

# Design of New Retail Supply Chain Management System Based on Web 3.0

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**Abstract:** With the emergence of new retail formats, new retail has become a research hotspot in enterprises and academia. Digitalization is a new feature of the development and progress of today's human society, and the digital economy has also become the key field of the new round of international competition. With the development of digital economy, the retail industry is undergoing earth-shaking changes. The scale of retailers and the concentration of retail market are developing day by day, and retailers have become the managers leading production and sales. In the supply chain, it is called "strong retailer". Among these leading retailers, the dominance of supply chain has changed, from manufacturer to retailer. This paper designs a new retail supply chain management system based on Web3.0. This paper mainly introduces the design of system and framework in retailer supply chain management, how to realize retailer supply chain management and the future development prospect of supplier management supply chain.

**Keywords:** Web3.0, New retail, Supply chain management.

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## 1. Introduction

The Tenth Five-Year Plan for the Development of Digital Economy[1] puts forward that "digital economy is a new economic form with data resources as the key element, modern information network as the main carrier, information and communication technology integration and digital transformation of all factors as the important driving force, and digital empowerment as the prominent feature. The digital economy is related to the overall development of the country. " Web3.0, the network infrastructure of the digital economy, integrates the concepts of Web3.0 and the meta-universe, and integrates blockchain, digital currency, smart contract, distributed autonomous organization (DAO), open finance (DeFi), science of research and development groups (SciTS), social movement network organization (CeSMO), dynamic netizen group organization (CMO), decentralized science (DeSci) and decentralized society.[2] The development of the Internet can be divided into three stages: Web1.0, Web2.0 and Web3.0. At present, the Internet is in the Web2.0 stage, and its data ownership is essentially owned by the platform. Data monopoly has caused problems such as data islands, data abuse, data privacy and algorithm hegemony. These shortcomings are not conducive to building an inclusive digital economy. The next generation Internet Web3.0 is based on blockchain technology. The main body of its content publishing is individuals, and the content ownership belongs to individuals, which will enable people to share the development dividend in the era of big data and artificial intelligence, and help stimulate the new vitality of the digital economy of "mass entrepreneurship and innovation". As the core technology of Web3.0, blockchain technology is naturally suitable for solving the problems of information asymmetry, data monopoly and low transparency in traditional supply chain business with its characteristics of

distribution, traceability and trusted sharing. Therefore, it is necessary to explore the design of a new retail supply chain management system for digital economy Web3.0[3].

## 2. Relevant Theories

### 2.1. Web 3.0

Web 3.0 refers to the next stage of Internet ecology after the mobile Internet, mainly through blockchain and other technical means, to achieve a decentralized network form, to achieve an Internet that simulates real-world feelings and breaks the virtual and real boundaries:[4]

Web3.0 is a set of extensive movements and protocols to make the Internet decentralized, verifiable and safer. The vision of Web3.0 is to realize a server-less, decentralized Internet, that is, an Internet in which users control their identity, data and destiny. If Web1.0 is Read, Web2.0 is Read+Write, and Web3.0 is read+write+own (As shown in figure 3).

### 2.2. The new retail supply chain management

The essence of retail competition is the competition between cost and efficiency. As shown in figure 1, in the four stages of retail evolution, bazaar-style, shopping mall-style and chain-store-style all belong to the retail 1.0 period, while e-commerce mode is the retail 2.0 period. The popularity of mobile Internet has made the retail industry enter the 3.0 period, while smart retail has entered the retail 4.0 era because of blurring the boundaries between online and offline, and the popularization of Internet of Things and artificial intelligence technology. New retail is the inevitable product of economic development and consumption upgrading, its essence is the seamless combination of online, offline and intelligent logistics, the foundation is omni-channel, and the core is the reconstruction of supply chain and the upgrading of logistics scheme.

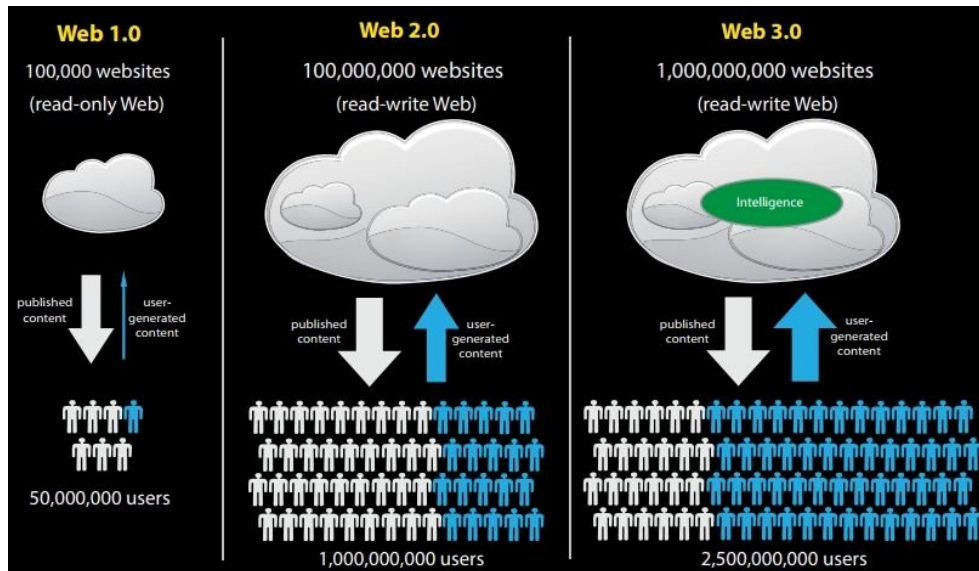


Figure 1. Schematic diagram of web1.0-web3.0[5]

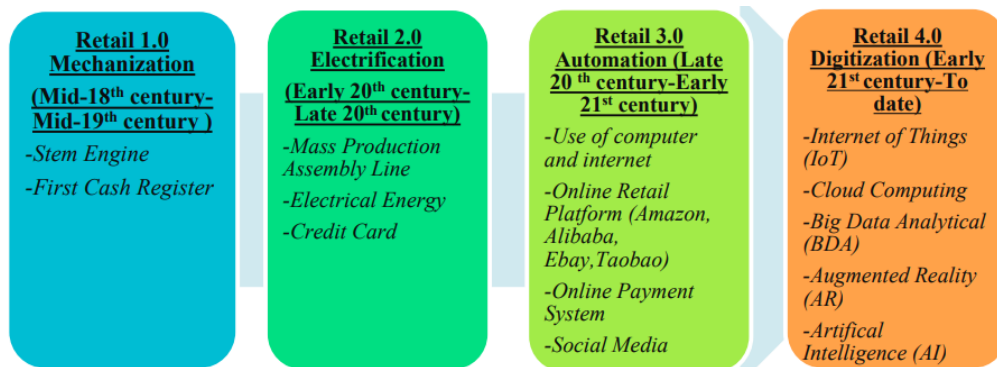


Figure 2. New Retail: Evolution from Retail 1.0 to Retail 4.0[6]

Supply Chain refers to the process of products from the source to the final consumer, involving raw material suppliers, manufacturers, distributors and retailers, connecting these into a close network structure. Supply chain management is to gather these suppliers, manufacturers, warehousing, distribution and distributors in a network to effectively manufacture and sell products under the premise of meeting a certain level of consumer demand, and achieve the lowest cost of the whole supply chain system through management.

Supply chain management includes effective management of logistics, capital flow and information flow. As shown in Figure 3, logistics flows from the supply direction to the sales

direction and the demand side; The capital flow is just the opposite, from the demand direction to the seller and to the supplier; Only information flow flows among the three. Commodities flow from raw materials and manufacturing to sellers and finally to consumers through logistics. Finally, the funds will be transferred to the hands of sales and suppliers through the sales of goods, that is, consumers pay for them. However, if the information exchange between them is also one-way, then suppliers can't know the market demand and consumer response, and miscalculation fails to predict the market, so the information flow always needs to be unblocked.



Figure 3. New retail revolution [7]

The new retail e-commerce has revolutionized the retail market (as shown in figure 3). Consumers used to need to go to physical stores to choose from a limited number of SKUs and become hundreds of millions of SKUs that can face the world in the virtual scene of the Internet. The supply chain has been directly shortened from the traditional brand-> channel-> retailer-> store-> consumer to brand-> consumer, and many links in the supply chain have been simplified. At the same time, due to the data of the whole link and the deep identification of business scenarios, personalization has become the standard of e-commerce.

### 3. System Requirement Analysis

Requirements analysis is an important node of system planning. We should further analyze the system requirements in detail, try to fully understand the system requirements, and then analyze various implementation schemes of the system requirements, and analyze the components of each key module.[8]

#### 3.1. Emotional needs

The Internet is shaping the consumption habits and lifestyles of a new generation of young people. The word "Internet aborigines" is the most prominent label of contemporary young people. They are tired of the original consumption routine and are more willing to pay for sensibility. Consumers' preference for brands has turned to factors such as "personality" and "self-realization". Under the "new normal" of consumption upgrading, the retail industry needs to be closer to the personalized life attitude and emotional appeal of the main consumer force with faster and more novel iterations. Emotional connection has a very good product transformation effect. In addition to the artificial connection with consumers, the product itself can be emotionally connected with users through mobile forms and innovative interactive modes. Retail can no longer focus on sales, but turn the mobile fresh food space into an attractive new lifestyle with differentiated innovative forms, immersive spaces and more interactive life scenes, paying attention to more temperature services and catering to users' deep emotional needs.[9]

#### 3.2. Functional requirements

Internet consumption and scientific and technological progress have brought many conveniences to life. On the one hand, with users' pursuit of convenience, new products and services such as take-away, fast food and mobile phone ordering have entered a larger market, and the lazy economy has gradually become popular. The social pressure time is almost economical. In order to save time and cost, under the premise of ensuring quality, users have a stronger demand for intelligent and convenient retail methods, while mobile retail replaces labor costs with intelligence, achieving this goal at a slightly higher economic cost, which can be praised by consumers.

On the other hand, young people's ideas, needs and social forms of making friends have obviously changed, and hot words such as "cyber socialization", "interest socialization" and "sexless socialization" have appeared. Long-term online "disco dancing" will not bother to expand the offline social circle, but want to socialize but reject complex socialization. I understand that young people are more willing to try virtual socialization, and retail space can expand its functional forms

through media to create brand-new social function modules to meet users' needs.

#### 3.3. The system running environment

The operating environment of the system includes hardware and software environment, in which the hardware server parameters can be referred to as follows: CPU model: Xeon E5-2603 v3, number 4, frequency 4 GHz; Hard disk type: SATA/SAS, capacity above 2TB; Memory type DDR4, 4GB memory capacity, reference machine type, for example: DELL R730/R790 series.

The software environment required for system operation includes software systems installed on the server, such as CentOS 6.5 or above of Linux operating system, Enterprise Java Bean(EJB) component 3.2 or above, Tomcat7 or above, JDK1.8 or above, zookeeper 3.4 or above, MySQL5.5 or above, and google chrome or above. At the same time, it also needs an external environment that can access the Internet.

#### 3.4. System Scenario Objectives

Supply chain is a kind of network chain structure that connects customers and suppliers through a series of activities such as planning, acquisition, storage, distribution and service. It is a typical distributed scenario. Realizing commodity transportation and sales in the retail supply chain system is a key link in the production and operation of retail enterprises, which not only includes various data such as commodity logistics, capital flow and information flow, but also involves various roles such as suppliers, consumers and third-party platforms.[10]

#### 3.5. System framework

Supply chain management framework, mainly to achieve two goals. On the one hand, it provides theoretical guidance for the corresponding computer information system. In addition, it provides theoretical guidance for the process based on information system. Aiming at the goal and function dimension, a retailer resource integration model, that is, supply chain management system, appears, that is, FROM—SCM model. Through the introduction forecasting system, "rebate", online ordering, and participation in manual processing mechanism. Solve the "FROM" problem with upstream enterprises in SCM practice. The following focuses on the introduction, based on web technology, man-machine interface interaction module, as well as manual processing mechanism module, the content of two modules. Man-machine interface interaction, based on the developed Web system. The main purpose is to handle user and system input and output. Other module functions and operations are all completed in this interface. In a sense, the man-machine interface module is a platform for users and supply chain management. It is important to understand that this module must have strong security protection. Only under the corresponding protection mechanism can the data security be guaranteed and the security of resource management in the whole supply chain be completed. Manual treatment; It mainly means that in the operation of supply chain management, data cannot be derived through established rules or mathematical operations. Many functions need to be combined with lower human resource costs in order to be further improved. For similar commodity pricing and discounts, the year-end "rebate" is greatly influenced by external factors. By analyzing the content of the whole system

and inputting specific data manually, the whole system can run smoothly. Give full play to people's subjective initiative and improve the accuracy of the system. In the framework of retailer FROM—SCM system, the function of commodity supplement has been completed through commodity logistics, ordering and feedback to retailer's demand information. The overall architecture of this system is shown in Figure 3. Application display interaction layer: based on Springboot framework and Thymeleaf template engine, the front-end interface is written to realize the separation of back-end java code and front-end code, and according to Bootstrap framework and ECharts data visualization graphic library, the data is presented to users in a visual form, and the user's instructions and data are fed back to the bottom.

Interface layer: Integrate Huawei Blockchain (BCS) through Springboot framework, and call relevant APIs to provide services for lower layers.

Service layer: the goal of supply chain management is to maximize the benefits of the whole supply chain and coordinate the internal and external resources of each enterprise to meet the needs of customers; The purpose of regulatory audit is to establish a full record of the supply chain behavior from responsibility to people, and use this system to monitor all links in the supply chain. If there is a problem, the regulatory agency can use this system to quickly find the responsible person and use this system to find out the key links of the problem. The purpose of traceability inquiry is to provide traceability service for information flow, capital flow and logistics, so that relevant enterprises can inquire the data of information, capital and logistics at any time.

Network layer: The existing blockchain network usually uses Gossip protocol, which contains a lot of complex information. If the number of nodes increases, the performance will decrease. However, Huawei chain spreads information synchronization from the core to the edge through fine hierarchical management, reducing message duplication and improving performance. Core layer: raft algorithm is used to ensure the data consistency of each node in the cluster, digital signature is used to ensure the correctness of node identity, encryption algorithm is used to ensure the data security in the chain, and the automatic operation logic of supply chain business is realized based on smart contract.

Storage layer: responsible for the persistent storage of block data through account books; MySQL database is used to store some insensitive data and support the data storage of the system. Memory cache block data.

## 4. System Design

After completing the requirement analysis, the next thing to do is to design the system. The goal of system design is to design a system that meets the predetermined requirements. The key aspects of system design include: defining the design method and direction, modularizing the system into several subsystem modules, determining the objectives, functions and links of each subsystem module, defining the management system and control method of each subsystem module, carrying out technical design and evaluation of each subsystem module, and carrying out technical design and evaluation of the whole system. Based on the user's core needs summarized above, the functional architecture of mobile unmanned fresh food retail applet is constructed, which is divided into four sections: retail service, viewing and reminding, mobile community and mine.

(1) Retail services focus on the user's experience in the purchase process, and users can view the maps of nearby retail outlets, quickly locate them and conduct online virtual shopping guides. Four function points, such as quick purchase, personalized service, reservation service and one-click service, have also been added in this section: quick purchase adopts the functions of quick search, classified query, one-click shopping cart purchase, common selection and private recommendation, which improves the efficiency of users in consumption decision-making; Personalized service caters to users' personal core needs through the functions of self-collection, purchase and delivery, and personal tailor, and solves the problem of food resource waste to some extent; Booking service includes the functions of booking retail space and pre-operation. Users can select their favorite fresh food in advance, book the service time of space and set the pre-operation, and choose the storage form in advance, so that they can taste satisfactory products in the first time when they arrive at the experience space. One-click service includes one-click authentication, one-click payment, one-click pickup and other function points. After users purchase products online, they can generate an order code, and they can choose the form of online direct payment or offline simultaneous payment, and directly pick up the goods after one-click authentication.

(2) The viewing and reminding service is divided into two parts: real-time viewing and reminding. Users can intuitively see whether popular or favorite goods are available in real time, and check the location distribution of retail modules containing the goods that users want to buy; When the goods are out of stock, the user can check the replenishment reminder option, which is convenient for buying the favorite goods at the first time next time; It also provides arrival reminder service that can be turned on or not.

(3) The mobile community consists of scene service introduction and experience circle. Scene service includes online virtual experience of five scenes, such as mobile study room, mobile Internet cafe, mobile movie bar, mobile lounge and mobile office. Users can know the structure and usage of space in advance, guide the experience, mobilize users' interest and promote multiple offline experiences. Based on the online and offline scene service experience, users can also establish their own experience circle, find like-minded "virtual playmates" and conduct virtual socialization.

(4) My part includes user information, user mode, my message, my order, payment method, coupon package and settings. Users can quickly find orders and understand the online and offline order status; Switching the user mode is convenient for guiding special people to carry out operation assistance.

According to the future concept, the main color of the page is blue, and the flat illustration style is integrated into the interface design to enhance the intimacy with users. The guide page uses key phrases such as "Guess what you like", "Discover your mobile circle" and "Explore your shopping planet" to catch the user's eye and guide the login exploration. "Retail Homepage" and "My" slide left and right to switch pages. The homepage is mainly arranged with functional services, and it is in the form of sliding interaction. Put "My Mobile Community" in the main visual area of the page, guide users to explore, and form a personal virtual social space to enhance the fun and user stickiness of the applet. The quick purchase, frequent purchase selection, personalized service and reservation service are set in the quick service block,

arranged in the center of the page, and presented by concise visual language, which is convenient for users to choose more intuitively. "Real-time view" clearly defines the types, inventory and evaluation details of real-time fresh food products through the interactive mode of drop-down.

The optimization of interface design innovates the user's purchasing process and improves the user experience in combination with the user's needs. Users can set the order after purchasing, so as to jump to the pre-operation interface to make time reservation and operation settings. After completing the order operation, they can view the change of the order status in real time until the whole service process is completed.

## 5. Conclusion

At present, with the change of consumer market demand, the market dominance has changed from seller's market to buyer's market. The role of retailers in the whole supply chain is increasingly prominent. Retailers play a leading role in the whole supply chain. With the economic growth of China, China plays an increasingly important role in the whole world market. In the era of "new retail", the intelligent supply chain system is facing both opportunities and challenges. Under the new trend of comprehensive integration of online and offline commerce, e-commerce enterprises, retailers and the government will work hard to coordinate and cooperate, and it is expected to establish an intelligent supply chain system that can meet the personalized and timely needs of consumers to the greatest extent, and at the same time realize zero inventory, realize more efficient production and sales, and create greater value.

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