Research on Optimization of Fresh Food E-commerce Distribution Links Based on Big Data Technology

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Abstract
In recent years, with the widespread use of big data technology, many industries have taken it as an important means to optimize production management. In the fresh food e-commerce industry, logistics and distribution are an important bottleneck restricting the development of fresh agricultural product e-commerce. The quality of fresh food e-commerce product distribution services greatly affects consumer satisfaction. Therefore, based on the characteristics of fresh produce e-commerce distribution, this paper studies the problems of high distribution cost, high damage rate and low level of intelligent information in my country's fresh produce e-commerce distribution, and optimizes fresh e-commerce based on big data technology. The distribution system and the optimized application of the corresponding distribution link are proposed to solve the last-mile distribution problem.

Keywords
Big Data; Fresh Food E-commerce; Distribution Optimization.

1. Introduction
With the rapid development of my country's Internet economy, the demand for high-quality consumption has increased, which has promoted the rapid development of fresh food e-commerce companies based on online retail. Especially affected by the new crown pneumonia epidemic, people are more willing to shop online, and the fresh food e-commerce market has grown steadily. According to iiMedia Data Center, the fresh food e-commerce market is predicted to reach 311.74 billion yuan in 2021; With the special nature of fresh products that are perishable, the storage, packaging, and distribution of fresh products have become extremely important. Especially the distribution link, located at the end of the entire fresh food industry chain, will directly affect consumer satisfaction and is the most important link in the entire industry chain. All fresh food e-commerce companies also pay great attention to the distribution link and adopt a series of measures to improve distribution efficiency and distribution quality. At present, big data technology has been widely used in the Internet, finance, industry and other industries and continues to promote the digital transformation of enterprises. The fresh food e-commerce industry has a huge amount of data, the main sources are order transaction data, cargo distribution data, warehouse storage data, online evaluation, etc., whether structured or unstructured data has important research significance. Mining the potential value of these massive data can help fresh food e-commerce companies realize business expansion, optimize supply chain management, and improve consumer satisfaction. Therefore, in the current big data environment, the use of big data technology has strong practical significance for optimizing the distribution links of fresh food e-commerce enterprises.

2. Relevant literature review
Big data technology supports enterprise decision-making by processing and analyzing massive data to unearth potential information value. At present, big data technology has been applied...
to all walks of life, and many scholars in the logistics industry are conducting research. For example, Zhang Xicai and Li Hailing (2020) rely on big data technology to build a modern information sharing platform and establish a "city database" and "Personal micro-database" is a "networked, strict standard, traceable, and high-efficiency" modern agricultural product cold chain logistics development model that is connected through big data \(^1\); Wu Linxian and Lu Zhiwei (2021) use big data technology to The analysis and discussion of the infrastructure part of the new infrastructure, summarizes the development status of my country's smart logistics, related policies and existing problems, and proposes the role of "new infrastructure" in promoting the development of smart logistics, and expands the value of smart logistics data through big data centers , Artificial intelligence promotes the intelligent transformation of logistics \(^2\). Lei Xin (2020) uses big data technology to study and control the operational risks faced by cross-border e-commerce companies \(^3\); Ren Juxiang (2020) develops agricultural products e-commerce marketing based on big data platforms and technologies, thereby promoting agricultural e-commerce and Collaborative development of logistics \(^4\).

It can be seen from the above research that the existing literature uses big data technology to study a lot in the logistics industry, but most of them focus on the development model, development status, operation decision-making, etc., and most of them are discussed from a macro perspective, not specific Therefore, this article will focus on the important end distribution links in the logistics industry, aiming at improving the quality of the supply chain, improving customer satisfaction when reaching customers in the last mile, and applying big data technology Research on the optimization link of fresh food e-commerce distribution to further improve the quality and efficiency of fresh food distribution.

### 3. Analysis on the Distribution of Fresh Products in E-commerce

#### 3.1. Characteristics of e-commerce distribution of fresh agricultural products

##### 3.1.1. High delivery timeliness requirements

Fresh agricultural products include vegetables, fruits, eggs, milk, aquatic products and other primary agricultural products that have not been deeply processed. They are easily damaged and corrosive. They are different from general products. They have higher requirements for freshness and are easily affected by transportation. Temperature, humidity, turbulence, package integrity, and other external quality influences. Since these products are necessities in consumers' lives, consumers have higher requirements for time, and the speed of delivery will directly affect consumer satisfaction degree.

##### 3.1.2. High specificity of distribution equipment

The perishable and corrosive characteristics of fresh products directly lead to higher requirements for product packaging and cold chain transportation. Therefore, the distribution of fresh agricultural products requires professional equipment, such as cold chain transportation vehicles, product storage boxes, and professional equipment removal. Unloading utensils, etc., so as to ensure the freshness of fresh agricultural products and food safety, and reduce product damage rate.

##### 3.1.3. Diversified distribution models

Fresh food e-commerce companies have designed a variety of distribution models for the distribution of fresh agricultural products. For example, Jingdong fresh food logistics includes third-party logistics and self-operated logistics; Meituan preferred delivery includes purchases the day before, and picks up near the community the next day ; Hema fresh food delivery includes direct delivery within half an hour by the courier brother, delivery within 24 hours from the production area, delivery by third-party logistics, and Hema Yunchao delivery tomorrow; it can be seen that the delivery model is not only reflected in The diversity of
distribution logistics models also reflects the flexibility of delivery time. Consumers can freely choose their own products and logistics models according to their own time, giving consumers great autonomy.

3.2. Problems in e-commerce distribution of fresh agricultural products

3.2.1. High distribution cost
The end of the distribution faces a small demand and randomly scattered customer groups. Each customer has different standards for service quality, and the level of service quality greatly affects the product repurchase rate and corporate image, which leads companies to ensure delivery service quality requires increased investment in manpower and material resources. For example, a lot of time will be spent on the training and assessment of the professional quality of the courier, and a lot of manpower will be invested in checking whether the product is in conformity with the physical product and whether the accessories are carried in time before the product is shipped. This is undoubtedly a cost that is difficult to choose.

3.2.2. High product damage rate
Most of the fresh agricultural products have a short shelf life and are easy to rot. In addition, packaging, processing, transportation and other distribution links are likely to be damaged, which leads to a high rate of damage to fresh e-commerce agricultural products.

3.2.3. Low degree of intelligence information
There is a large amount of data and information in the distribution process, but most fresh food companies still do not use this information for decision-making assistance. For example, the traditional cargo distribution routes are driven by drivers based on their own experience. They may miss the best driving route and cannot save delivery time. Increased distribution costs. Therefore, the economic value behind each piece of information is immeasurable, and companies that do not pay attention to logistics informatization will be detrimental to their own growth and development.

4. Work process of fresh food e-commerce distribution system based on big data technology
The workflow of the fresh food e-commerce distribution system optimized based on big data technology is divided into three stages. The first stage is data collection, which can be collected according to channels such as GPS, radio frequency, sensors, system background, and partner platform docking. Environmental data, including weather, traffic conditions, etc.; e-commerce platform data, including product information data; order system data, including order information data, consumer data, including consumer personal information, preferences, historical behavior data, etc., logistics enterprise data, Contains data such as logistics distribution and warehousing; the second stage is data processing, preliminary information filtering and sorting according to the information processing platform, and then using spatial analysis, operations research, data mining, logistics system simulation modeling and other big data technologies for different scenarios In-depth processing and analysis; the third stage is data application. The system uses effective data to obtain a personalized distribution plan with scientific basis through the model. Fresh food e-commerce companies or logistics companies refer to the distribution plan provided by the system for distribution services, and the information on the implementation of the distribution plan is returned as an important data for consumer satisfaction. In the enterprise database, to support the system for continuous model adjustment and training, provide prediction accuracy and develop more functions, realize customer value and maximize management benefits. The specific fresh food e-commerce distribution system workflow is shown in Figure 1.
5. Application of fresh food e-commerce distribution system based on big data technology

The large amount of information generated in the process of fresh food e-commerce agricultural product distribution management creates conditions for the application of big data technology. Through big data analysis, delivery vehicles can be supervised and dispatched more effectively, and vehicle utilization and product safety can be improved. At the same time, it helps to optimize vehicle distribution routes, reduce distribution costs, and better meet timeliness requirements. Furthermore, it also helps to accurately study and judge customer behavior and achieve precise distribution. Specifically, through the application of the fresh food e-commerce distribution system of big data technology, the e-commerce distribution of fresh agricultural products can be optimized in the following aspects.

5.1. Intelligent monitoring of delivery vehicles

Due to the emergence of big data carriers such as GPS and sensors, information acquisition channels are more convenient. E-commerce companies or logistics companies can build a machine learning model for vehicle scheduling optimization based on information such as the load, capacity, and storage conditions of the delivery vehicle. Provide scientific model strategy support for different distribution tasks to achieve optimal vehicle scheduling strategy provision; establish vehicle and driver information binding, and assign responsibility to individuals to
ensure cargo safety; vehicles install GPS positioning devices, if the delivery vehicle is lost, it also realizes rapid positioning and searching; in the process of fresh food distribution, the food monitoring equipment is used to monitor the fresh goods in real time at low temperatures, and the information is sent to the delivery staff and platform information administrators; once the fresh produce is damaged, it can be reported to the platform and the delivery staff in time, and the warehouse administrator will be notified to prepare and deliver the goods again. The delivery staff will return in time to save unnecessary distances and inform customers of the actual situation and reduce satisfaction. In addition, if customers want to know the platform can also accurately inform the situation of the product.[7][8].

5.2. Optimize the driving path of delivery vehicles

The route choice of the delivery vehicle has a great influence on the delivery time of fresh produce and the freshness of the product. However, most of the traditional fresh produce delivery routes in my country are based on the driver's own experience. Therefore, we can use big data technology to optimize the vehicle route. Fresh food e-commerce companies can use the on-board computer to upload the information of the RFID sensors on the agricultural products to the server. The server will use the vehicle information, package information, and weather, traffic and other information on the public data cloud platform according to consumer preferences. Arrange the optimal vehicle route with the delivery route. At the same time, according to the information fed back from the vehicle driving state and the online dynamic vehicle path optimization model, the driving route is adjusted in real time; through the analysis of the existing vehicle driving path and driving time records, the general laws of road traffic are excavated to make reasonable driving Arrangement: Based on the big data platform, the remaining delivery time can be analyzed and calculated, and customers can be notified to pick up the goods in time, reducing customer waiting time, and improving the quality of delivery service and the timeliness of the entire delivery.[9].

5.3. Predictive analysis of consumer behavior

Through the collection of consumer ordering behavior information through the platform system, through big data technology, combined with customers' shopping habits and historical frequency of choosing the delivery model, the delivery model plan group is accurately launched, so that consumers can flexibly choose various delivery plans to satisfy consumers. Through the analysis of customer consumption behavior, it is helpful to arrange distribution resources in advance, reasonably distribute sites, and improve the timeliness of distribution; in addition, use big data analysis technology to establish association rules between ordered goods and time, latitude, and then follow certain The probability of advancement of the distribution behavior, distribution and sorting operations, personnel arrangements and vehicle scheduling in advance, saving distribution time[9].

References


