Research on Optimal Design of Urban Terminal Distribution Network of Fresh Products under the Background of New Retail

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Abstract
This article starts from the relationship between new retail, fresh products and terminal distribution, and analyzes the structure and characteristics of the urban terminal distribution network of fresh products in the context of new retail. Finally, it was discovered that there are problems in the terminal distribution network of fresh products under the background of new retail, such as high enterprise costs and low customer satisfaction, and based on this, the optimization design direction of network node layout, logistics service distribution, and distribution path is proposed.

Keywords
New Retail; Fresh Products; End Delivery; Network Optimization.

1. Introduction
In recent years, with the changes in people's consumption concepts and the rapid development and application of emerging technologies such as mobile Internet, big data, cloud computing, blockchain, and artificial intelligence, new retail has emerged. Because fresh products have product characteristics such as short preservation time, scattered production areas, and perishable damage, the terminal distribution of fresh products has always affected the operational efficiency of enterprises. In the context of new retail, how to plan and design an efficient terminal distribution network to increase the market circulation rate of fresh products and reduce business risks has important theoretical and practical significance.

Regarding the research on the optimization of the distribution network of fresh products, most of the perspectives focus on the optimization of the distribution network system facility structure, the logistics network LRP (Locating-Routing Problem) and other aspects. Zhao Shumei and others put forward the constraints on the development of "new logistics" under the background of new retail, and believed that the development of new retail logistics requires the combination of innovative development concepts and implementation strategies to continuously improve customer experience and other strategies, and pointed out that "new logistics" is the future of logistics the development trend of the industry [1]. Li Fu analyzed the background, concept and characteristics of new retail, and on this basis, found the problems in urban distribution, and finally put forward new development suggestions [2]. Based on the characteristics of perishable goods, Zhao S et al. designed a satisfaction function according to the service time window, and proposed a method to solve the LRP in two stages by using the minimum envelope clustering analysis and the tabu search algorithm. The simulation results proved the model and The practical value of the algorithm [3]. In the supply chain network of fresh products for graduate students, Govindan K and others considered the perishable characteristics of the product and the time window factors, constructed a two-level multi-objective sustainable supply chain network model, and finally designed a multi-objective hybrid method To solve the model, it also compares and analyzes with other multi-objective algorithms such as NSGA-Ⅱ algorithm to test the advantages of the designed algorithm [4].
When studying the LRP problem of cold chain logistics, Wang S and others strengthened the awareness of green logistics, took the cost of carbon emissions into account in the model, and established the objective function of the cost of carbon emissions to achieve parallel development of economy and environment[5].

2. The Connection between New Retail, Fresh Products and End Distribution

2.1. Concept Definition
New retail refers to the traditional retail that is driven by emerging technologies to upgrade and transform the retail model, reshape the ecological structure of the human goods field, optimize the supply chain, and improve the efficiency of commodity circulation and retail activities. The essence of new retail is customer-centric. New retail is a new retail model that integrates online and offline and modern logistics.

A fresh product refers to a kind of primary product that is perishable and has not undergone a production process or just undergoes a simple on-site production process. It generally includes fruits, vegetables, meat, dairy, seafood, etc. The specific classification is shown in Figure 1 Show. In view of this feature, it is different from general products, and necessary cold chain measures must be taken in the logistics process of production, transportation, warehousing, etc. to ensure the quality of fresh products, or to reduce the circulation links to shorten the transportation time. Combined with the research environment of this article, this article studies the urban end distribution network of fresh products under the background of new retail. The fresh products here mostly refer to the ingredients consumed by residents daily. In order to simplify its characteristics, this article mainly studies Fresh products specifically refer to fresh vegetables.

![Figure 1. Fresh product category](image)

The meaning of end distribution usually refers to the logistics distribution mode that is delivered to consumers in the last mile, and it is a distribution activity whose ultimate goal is to meet the needs of consumers. The end distribution service is also a consumer-centric distribution activity. The end distribution refers to the distance from the distribution center to the customer. This distance directly determines the cost of the end distribution and the reliability and stability of the entire end distribution network.
2.2. **The Connection between New Retail and Terminal Distribution**

Terminal distribution is the capillary under the new retail format system and one of the key points in the construction of the new retail ecosystem. The terminal distribution ecological structure under the new retail format, the front desk is diversified and customized according to the needs of the person; the middle station is empowered through flexible manufacturing or intelligent manufacturing; the backstage is the online SAAS cloud, and offline express delivery. The express logistics distribution center allows all products to have labels and identities, so that all product circulation can be traced, and the efficiency of product circulation is greatly improved. The typical terminal delivery modes in the current market include 30-minute delivery, front warehouse, unmanned warehouse, automatic vegetable vending machine, and overseas direct mail. The ultimate goal of terminal distribution under the new retail format is to achieve true zero inventory and make inventory management more convenient and informatized.

The end distribution service is directly customer-oriented. The success of the end distribution service can enhance customer stickiness and increase customer satisfaction, which plays a key role in the new retail format. With the support of big data, new retail analyzes consumer needs, can complete the production reshaping of the product supply chain, optimize the end distribution network, and truly realize data-driven new retail. Technology is also driving new retail, which is mainly manifested in the way of terminal delivery. In recent years, we can see various intelligent express cabinets, terminal delivery robots, drones, and electric terminal delivery, which demonstrates green and environmental protection. It reduces the cost of terminal distribution and improves the timeliness of terminal distribution.

2.3. **The Connection between Fresh Products and End Delivery**

Fresh product logistics belongs to the category of cold chain logistics, and its purpose is to control the temperature in a certain state through special equipment to reduce product loss and ensure product quality. Due to the special properties of fresh products, the transportation of fresh products needs to ensure that the fresh products are at an appropriate temperature and humidity. Compared with other commodities, fresh products have their particularities, mainly in the aspects of complexity, timeliness, high cost, and high coordination.

Judging from the future economic development and the transformation of residents’ consumption patterns, we will say goodbye to the daily habit of the residents who store vegetables in the refrigerator. The residents need fresher, safer, and greener ingredients. This demand poses a higher challenge to the logistics end distribution enterprise end.

Under the new retail format, fresh food companies can improve customer satisfaction in order to allow consumers to have a better shopping experience, thereby increasing their brand. This puts forward higher requirements for the end-of-life distribution of fresh food in cities, not only to shorten the delivery time, but also to ensure the delivery quality of fresh products. In order to achieve this goal, fresh retail companies optimize and upgrade resources, integrate resources, rely on technical support, establish fresh supermarket experience stores or front warehouses, and analyze customers in a city-wide manner through a point-to-face approach. Demand points, including analyzing the geographical location, demand and consumption level of customer demand points, and establishing a small network system for end distribution.

2.4. **The Connection between Fresh Products and New Retail**

Regarding the issue of fresh products under the new retail model, first of all, because of the particularity of fresh products and the emergence of new retail models, the supply chain system of fresh products can be optimized. The chain has been upgraded and optimized, and a fresh supermarket store with integrated store and warehouse is built closer to consumers, which not only shortens the distance with consumers, but also simplifies the product distribution network.
Fresh products can reach the city directly from the place of production. The regional cold chain warehouse may be directly connected to the supermarket, reducing the turnaround time for fresh products to customers.

In the domestic urban environment, traditional fresh food e-commerce companies build cold storage in the suburbs of urban areas, and then deliver them to consumers through cold chain logistics trucks. The enterprise cost of this distribution model is extremely high. For fresh products, due to the particularity of their products, the cost has increased a lot. For example, in order to avoid damage during transportation, merchants generally spend more on packaging to avoid the entire order. The situation of payment of goods.

In summary, the three are interrelated and mutually reinforcing. The biggest feature of fresh retail is that it is consumer-centric. End-of-end distribution services are also consumer-centric distribution activities. Therefore, end-of-sale distribution naturally plays a decisive role in the new retail format. The core of terminal distribution is the distribution distance, that is, the distance from the distribution center to the customer. This distance directly determines the cost of terminal distribution and the reliability and stability of the entire terminal distribution network. Although the entire supply chain has been optimized under the new retail model, and the distribution center is getting closer and closer to our consumers, according to the survey results, many fresh new retail companies have closed down due to end-of-end distribution problems. The quality of service is still at the previous stage, and has not improved with the update of retail formats.

3. Analysis on the Structure and Characteristics of the Urban End Distribution Network of Fresh Products under the Background of New Retail

3.1. Structural Analysis

We start from the concept of end distribution, the main body of the network structure is mainly composed of three parts. Including fresh supermarkets, consumers and end-of-line delivery service finishers.

Fresh food supermarkets play a pivotal role in the new retail format, linking the past and the next. The establishment of fresh food supermarkets connects new retail companies and consumers. Consumers have a shopping experience in fresh food supermarkets. Through the platform of fresh food supermarkets, new retail companies can better connect with consumers, and customers can purchase and use in supermarkets. The APP developed by the supermarket is used for purchase and payment. In the long run, big data can be used to form consumer portraits for consumers, provide customers with scene-based experience, demand analysis and forecasting, and so on. Of course, fresh food supermarkets play the role of commodity providers in the terminal distribution network. Fresh food supermarkets in the context of new retail are integrated with stores and warehouses and have the function of logistics and warehousing. This can not only satisfy consumers’ offline consumption. It can also satisfy consumers’ online consumption and shorten the delivery time at the end.

Consumer refers to the last node in the urban end distribution network of fresh products under the background of new retail, and he is the user of fresh products. With the upgrading of consumption and the popularization of mobile Internet, consumers’ consumption patterns are diversified. In this network, consumers have different purchasing behaviors and different purchasing needs. Fresh food supermarkets must leverage big data to provide consumers with peer-to-peer services.

The person who completes the end distribution service. In the context of new retail, the strategies of each new retail enterprise are also different. The end distribution presents
diversified characteristics. They include distribution personnel in self-operated distribution, third-party logistics distribution personnel, and distribution in crowdsourcing mode. Personnel etc.

3.2. Characteristics

In the urban end distribution network of fresh food supermarkets under the background of new retail, we mainly analyze the characteristics from two aspects. The first is the new retail model or the characteristics of the business format; the second is the end distribution of fresh products Features.

1. The model characteristics or business format characteristics of new retail can be summarized as follows:
   (1) New retail drives the future with data. Through big data platforms, merchants can achieve precise marketing, precise inventory, and precise distribution of goods, so that the product supply chain can be reshaped.
   (2) New retail is centered on consumer experience, and online and offline logistics provide customers with the best service experience from multiple perspectives.
   (3) Under the new retail format, offline stores play an important role as a bridge connecting customers. Through the good realization of the social, entertainment, consumer experience, e-commerce and other functions of the store, it can reach the new retail flow line On purpose.
   (4) Under the new retail format, it has a complete supply chain system and can meet the consumer demand of customers in various channels.
   (5) Products under the new retail model are all traceable, and the safety and reliability of the products are guaranteed.

The distribution of consumers presents multiple and scattered characteristics. The demand points are distributed in various communities in the city, and they face the complex traffic conditions in the city. In addition, due to the inherent particularity of fresh products, it is more difficult for the end delivery service completers to perform the delivery tasks.

2. The end distribution shows the following characteristics:
   (1) The number of products distributed at the end is small and the batches are large. The consumer demand of consumers presents the characteristics of multiple batches and small quantities. Due to the upgrading of residents' consumption, people are pursuing higher-quality fresh products with a high level of freshness. When buying such products, they often choose to buy in multiple batches, each time buying small but fresh products.
   (2) The terminal distribution network is complex. In the urban end-of-city distribution network of fresh food supermarkets under the background of new retail, end-users are scattered in all areas and corners of the city. In addition, the traffic situation in the city complicates the end delivery route. In addition, the different carrying capacity of the delivery vehicles and the different driving distances will also lead to different parallel networks in the distribution process of fresh products at the end of the city. Different customers have different requirements for the timeliness of distribution, which will also lead to different distribution networks for fresh products.
   (3) The timeliness of the end distribution is high. In the context of new retail, consumers pay more attention to the timeliness of terminal delivery. Moreover, the timeliness of delivery will directly determine the online shopping experience and customer satisfaction of end consumers. Faced with different customer time window requirements, the penalty cost of time window often increases.
   (4) The requirements for smart terminal distribution have increased. Under the new retail format, the needs of consumers are diverse. Because of the popularization of the mobile Internet, consumers have a demand for traceability during the delivery process, which puts
forward new ideas for the optimization of terminal delivery technology for new retail companies. Claim.

4. The Problems and Optimization Design of Fresh Products in the Urban End Distribution under the Background of New Retail

4.1. Problems in the Urban End-of-City Distribution of Fresh Products under the Background of New Retail

Through the analysis of the network structure of the end-of-fresh products distribution network under the background of new retail, combined with case studies of typical enterprises in the fresh-food industry under the new retail format, we can discover the problems existing in the end-of-fresh products distribution network under the background of new retail. Problem analysis This article mainly starts from the main body of the terminal distribution network structure of fresh products under the background of new retail.

The main problems of fresh supermarkets are unreasonable location selection. The location of the fresh food supermarket failed to fully consider the demand points around the fresh food supermarket, and the service distribution of the two fresh food supermarkets overlapped.

From the perspective of end-demand stores, considering that the new retail format is customer-centric, end-demand points need to be comprehensively analyzed from the customer's consumption habits, traffic conditions, and road distances between demand points. But in reality, the factors that are often considered are not perfect, resulting in unreasonable end distribution route planning.

From the perspective of the person who completes the end delivery service, the end delivery service personnel are not professional enough, the route chosen is unreasonable, and the packaging is seriously damaged.

4.2. Optimized Design of Urban Terminal Distribution Network for Fresh Products under the Background of New Retail

In this paper, the optimization design problem of the new fresh retail city terminal distribution network is mainly aimed at the integration and optimization of various logistics resources in the urban area where the consumer population is concentrated, combined with the combination and feature analysis of the fresh new retail city terminal distribution network described above, we mainly need to integrate and optimize the logistics nodes in the terminal distribution network, mainly including regional cold storage, distribution center, which refers to the fresh supermarket and demand point with integrated store and warehouse, and the transportation route network connecting each node.

The main content of the optimization design of the urban end distribution network of fresh products under the background of new retail is to optimize the location, quantity, inventory and service object distribution of the logistics nodes and logistics infrastructure of the end distribution network in the urban area. In addition, the information network and transportation network of each logistics node connected in the circulation network of fresh products are fully optimized. Specifically, the content of the optimization design of the fresh food new retail city terminal network is to establish a suitable fresh food supermarket service multiple demand points in order to serve different groups of people in the urban area, and the fresh food supermarket service terminal distribution selects the optimal path pair Delivery to various demand points.

The steps for the optimal design of the distribution network at the end of the fresh and new retail city are shown in Figure 2. It has a phased feature, which mainly includes three important parts. The first is the location optimization problem of logistics nodes, the second part is the distribution of services in the terminal distribution network, and the last is the routing in the
transportation network problem. The contents of these three parts are independent of each other and closely related.

The first stage is about the optimization problem of the location of logistics nodes in the terminal distribution network. Its decision-making process should establish a multi-criteria decision-making model based on different types of network location planning problems, and then initially select the geographic location of the logistics node facility based on the model, and finally adjust and optimize the location plan according to the specific situation and environment. It is worth noting that in the process of facility location decision-making, the factors we consider need to be adjusted accordingly according to different regional network location planning goals. In addition, some factors such as the number, scale and geographic location of the logistics node facilities are used to improve the model.

The second stage is about the service distribution problem of the demand point in the end distribution network. First of all, our first basic principle is to assign each customer to the most suitable logistics node for service. The so-called suitability requires us to comprehensively consider all the logistics node information of the end distribution network range and the information of the supply chain network. The final distribution plan can not only reduce the logistics cost of the entire end distribution network, but also can reasonably meet the needs of all areas. customer demand.

In the third stage, for the distribution route problem in the city end distribution network, it is often based on different route optimization types, considering different influencing factors and distribution characteristics, choosing the shortest transportation distance or the fastest delivery time as the goal to establish a route network covering all demand points.

5. Conclusion

This article mainly studies the optimization design of the urban end distribution network of fresh products under the background of new retail. First, we start from the definition of new retail, end distribution, and fresh products, explore the interrelationships between the three, and find an entry point. Then according to the supply chain structure of fresh products under
the background of new retail, the network structure is depicted, and then the main structure analysis, characteristic analysis and characteristic analysis of the urban end distribution network of fresh products under the background of new retail are carried out. Then we combined with the analysis of typical industry cases under the current new retail format, and put forward the problems in the end-of-life distribution network of fresh products under the background of new retail. Finally, according to the characteristics of the company's operational strategy, we proposed the steps to optimize the design of the network. The optimized design proposed in this paper can improve the operational efficiency of relevant new retail enterprises in commercial operations, and has great strategic significance and practical value.

References