose measures for reducing the operating costs of JD's Nanning Intelligent Logistics Park. By applying the Activity-Based Costing (ABC) method, the research provided a comprehensive analysis of the logistics park's warehousing operations and cost structure, offering both diagnostic insight and strategic recommendations.

1. To determine the current status of logistics operating costs of the JD Nanning Intelligent Logistics Park since its operation in 2022-2023

This study employed the Activity-Based Costing (ABC) method to analyze the logistics operating costs of the JD Nanning Intelligent Logistics Park from 2022 to 2023. The findings reveal that the park's total annual operating costs increased modestly from 100,801,612.1 RMB in 2022 to 101,421,155.9 RMB in 2023, reflecting stable but expanding operations. Among the three primary operational segments—warehousing, sorting, and transportation, the warehouse Center consistently accounted for the largest cost proportion, averaging 44.71% over the two years. In contrast, while storage costs declined in 2023, outbound operational costs rose, accompanied by an increase in the cost share of the sorting Center from 30.59% to 36.74%.

Order volume increased significantly during the same period, from 20,752,226 to 23,155,985 orders, demonstrating the park's growing operational scale. When comparing costing methods, the ABC model revealed a lower per-order cost (2.81 RMB) than traditional cost accounting (3.19 RMB), highlighting the improved accuracy and relevance of ABC in logistics cost management. Additionally, transportation costs showed a clear distribution: 63.55% attributed to transport operations and 36.45% to driver labor. Cost peaks were observed in specific months for warehousing and sorting, while transportation costs remained relatively stable, particularly in the second half of 2023

2. To propose measures for reducing the operating costs of JD's Nanning Intelligent Logistics Park

The study further demonstrates that the ABC method offers a systematic and accurate approach to calculating logistics operating costs by tracing expenses to specific activities rather than broad cost categories. In the case of JD Nanning Intelligent Logistics Park, the application of ABC enabled a clearer understanding of cost drivers across warehousing, sorting, and transportation functions. The model accounted for multiple resource categories, including labor, equipment depreciation, utilities, and facility usage, aligning them with distinct operational activities such as order processing, inventory handling, goods transport, and distribution.

Through detailed data collection and cost allocation, ABC provided an integrated view of how resources are consumed at each stage of the logistics process, particularly in the context of order fulfilment. This approach facilitated a precise evaluation of cost behavior in response to operational fluctuations, such as increased order volumes during promotional campaigns. The method's effectiveness was evidenced by its ability to reveal variations in monthly costs, isolate high-cost processes, and generate more accurate unit cost metrics.

**Recommendations**

Based on the analysis and cost evaluation conducted using the Activity-Based Costing (ABC) method, several targeted recommendations are proposed to optimize logistics cost management and operational efficiency at the JD Nanning Intelligent Logistics Park. These recommendations address key findings in warehousing, sorting, transportation, and strategic cost awareness.

**1. Improve Storage Space Utilization through Process Reengineering**

The warehousing Center consistently accounted for the largest share of total logistics costs, averaging 44.71% annually from 2022 to 2023. Within this, Storage and Custody（Storage Costs） operations alone represented 60% of warehousing costs. Given the limited land area and the challenges of expanding the physical infrastructure in the short term, process reengineering becomes essential.

The logistics park should continue to adopt and refine intelligent warehouse management systems (WMS), incorporating automated storage and

retrieval technologies such as robotic shelving and material handling systems. These tools can dynamically optimize storage based on goods' size, weight, and turnover frequency, increasing space utilization and reducing rental and labor costs. Additionally, the warehouse layout should be redesigned to position high-frequency SKUs in easily accessible zones, improving turnover rates and minimizing handling inefficiencies.

**2. Enhance Sorting and Distribution Efficiency through Automation and Algorithmic Optimization**

With the rapid growth in order volume, sorting center costs have significantly increased. The adoption of advanced automated sorting equipment and intelligent sorting algorithms is crucial to handling this rising demand efficiently. Automation can enhance throughput and accuracy while reducing dependency on manual labor.

Algorithms should be employed to optimize sorting paths based on real-time data such as cargo destination, weight, and volume. In parallel, labor management practices should be improved through predictive scheduling to balance workload distribution, reduce idle time, and avoid overwork, thus lowering labor costs and increasing productivity.

**3. Optimize Transportation Routes and Fleet Utilization Using Big Data**

Transportation costs, while more stable, represent a significant portion of logistics expenses. Route optimization using big data analytics—including real-time traffic, weather, and demand distribution—can improve delivery efficiency and reduce operational costs.

The integration of traffic monitoring systems with vehicle dispatch can help avoid congested routes, minimize delays, and lower fuel consumption. Moreover, vehicle loading efficiency should be enhanced by aligning delivery plans with order density and distribution zones. Routine maintenance of delivery vehicles should also be reinforced to ensure operational continuity and reduce unplanned downtime and associated costs.

**4. Strengthen Demand Forecasting to Stabilize Operating Costs**

Monthly cost analysis reveals distinct seasonal fluctuations, particularly during major promotional events (e.g., "618" and "Double 11"), which contribute to

cost spikes in warehousing and sorting. To mitigate these effects, JD should establish a robust closed-loop system integrating forecasting, inventory replenishment, and distribution.

By leveraging advanced data analytics and machine learning, real-time demand forecasting can be achieved using data on consumer behavior, external factors (e.g., weather, policy), and supply chain metrics (e.g., inventory levels, lead times). Transitioning from an "order-driven" to a "prediction-driven" model can reduce inventory pressure and avoid the bullwhip effect. Additionally, dynamic SKU management—tailored to regional consumption patterns—can optimize inventory structure across urban and rural fulfillment Centers, enhancing order fulfillment efficiency and cost-effectiveness.

**5. Promote Cost Awareness and Institutionalize ABC in Cost Management**

Although the ABC method proved more accurate than traditional methods, its adoption remains limited due to insufficient internal awareness and incomplete operational data tracking. The company should implement a multi-tiered cost management training program:

- Senior management should be engaged through strategic cost seminars to align cost control with corporate goals.
- Middle management should undergo training in cost data interpretation and decision-making using ABC principles.
- Front-line staff should participate in regular cost awareness workshops to understand how their daily actions impact overall logistics costs.

In parallel, a performance-based cost control incentive system should be introduced. By integrating cost management metrics into performance appraisals and offering bonuses or career advancement for effective cost-saving initiatives, employee engagement in cost control can be significantly enhanced.

**6. Develop and Sustain a Professional Talent Pipeline for Cost Management**

During the research process, disparities in professional capabilities across departments were observed, particularly concerning cost analysis and operations management. To address this, JD should pursue a dual-track talent development strategy:

- External recruitment: Hire experienced logistics and cost management professionals through targeted channels such as headhunting firms and industry platforms.
- Internal development: Collaborate with universities and research institutions to establish training bases, fostering multi-disciplinary talent. Identify high-potential employees for focused development programs, including project-based learning and cross-functional exposure in cost management.

Ongoing professional development should be institutionalized. Regular workshops led by industry experts and cross-departmental knowledge-sharing sessions will promote continuous learning and innovation in logistics cost optimization.

**Further Study**

While this research provides an in-depth analysis of JD Nanning Intelligent Logistics Park's cost structure using the Activity-Based Costing (ABC) method, several avenues remain for further investigation.

1. **Comparative Applications of ABC in Diverse Logistics Contexts**

Future research could assess the applicability and performance of ABC in other logistics hubs, both domestically and internationally, to identify contextual factors influencing cost structures and efficiency gains.

2. **Integration of ABC with Predictive Analytics**

Combining ABC with real-time predictive analytics and big data processing could enable proactive cost control, allowing managers to anticipate and respond to operational fluctuations before they escalate into cost spikes.

3. **Longitudinal Impact of Automation**

A multi-year study tracking automation adoption—including robotic warehousing, algorithmic sorting, and AI-driven route optimization—would clarify the return on investment (ROI) and long-term effects on cost behavior.

4. **Human Factors in Cost Management**

Additional research could explore the behavioral responses of employees to cost awareness programs and incentive systems, identifying strategies that maximize engagement and sustain cost-saving practices.

5. **Regional Demand Forecasting Models**

Further studies might develop and validate region-specific forecasting models that integrate socio-economic, seasonal, and event-driven factors, aiming to optimize SKU allocation and minimize logistical bottlenecks.

6. **Cross-Functional Cost Synergies**

Investigating cost interdependencies between warehousing, sorting, and transportation may reveal opportunities for synergistic savings that single-function cost analysis might overlook.

By pursuing these research directions, future studies can expand the theoretical foundation of logistics cost management while providing actionable insights for both practitioners and policymakers.

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