Application of Big Data Technology in Supply Chain Warehouse Operation Management and Control Platform

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Abstract. In order to understand the application of supply chain in warehouse operation management and control platform. A research on the application of big data technology in the management and control platform of supply chain warehousing operation is put forward. This paper first describes the big data in the supply chain. In the process of rapid growth of the amount of data produced in the practice of supply chain management, big data analysis has a very large room for growth in the supply chain. Secondly, a warehouse operation support platform based on big data analysis is proposed to solve the data integration problem of the warehouse, and the enterprise operation information is deeply mined by using big data analysis technology, so that warehouse managers can fully understand the key indicators of all aspects of warehouse operation in time, and at the same time solve the coordination, management, collaboration and decision-making in the whole process of enterprise management and control. Finally, the study shows that the warehouse business support platform is suitable for large and scattered enterprises with many warehouses, it not only helps people manage the warehouse and understand the products in time, but also uses big data in the logistics business. It plays a significant role in creating intelligent warehouse, improving logistics business processes, and improving the level of automation and intelligence of logistics warehouses. The analysis of risk factors and the proposal of targeted risk prevention strategies can reduce regulatory costs and reduce security risks, which is of great significance to the smooth operation of agricultural products supply chain under the big data environment.

Keywords: big data; Supply chain; Warehousing operation.

1 Introduction

The rapid development of digital technologies, such as sensor networks and the Internet of Things, has created enormous amounts of data. Big data is big data and structure. Data analysis software cannot collect, analyze or process data for a specific period of time. It should be optimized and complete in order to have useful information for making business decisions. My tacit knowledge of how to extract useful information from big data, intelligent decision making and business processes became the main problem of latency and big data technology became the key to solve these problems. Information technology is a powerful tool for data collection, storage, data management, data analysis, data mining, data extraction, etc. We can find many useful or interesting rules and conclusions. The goal of supply chain management is

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more than just the lowest shipping costs or delivery inventory, improving customer service levels and ensuring compliance across the entire supply chain. In order for the entire supply chain to function properly, there is a need for good cooperation between suppliers, manufacturers, retailers and buyers. In supply chain management, a lot of information is generated every second, which leads to the collection and collection of a lot of information in the supply chain, and a lot of information is obtained from various sources and heterogeneous structures; It is very important to process data sets quickly, and the speed depends on many factors, such as the performance of the data storage device, the speed of data transfer, and the speed of finding the necessary knowledge. Big data is characterized by scarcity, uncertainty and diversity, which makes it difficult to benefit from big data. Currently, the use of big data technology in supply chain management is in its early stages. With the continuous development of the supply chain, big data technology is developing tremendously in supply chain management[1-2]. As shown in Figure 1:

References

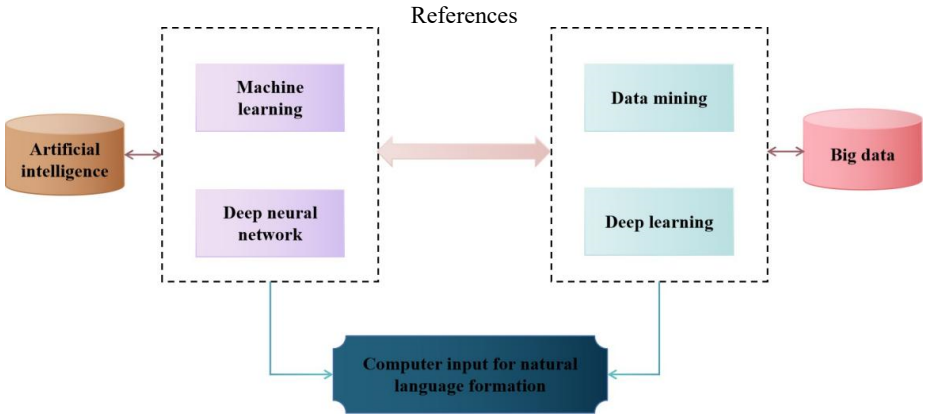

Figure 1. Big data analysis model

2 Big data in the supply chain

In order to make the whole supply chain as its analyzable object for big data analysis, many scholars have made corresponding big data analysis for different degrees of the supply chain.

(1) Demand planning

Many supply chain managers prefer to use big data to improve demand forecasting and production planning. By analyzing and measuring customer behavior, big data can change business services. Big data analysis allows us to understand demand signals, determine the best price and track customer loyalty data, which is good for performance analysis new business. Now, the hardware, software, and big data in the model have been updated, traffic history data and weather data have been incorporated into the calculation model and requirements. really was predictable. This model can know where and when payment is needed. In order to improve the company's business, the operator prepares energy production strategies and creates models of computing with big data. In order to meet the needs of short-term customers, this model has been found to be very accurate in calculating short-term employee data, which makes it very efficient[3].

(2) Procurement

Procurement is a competitive process with contracts for goodwill and strategy. Supply chain data analysis can be used in procurement. Based on product risk and vendor analysis work, this paper presents and analyzes an electronic product risk model developed using internal and external big data for risk management, analysis, emergency planning, supply chain support, and application. of big data for forecasting. Some researchers have discussed the role of big data in supporting the purchasing process and the use of purchasing through survey data, highlighting the benefits of this method of purchasing products.

(3) Production

Big data analysis is widely used in manufacturing processes. With the constant change of information and its use in the industry, the era of big data is emerging in the industry. Developing data mining skills leads to real-time, dynamic, flexible and accurate management of smart products. Big data analysis is also used in the business intelligence industry. Many sites and robots will use the Internet and big data in manufacturing and semiconductor manufacturing. Using big data processes, we take a lot of information from inside and outside the factory and analyze the interaction of work processes, information flows and energy flows. The search for practical solutions to reduce energy consumption shows important changes in the production process of the knowledge industry due to the transfer of small data to big data, and the critical importance of data criticism and computation in knowledge. production process [4-5].

Due to the complex influencing factors involved in the supply chain distribution scheduling,, it is difficult to synthesize multiple variables and conditions to obtain a satisfactory scheduling scheme. Therefore, it is necessary to apply big data technology, analyze the demand, obtain effective information, reasonably use relevant resources, complete reasonable intelligent scheduling, and increase the economic benefits of relevant enterprises. The first optimization objectives to be considered are: the maximum customer satisfaction, the minimum distribution cost of the enterprise, and the minimum penalty number of the enterprise, of which the most important is the customer satisfaction. Suppose that the time required to complete the distribution service of customer a is Ta, and the time window of customer a's distribution is [ea,ta], where ea is the earliest service time of customer a's distribution, and ta is the latest distribution time of customer a's distribution. And set the customer's delivery satisfaction time window as [ma , na]. When the delivery arrival time is within this range, the customer's satisfaction can reach 100%; If the delivery arrival time is [ea，ta], the customer satisfaction is 0; If the delivery arrival time is within the range of [ea，ta] or [ma ,ta], customer satisfaction is a proportional function of the time difference. Customer a's satisfaction with the delivery received at time i is Sata (i). Customers are divided into different distribution levels Wa according to material demand. The higher the number of levels, the more urgent the distribution demand. The objective function of maximum customer satisfaction is as follows (1):

$$Sat = Max\sum W_i \cdot Sat_a(i) \tag{1}$$

The big data aggregation method is used to manage the intelligent processing and power supply of the data processing equipment, and to integrate the analysis process of the unknown group into an electronic device. The Big Data Fusion model of smart devices goes back to the

characteristics of smart devices to control and monitor electronic devices, intelligent control of smart devices, and the function of the air cluster of management information. power supply (2):

$$x_n = a_0 + \sum_{i=1}^{M_{AR}} a_i x_{n-i} + \sum_{j=o}^{M_{AR}} b_j \eta_{n-j} \tag{2}$$

Where a0 is the initial sampling amplitude of the control information of the intelligent supply chain of power materials, and xn-i is the statistical characteristic of the transmission information of the intelligent supply chain of power materials. Using the fuzzy information sampling method, the objective function of the intelligent supply chain scheduling of power materials is (3):

$$\min imize \frac{1}{2}\|w\|^2 + C\sum_{i=1}^{n}\left(\xi i + \xi i^*\right) \tag{3}$$

Where: ζi and ζi* represent the inter class characteristic quantity of information transmission of power material intelligent supply chain. The information of power material intelligent supply chain is fuzzy weighted. In the window [Wmin,Wmax], the regression analysis formula of power material intelligent supply chain transmission information is obtained as follows (4) - (5):

$$W(t+1) = 4.0W(t)(1 - W(t)) \tag{4}$$

$$W(t) = W_{\min}(W_{\max} - W_{\min})W(t) \tag{5}$$

Where: [Wmin,Wmax] is the characteristic coefficient of information sampling of power material intelligent supply chain under the constraint of maximum iteration times, generally taken as [0.3, 0.8]. The fuzzy association rule mining method is used for fuzzy information scheduling of power material intelligent supply chain management and control, which is expressed as (6):

$$E_{i,j} = \langle e_1, e_2, \cdots, e_n \rangle \tag{6}$$

In the cloud computing environment, the intelligent supply chain of power materials is optimized for scheduling. The optimal scheduling model is expressed as (7):

$$V = \{C_1, C_2, \cdots C_K\} \tag{7}$$

In the network virtual resource database, the information transmission of power material intelligent supply chain is carried out [6], and the multi-path transmission model of power material intelligent supply chain information transmission is obtained as (8) - (9):

$$\int_{-\infty}^{+\infty} W_x(t,v)dt = |X(v)|^2 \tag{8}$$

$$\int_{-\infty}^{+\infty} W_x(t,v)dv = |X(t)|^2 \tag{9}$$

In the above formula, |X(v)| represents the mode of information transmission in the intelligent supply chain of power materials. Combined with the correlation density information analysis

method, the big data fusion of the intelligent supply chain of power materials is realized. According to the above calculation, the customer's material supply and distribution demand and the calculation method of their satisfaction with distribution can be obtained. Combined with the actual situation, the influencing factors of intelligent scheduling can be analyzed, and the design of intelligent scheduling system can be completed through computer related programs.

3 Warehousing operation support platform

A platform that supports warehouse operations is a platform with important content. As shown in the figure below, the system architecture is divided into five layers: concept layer, transport layer, information layer, service layer, and application layer. As shown in Table 1:

(1) Sensory layer

These include RFID readers, laser radars, video terminals, security intercoms, temperature and humidity sensors, and alarms.

(2) Container

Wired LAN or WIFI wireless communication mode is used to connect to the supporting platform and transfer data.

(3) Data layer

These include: product database, business database, maintenance database, employee database.

(4) Service layer

It includes RFID middleware, ESB bus and other third-party interface modules that provide support for the entire workflow.

Application form

This includes inventory management, security management, personnel management, data analysis, and system management. By running a warehouse support platform, business intelligence such as storage, warehouse, transfer, and inventory management can be achieved. Among them, video analysis technology can play the role of safety management and personnel management, which not only uses intelligent product management, but also processes data from many production processes, delivery and operations. As an important part of the data source of the big data analysis platform, it is the basis for business intelligence analysis [7].

Table 1. Design of Warehouse Operation Support Platform

Supplier information	Order information	logistics information	
application layer	Warehouse business management	Security management	system management
Service layer	Order information	logistics information	Monitoring information base
Data layer	Equipment information base	Business information base	Personnel information base
transport layer	Platform connection	Hardware equipment	Transmission data

4 Application of warehouse operation support platform based on big data analysis

4.1Transportation Scheduling and Storage Management

Big data analysis technology can process a large amount of data, so it can be used to effectively connect all parts of the supply chain, and on this basis, the warehousing items and warehousing tasks can be coordinated as a whole, so as to formulate a reasonable transportation scheduling scheme. In the specific implementation process of the scheduling scheme, big data analysis technology can be applied to deploy personnel and vehicles to improve transportation scheduling efficiency. In addition, when the platform is put into use, it is necessary to reasonably design the storage location of goods. Because big data analysis technology can realize data processing, recording and mining, it can be used to improve storage efficiency, optimize the picking list and make the platform run better[8].

4.2 Improve marketing accuracy

Big data technology can explore the deep-seated needs of users through the collection, storage and research of user information. Enterprises can understand and analyze the preferences and habits of users in different regions according to the feedback data, and rationally allocate resources through big data technology to improve marketing accuracy. However, it should be noted that in data collection and analysis, the vital interests of users should not be damaged to ensure the rationality and appropriateness of the application of big data technology. In addition, after analyzing the needs of users, it is necessary to effectively supervise the commodity production system of enterprises through big data technology to produce goods that can meet the needs of users in different regions and enhance the competitiveness of enterprises.

4.3 Realize the traceability of management

Big data analysis technology can not only analyze and calculate big data, but also store relevant information, thereby making business management controllable. Especially for a smart product marketing support platform based on big data analysis, the data generated by the system is large and the traditional recording process is not true. Therefore, the data collected by the system is analyzed and recorded by big data analysis technology to create independent product data and fully ensure product quality. In addition, in this process, the employee's work information is recorded, and responsibility can be taken according to the recorded situation due to human misconduct [9-10]. As shown in Table 2:

Table 2. Application of Warehouse Operation Support Platform

Big data application layer	Transportation dispatching	precision marketing	Warehouse scheduling
Big data processing layer	Unified scheduling	Monitoring service	Authority control service
Big data acquisition layer	Data import and export	Distributed data acquisition	Real-time data synchronization
Data source layer	Warehouse sensing equipment	logistics information	Third platform data

In the process of big data application in the supply chains of different industries, a common goal is to improve productivity by utilizing the data by providing the appropriate information to the appropriate users at the appropriate time. Big data analysis (BDA) has applications in the supply chains of different industries, including finance, technology, healthcare, consumption, energy and manufacturing, and all have their corresponding data processing methods and commercial value, as shown in Figure 2.

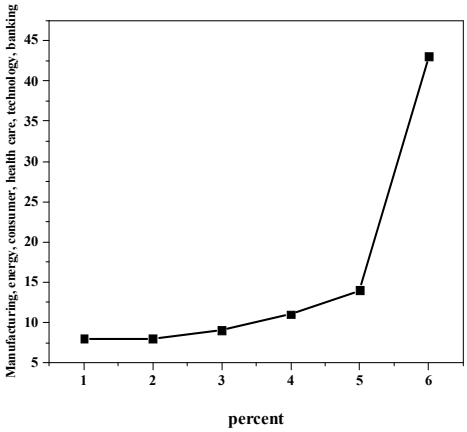

Figure 2. Application of big data analysis in the supply chains of different industries

5 Conclusion

When building a smart product business platform based on big data analysis, the sensor layer, the middle layer, and the application layer will be properly designed and the relationship between the layers different will be shown. In addition, the middle layer includes the transport layer, the data layer, and the service layer. The system can be used in scheduling delivery and process management, improve business accuracy, realize management footprint, and improve business management.In terms of logistics management,in 2019, the circulation rate of cold chain in A province is relatively low. The circulation rate of fruits and vegetables, meat and aquatic products is 6%, 15% and 23% respectively, which is generally at a low level, and the comprehensive cold chain utilization rate is only 19%. The loss and rot rate of fruit and vegetable products is the highest, reaching 36%, and the loss rate of fruit and vegetable logistics link is large, while the loss rate of international fruit and vegetable logistics is controlled at 3% -8%. Only by realizing the important role of big data and actively using data analysis technology in supply chain management can we improve the ability of managing the chain.

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