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The Exploration of the Optimization of Rural Logistics Distribution Mode in Big Data Environment

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Abstract: *In the digital age, the development of big data technology has brought new opportunities and challenges to rural logistics distribution. Based on the optimization of rural logistics distribution mode in big data environment, this thesis first analyzes the problems existing in rural logistics distribution, then discusses the application principle and concrete application of big data in rural logistics distribution, and finally puts forward an intelligent rural logistics distribution mode based on the Internet of Things and cloud computing, and discusses its implementation method and effect.*

Keywords: *Big data; Rural areas; Logistics and distribution*

1. Introduction

In recent years, with the rapid development of global information technology and the advancement economic globalization, the state has paid more and more attention to the development of rural areas [1]. However, in terms of rural logistics distribution, due to inconvenient transportation, poor information and other factors, the rural logistics distribution model has long had problems such as high cost and low efficiency, which has restricted the development and progress of rural economy and society [2]. In order meet the needs of rural residents' life and enterprise development, it is necessary to strengthen the and optimization of rural logistics distribution mode through the introduction of big data technology, so as to improve the efficiency and quality of rural logistics distribution.

2. Problems Existing in Current Rural Logistics Distribution

2.1 Inconvenient transportation and poor information lead to higher costs

Road traffic conditions in rural areas are relatively poor, and inconvenient traffic is one of the main problems in rural logistics distribution at present. At the same time, the low level of informatization increases the difficulty of logistics distribution management, which makes the cost of rural logistics distribution under the existing distribution mode higher[3].

2.2 Scattered customers, small order quantity, single order type and wide distribution range lead to inefficiency

In rural areas, customers are scattered, the number of orders is small and scattered, the types of are relatively single, and the distribution range is wide, which is also one of the reasons for the low efficiency of rural logistics distribution[4]. The traditional logistics distribution model can no longer the actual needs of rural areas, so it is necessary to adopt a more intelligent distribution model to the efficiency of logistics distribution.

2.3 Traditional manual methods can not meet the requirements of fast shipment and accurate cost calculation

Because the number of orders is small and scattered, the traditional manual method is difficult to the requirements of fast shipment and accurate cost calculation[5]. Under the existing logistics distribution mode, a lot of work needs manpower to complete, which increases the difficulty of distribution management and leads to low efficiency.

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3. The application principle of big data in rural logistics distribution

With the continuous development of rural economy and society, logistics distribution is becoming more and more important in rural areas. As one of the hottest fields in the information age, big data also plays an increasingly important role in rural logistics distribution. The application principle of big data is to collect, store, process and analyze all kinds of information resources, and realize the functions of data association and prediction and analysis through the calculation of algorithm model.

3.1 Acquisition

The first step of big data application is to collect all kinds of information resources, including personal information, order information, customer information, product information, route information and so on[6]. This information can come from smart devices, sensors, GPS navigation, social media and other sources.

3.2 Storage

The collected information needs to be classified, filtered, processed and stored for subsequent data analysis. Choosing a suitable data warehouse is very important for the storage process. A reasonable data warehouse can ensure that the data is single and easy to manage, and avoid information loss caused by scattered data.

3.3 Analysis

Data analysis is the core content of big data application and the key to the whole big data application. Through various algorithm models, the collected information is analyzed and processed[7]. For example, the machine learning algorithm can be used to analyze the historical data, so as to predict the future transportation demand.

3.4 Visualization

Big data applications also need to visualize data so that decision makers can more intuitively grasp all kinds of information in logistics and distribution. This requires various technical means, such as data maps, reports and dashboards, to make the data organized and easy to display.

In rural logistics distribution, the principle of big data application is mainly reflected in the following aspects: First, quickly respond to customer order demand. Through the data analysis and prediction of customer demand, we can quickly respond to customer order demand and improve logistics service level and customer satisfaction. Second, rationally plan the logistics distribution route. By analyzing and forecasting all kinds of distribution routes, we can work out reasonable logistics distribution routes, improve logistics efficiency and service level, and avoid the waste of time and cost caused by improper selection of distribution routes. Third, optimize warehouse management. Using big data technology to analyze and predict the warehouse system can also optimize the rural warehouse management mode, thus achieving the purpose of improving logistics distribution efficiency and reducing logistics costs.

4. Specific application strategies of big data in rural logistics distribution

4.1 Using information technology to improve management efficiency

With the continuous development and popularization of information technology, more and more enterprises begin to apply it to production and management to improve efficiency, reduce costs and enhance competitiveness. As an important part of rural economy, rural logistics also needs the help of information technology to improve its management efficiency. The construction of rural logistics information platform is the key to improve the efficiency of logistics distribution. Through this platform, logistics information can be shared and integrated, and logistics transportation and warehousing can be effectively coordinated. In the process of construction, we should consider the limitations of infrastructure conditions in rural areas and adopt technical means and schemes suitable for local conditions. At the same time, we should also strengthen security to ensure the safety and reliability of logistics information. Big data analysis is another information means to improve

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management efficiency. By counting and analyzing customer order demand, distribution scope and other data, we can better understand customer demand and logistics transportation, so as to adjust distribution strategy, optimize distribution route and improve logistics efficiency and service quality. In order to realize big data analysis, it is necessary to collect and store a large number of customer order information and logistics data, and analyze and apply them by using data mining and machine learning technologies on the premise of ensuring the authenticity and accuracy of the data. Intelligent customer information management system is a system integrating order management, customer service and data analysis, which can record customer order demand, distribution scope and logistics and transportation in real time. Through intelligent calculation and analysis, we can optimize the goods distribution route, reduce the empty driving rate and shorten the delivery time, improve the logistics efficiency and reduce the cost. At the same time, we can better understand customer needs, predict market trends, and prepare for delivery in advance, thus enhancing the advantages of enterprises in the competition.

4.2 Promote multimodal transport and improve traffic efficiency

Popularizing multimodal transport is one of the important measures to improve the efficiency of rural logistics distribution and transportation. Its advantage is that it can coordinate, integrate and optimize the resources between different modes of transportation and give full play to the advantages of various modes of transportation. Especially in areas with inconvenient road traffic to rural areas, multimodal transport can effectively alleviate the problem. Taking the combination of land transport and water transport as an example, products destined for the provincial market can be transported by water, which can not only give full play to the advantages of rivers and lakes, but also reduce the number of trucks and the occupation of road resources, thus reducing the risk of traffic congestion and road damage. At the same time, it can better meet the needs of customers and provide faster and safer services. For products going to other provinces, different intermodal modes such as railway or expressway can be adopted, which can shorten the logistics time and reduce the cost. Especially with the continuous improvement and development of railway construction, railway transportation has become an excellent and safe logistics transportation mode, which can greatly improve the efficiency of logistics distribution. In addition, multimodal transport can also promote the sharing and integration of logistics distribution information and improve the utilization efficiency of cross-industry logistics resources. By means of advanced information technology, a logistics information sharing platform can be realized, through which information such as cargo transportation and cargo status can be monitored and mastered in real time, and adjusted and arranged in time.

4.3 Strengthen warehousing management and rationally plan distribution routes

Warehouse management is one of the important links in logistics distribution. Reasonable and effective warehouse management can ensure the safe, fast and accurate storage and delivery of materials and orders. Therefore, it is necessary to establish a modern warehouse management system, including supporting construction of storage equipment, information management and safety management. In terms of equipment, efficient and intelligent storage equipment can be used, such as automatic conveyor line and automatic shelf lifting manipulator, to improve the efficiency of warehouse operation and reduce the errors and security risks caused by manual operation. In terms of information management, it is necessary to establish a perfect warehouse management system to comprehensively control materials and orders, including order management, inventory management, warehouse entry and exit management, etc., so as to know the materials in the warehouse in time and deal with problems quickly. In terms of safety management, we should strictly abide by the warehousing management regulations, strengthen safety precautions, prevent fire, theft and other accidents, and ensure the safety of stored materials. Distribution route planning is also an important link to improve the efficiency of logistics distribution. Big data analysis technology can make full use of various data resources and realize the screening and determination of the optimal distribution route, thus improving distribution efficiency and reducing costs. The intelligent planning method can quickly optimize the distribution route, reduce the empty driving rate and mileage, and maximize the logistics efficiency. In order to realize the rational planning of warehouse management and distribution route, it is necessary to strengthen personnel training and technical support. Training and introducing professionals in warehousing management, information technology and logistics distribution to improve management level and technical literacy; At the same time, we should also encourage and support enterprises to independently develop and promote energy-saving and environmentally-friendly logistics and transportation technologies, recycle resources and other ways to improve the level of logistics greening and social responsibility.

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5. Intelligent rural logistics distribution mode based on Internet of Things and cloud computing

With the development of advanced technologies such as Internet of Things and cloud computing, intelligent logistics distribution has become one of the main directions of future development. In rural areas, there are still many problems and challenges in the process of logistics distribution, such as inconvenient transportation, poor information and low efficiency, which puts forward new requirements and challenges for the management and service of rural logistics distribution. The intelligent rural logistics distribution mode based on the Internet of Things and cloud computing came into being. By using various sensors and RFID and other sensing technologies, the all-round monitoring and management of the logistics process can be realized, thus improving the efficiency and quality of rural logistics distribution.

5.1 Logistics Information Collection and Processing

Intelligent rural logistics distribution model based on Internet of Things and cloud computing puts information collection and processing in one of the key positions in the distribution process. This mode collects data about product weight, volume, temperature, humidity, etc. by using technologies such as sensors or RFID, and uploads the data to the cloud for processing and analysis. At the same time, using big data analysis technology to analyze historical order data, formulate reasonable distribution strategy and optimization scheme, and predict future demand changes, which will play an important role in the subsequent logistics distribution process.

5.2 Transportation Route Planning and Resource Sharing

The application of Internet of Things and cloud computing technology can fully utilize diversified transportation resources, optimize transportation routes, and ensure the balance of transportation resources. By monitoring the traffic situation, the route information is updated in real time, and the best distribution path is selected to improve the efficiency and accuracy of distribution. At the same time, the model also encourages the sharing of resources among enterprises, makes full use of all kinds of resources in logistics distribution, and avoids the waste of time and cost caused by the lack of distribution resources.

5.3 Real-time monitoring and scheduling

In the process of rural logistics distribution, the intelligent monitoring system can track the position and state of goods transportation in time, and monitor the transportation trajectory and safety of goods in real time. If there is a traffic problem or abnormal situation of goods, the delivery personnel can find and solve the problem in time, and allocate resources and dispatch traffic through the intelligent dispatching system to ensure that the goods can be delivered to the destination safely and quickly. Even in the diverse and complicated traffic environment, we can quickly find the best distribution scheme to ensure the timely distribution of agricultural products.

5.4 Timely feedback and service

Intelligent rural logistics distribution mode based on Internet of Things and cloud computing can realize timely collection and analysis of customer feedback and satisfaction evaluation. By using big data and artificial intelligence technology, customer satisfaction is monitored and analyzed, and the results are fed back to enterprise management in real time. Based on this, enterprises can adjust their operation strategies in time, optimize distribution services, and improve customer satisfaction and brand influence.

In a word, the intelligent rural logistics distribution model based on the Internet of Things and cloud computing has a broad application prospect in expanding the field of rural logistics distribution services. By collecting, storing and processing logistics related data, an intelligent distribution model is established to maximize the efficiency of logistics distribution, better meet the needs of rural markets and promote the development and prosperity of rural economy. In the subsequent development, we need to pay more attention to the innovation and upgrading of distribution mode to improve its intelligence and reliability.

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6. Conclusion

Intelligent rural logistics distribution model based on Internet of Things and cloud computing has broad application prospects, which can meet the needs of rural residents and promote the sales of agricultural products and the development of local economy. However, in practice, we should pay attention to issues such as data privacy and security protection, technology cost and training, which requires the joint efforts of the government, enterprises and all sectors of society in order to better play the role of big data technology in rural logistics distribution and promote the digital transformation and modernization of rural areas.

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