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Logistics Development in Laizhou under Big Data

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Abstract: The extensive utilization of big data in logistics management is increasingly prevalent due to economic development and advancements in Internet technology. This research examines the present state and optimization method of big data utilization in logistics management, using Laizhou City as a case study. By examining the progress and current challenges of logistics in Laizhou City, this study proposes optimization solutions including the implementation of a big data platform, enhancement of logistics and transportation routes, allocation of resources, and risk management. As an example, we examine a logistics company in Laizhou City to demonstrate the practical implementation of big data. The research presented in this paper serves as a valuable resource for enhancing the efficiency of logistics management in Laizhou City. Additionally, it offers insights that can be used to the advancement of logistics management in other areas.

Keywords: Laizhou city, big data, logistics management

1. Introduction

The exponential growth of information technology has made big data an essential component of contemporary logistics management. Amidst the backdrop of globalization and digitalization, the logistics business is encountering unparalleled transformations. The utilization of big data enhances logistical efficiency, optimizes resource allocation, minimizes operational expenses, and offers data-driven insights for decision-making. Through the analysis of vast quantities of data, logistics organizations may enhance their ability to forecast market demand, optimize the movement of goods, and enhance customer satisfaction. Furthermore, big data significantly influences the logistics business by facilitating real-time monitoring, risk management, and future trend prediction.

Laizhou, as a significant municipality in Shandong Province, with a distinctive geographical position and economic context. Situated on the Jiaodong Peninsula, this area boasts abundant natural resources and a thriving commercial and industrial sector. The logistics business in Laizhou City has encountered new obstacles and opportunities due to the city's rapid expansion. Laizhou City has a crucial role in the regional logistics network as it serves as a significant link between the eastern coast and the western inland, connecting both the land and water routes. Nevertheless, the economic progress and market dynamics have presented Laizhou City's logistics management with multifaceted issues, including the need to control logistical costs, enhance service efficiency, and foster technology innovation. Hence, investigating the optimization strategy of logistics management using big data

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holds immense importance in enhancing the competitiveness and ensuring the sustainable growth of the logistics industry in Laizhou City.

2. Current Situation of Logistics Management in Laizhou City Based on Big Data

2.1. Logistics development trend in Laizhou

Laizhou's economy is mostly dependent on its traditional businesses, which include gold, machinery production, automobile components, stone, cultural tourism, and the maritime economy. The ongoing progress of these sectors and the occurrence of "legacy trees generating new ones" establish a stable basis and expansion prospects for the logistics industry in Laizhou. Simultaneously, Laizhou City is actively fostering and developing emerging economic sectors, with a particular emphasis on the "four new" economies encompassing new energy, new materials, new ports, and new cities. This strategic approach aims to facilitate the transformation and advancement of the city's economic structure.

Furthermore, in 2023, the growth plan of Laizhou City is primarily focused on meeting the demands of the "1343" work system deployment, with a particular emphasis on the "Industrial Strengthening City" strategy. This strategy prioritizes the modernization and improvement of conventional industries and the establishment of new economic growth centers. Its objective is to expedite the achievement of environmentally friendly, low-carbon, and high-quality progress through a dual approach. Furthermore, Laizhou City prioritizes the expansion of the marine economic industry chain and the advancement of the port logistics industry. This is achieved through enhancing the construction of key projects like the Jiaodong Comprehensive Logistics Industrial Park, with the aim of elevating the development status of the port logistics industry [1].

The logistics industry in Laizhou City is currently undergoing a process of diversified transformation. It is building upon the strong foundation of traditional industries while also prioritizing the development of new economic sectors. The goal is to achieve an optimized and upgraded industrial structure while ensuring stable economic growth.

2.2. Logistics Development and Big Data Application in Shandong Province

Shandong Province follows the strategy of "one chess in the whole country" and "one chess in the whole province". It focuses on early planning, strengthening mechanisms, ensuring smooth passage, and prioritizing service to ensure a seamless transportation network and efficient logistics operations in the province. The primary operating indices of freight logistics are experiencing ongoing improvement [2], as depicted in figure 1.

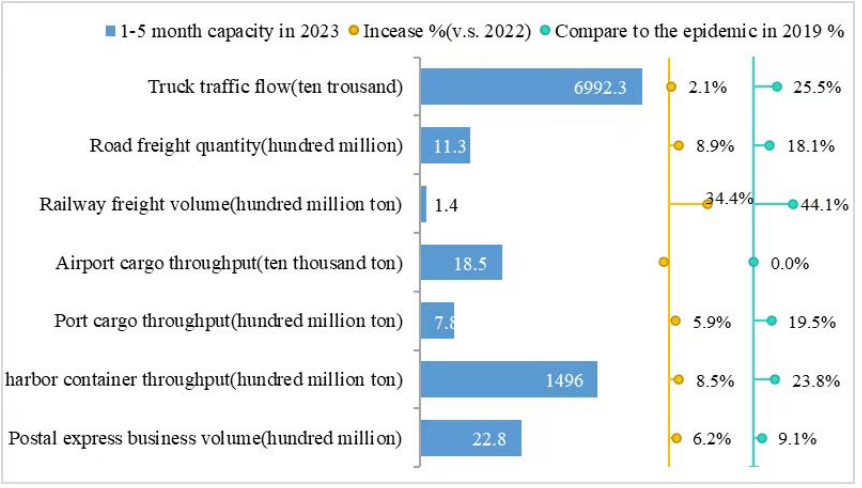

Figure 1: Comparison of logistics network before and after the epidemic in Shandong Province

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Based on 2018 data, the logistics sector in Shandong Province has demonstrated a consistent and advancing trend in terms of its industrial scale. During the first six months of the year, the province achieved a total social logistics value of 9.28 trillion yuan, representing a 7.1% year-on-year growth. It is anticipated that the province would achieve a total social logistics value of approximately 21.8 trillion yuan for the entire year. Qingdao, Linyi, and Jinan rank among the top three cities in terms of total freight logistics, with respective values of 1.4 trillion yuan, 1.3 trillion yuan, and 1.1 trillion yuan [3].

Shandong Province has promoted the growth of the sector by implementing supply chain pilots, thereby enhancing operational efficiency. By June 2018, the average logistics cost for all types of businesses in the pilot cities has fallen from 37.20% to 21.20% of the main business income. Additionally, the vehicle turnover rate has increased from 1.25 times to 1.9 times, resulting in a considerable improvement in logistics efficiency [4].

Shandong Province is aggressively promoting the implementation of current information technology, such as big data, Internet of Things, and cloud computing, in the field of logistics informatization building. The Shandong port logistics synergy platform was launched and began operating at Qingdao port in October 2018. The number of registered enterprise members on the province's transportation and logistics public information platform reached 3,773, and a total of 1,806,000 supply and demand information were released [5].

The magnitude of the international express business in Shandong Province has been growing within the context of global logistics corridors. Between January and November 2018, the total number of international/Hong Kong, Macao, and Taiwan transactions reached 12,007,300, representing a 12.08% increase compared to the previous year. Furthermore, Shandong Province actively advances the development of international trade routes, including the Eurasian liner and the China-Japan-Korea cross-border food trade sea highway project. As of October 2018, this initiative has facilitated over 800 shipments, establishing an international sea and land route that connects Japan and South Korea in the east, and Central Asia and Europe in the west [6].

Regarding Laizhou City, the swift progress of the city has brought forth fresh problems and opportunities for the logistics business. The essay examines the growth trajectory and current challenges of logistics in Laizhou City. It suggests optimization solutions include the creation of a big data platform, enhancing logistics and transportation routes, allocating resources efficiently, and managing risks. The objective of these initiatives is to improve the competitiveness and promote the sustainable growth of the logistics industry in Laizhou City.

2.3. Problems of logistics management in Laizhou City

The level of digitalization in the logistics sector in Laizhou City is inadequate, resulting in fragmented and inconsistent data, hence hindering efficient data sharing and integration. This problem of information silos adversely impacts the efficiency and accuracy of logistical decision-making and hinders the information mobility and transparency of the sector as a whole. Furthermore, the informationization process is hindered and the application and growth of technology in logistics management are further impeded due to the computer penetration rate being below 20%.

The logistics management transportation route in Laizhou City has not been efficiently optimized, leading to comparatively elevated transportation expenses. Furthermore, the issue of resource allocation is increasingly noticeable, characterized by wastage and duplication of resources. This not only leads to higher costs but also diminishes the efficiency of logistics operations. Simultaneously, the absence of risk management is also a significant concern. The city of Laizhou lacks a comprehensive system and plan for effectively managing logistics risks, resulting in challenges in identifying and addressing possible risks promptly. The logistics management issues in Laizhou City encompass both technical hurdles and inadequacies in operational and managerial aspects. These

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challenges not only hinder the overall efficiency and cost control of the logistics industry, but also limit the competitiveness of Laizhou City in the broader market. Hence, resolving these issues holds immense importance in augmenting the general proficiency and enduring growth of the logistics sector in Laizhou City.

3. Optimization strategy of logistics management in Laizhou City based on big data

To address the above problems, this paper proposes the following optimization strategies.

3.1. Establishment of big data platform to realize logistics informatization

Establishing a big data platform is essential in Laizhou City to optimize logistics management through the utilization of big data. The objective of this platform is to amalgamate diverse logistical data resources in order to achieve data exchange and integration. This encompasses both the internal data of the logistics business and external data pertaining to logistics, including market dynamics, client demand, and traffic conditions. This platform can greatly raise the level of logistics digitalization and improve data processing capabilities through effective data analysis and management.

Following this, Laizhou city must promptly devise a strategic and rational blueprint for the development of "Smart Laizhou" based on the comprehensive objectives outlined in the 12th Five-Year Plan for economic and social progress, taking into account the specific circumstances of the local area. Laizhou, being a crucial component of the Yellow River Delta Economic Zone, must effectively utilize its current information resources to further the development of the smart city. This strategy will not only enhance the growth of the logistics industry, but also stimulate the economic and social advancement of the entire Laizhou City.

3.2. Logistics Transportation Path Optimization Based on Big Data

The utilization of big data for optimizing logistics and transportation routes is crucial in the management of logistics in Lehigh City. The growing intricacy of worldwide supply chains and logistics networks has created opportunities for supply chain management and logistics optimization through the implementation of artificial intelligence technology. AI technology can optimize supply chain management and logistics systems by utilizing data analysis, predictive modeling, decision assistance, and automated processing. Artificial intelligence can determine the most efficient routes and transit options for logistics by analyzing extensive historical data and current traffic conditions. This methodology considers several limitations and cost-efficiency, and has the capability to adapt routes in response to evolving conditions [6].

The essence of intelligent logistics resides in the surveillance and supervision of up-to-the-minute data. AI utilizes sensors, IoT devices, and other technology to actively track and monitor the real-time status of items, including their location, temperature, humidity, and other essential data. The data undergoes AI technology processing and analysis to generate visual representations and enable real-time monitoring, significantly enhancing the transparency and management of the transportation process. Furthermore, AI has the capability to proactively detect possible equipment malfunctions or transportation issues using predictive analytics. By analyzing past data and recognizing patterns, it can accurately forecast the probability of equipment failure and suggest suitable maintenance strategies. This proactive maintenance strategy allows for preemptive repairs to be conducted prior to the occurrence of failures, resulting in cost savings for maintenance and prevention of transportation disruptions.

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3.3. Optimization of logistics resource allocation based on big data

Optimizing logistics resource allocation in Laizhou City with big data entails analyzing and managing data to acquire insights into the use and demand of different resource kinds. This allows for the optimal allocation and rational exploitation of resources. This optimization encompasses not just conventional inventory management, but also entails the extensive utilization of transportation, storage, and other resources. For instance, employing big data technology to assess inventory status and demand forecast information can assist logistics firms in formulating more rational procurement and inventory strategies, hence minimizing resource wastage and enhancing resource utilization efficiency. This encompasses the process of continuously monitoring changes in market demand using up-to-date data, making necessary adjustments to inventory levels, and optimizing transportation routes and scheduling schedules to ensure that logistical resources are utilized efficiently and effectively [6].

3.4. Logistics risk management based on big data

Logistics risk management, which relies on the analysis of large sets of data, is a crucial field in Lehigh City. The lack of data standardization and consistency poses a significant obstacle for logistics companies, as it hinders their ability to share and consolidate data. This directly impacts the efficiency of optimizing transport routes and allocating resources. In addition, these issues result in insufficient risk management, posing challenges for logistics companies to promptly recognize and mitigate potential dangers. Hence, the adoption of big data technologies is necessary to enhance risk management and ensure greater operational stability and reliability in the logistics business of Lehigh. This encompasses the utilization of big data analytics to forecast and alleviate potential supply chain hazards, such as delays in transit, deficiencies or surpluses in inventory, and security concerns during transportation. Illustrating the utilization of port logistics data, the subsequent model can be adopted [6].

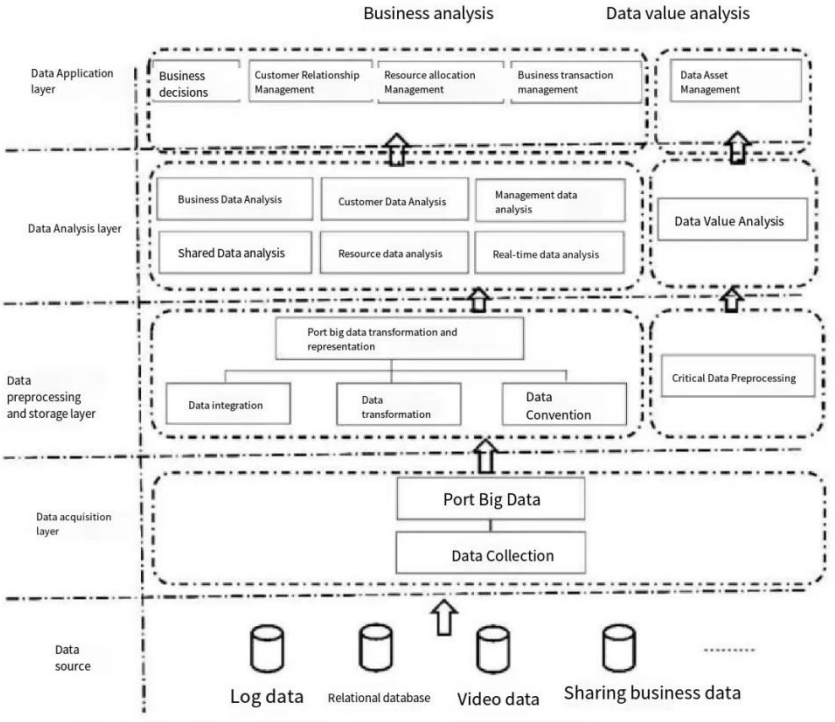

Figure 2: Port big data management model based on sea charts [6]

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4. Case Studies

Several logistics firms in Laizhou are employing big data technology to enhance the effectiveness of their business operations through collaboration and technical advancements. An exemplary instance is the Intelligent Logistics Database Innovation and Application Center, which was collaboratively built by Rhymex and Aliyun in Shanghai. This center is the initial implementation of AliCloud's native distributed database on a wide scale in the government and enterprise domains. Within the logistics business, this collaboration is seen as a significant achievement in the implementation of big data, particularly in the extensive utilization of dispersed databases.

The logistics industry generates billions of data points daily, which necessitates increased stability, availability, and cost-effectiveness of the main business system database. Yang Zhoulong, Vice President and CTO of Rhymex, stressed the importance of digitization in facilitating effective collaboration in the logistics industry. He highlighted the essential role of distributed databases in enabling lean operations and ecological collaboration.

Furthermore, this program represents a significant endeavor to establish a domestic database inside the logistics business. As per top specialists in the database business, the logistics sector system is characterized by a substantial amount of data and significant concurrent demand on the database. This necessitates the database to possess a high level of reliability and complexity, comparable to that of financial systems. The collaboration focused on the distributed transformation of the logistics core system's database and the optimization of its kernel function. The objective was to enhance the efficiency of logistics operations.

5. Conclusion

Logistics enterprises in Laizhou City are employing big data technologies to undergo digital transformation, resulting in notable enhancements in operational efficiency and market competitiveness. The logistics industry has encountered various challenges, including inadequate information technology, optimization of transportation routes, allocation of resources, and risk management. However, the implementation of optimization strategies utilizing big data has been proven to effectively address these issues and facilitate the sustainable growth of the industry. This study is deficient in practical investigation, lacks substantiated data, and has an insufficient analysis of local data for Laizhou. Further research in this area will be conducted to address these shortcomings. Big data technology will remain crucial in the logistics industry, aiding logistics enterprises in Laizhou City and beyond to achieve enhanced efficiency, reliability, and intelligent management. This will enable them to adapt to evolving market demands and technological advancements, while driving innovation and promoting the industry's development towards greater automation and intelligence.

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