

# Research on the Fourth Party Cold Chain Logistics Information Platform Construction

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## Abstract

**With the development of cold chain logistics, it is very important to integrate cold chain resources and develop cooperative mode. This paper analyzes the status quo of cold chain logistics, and on the basis of the development of the fourth party cold chain logistics, designs the information platform of the fourth party cold chain logistics. It analyzes the operation mode and integration mode of the information platform, as well as the main functional modules and architecture. It is hoped to provide reference for the development of cold chain logistics by exploring the information platform of the fourth party cold chain logistics.**

## Keywords

**cold chain logistics, fourth party logistics, information platform.**

## 1. Introduction

In recent years, with the rapid social and economic development and the development of the Internet, people's living standards have been greatly improved, resulting in the annual increase in the output and circulation of fresh agricultural products in China, promoting the rapid development of cold chain logistics. Now consumers on the quality of good, variety of fresh agricultural products demand is more and more high, not only requires the product fresh, quality assurance, but also requires timely and accurate delivery to the hands of customers. This puts forward higher requirements for cold chain logistics, also provides a recent opportunity for its development. Although the development speed of cold chain logistics of agricultural products in China is relatively fast, a large-scale and systematic cold chain logistics system has not been formed due to the complexity, difficulty in operation and high cost of the cold chain of agricultural products, which is far from meeting the needs of China's economic development [1]. So also need to actively explore the cold chain logistics.

Although at present, many enterprises make use of the professional Logistics operation system and distribution facilities of the Third Party Logistics (3PL) to realize cold-chain Logistics business. However, in the process of cold chain logistics, there will still be "broken chain" phenomenon, resulting in a large number of losses. The quality of products is difficult to be guaranteed, resulting in a series of problems such as the decline of consumer satisfaction. Four Party Logistics (4PL) can well make up for the shortage of third-party Logistics, effectively integrate the resources of all parties, share the cold chain Logistics information by using the information platform of the fourth Party Logistics, which ensure the whole process of the cold chain is controllable. In 2010, the development plan for cold chain logistics of agricultural products released by the national development and reform commission proposed to take "promoting the informatization of cold chain logistics" as the main task for the development of cold chain logistics [2]. In April 2017, the warehousing and distribution association, China animal husbandry association with the cold chain operations, a group jointly issued the "cold chain operation management standard", and issued by the national

standardization of cold chain operation evaluation method ", and launched the "national cold chain operation of public management platform", in order to promote the further development of cold chain logistics provides a new platform and conditions [3]. In the new situation of "Internet +" and Internet of things, the rapid development of the fourth party cold chain logistics is of great practical significance to its research.

A number of scholars have studied cold chain logistics. In foreign countries, some scholars have discussed the storage problem of perishable goods in cold chain logistics and the optimization problem of cold chain performance [4-5]. In China, scholars study the standardization of cold chain logistics [6]. People have also studied the development of China's cold-chain logistics industry [7]. Starting from the functional requirements of government regulatory authorities, cold-chain related enterprises and consumers, Wang[8] and other scholars constructed a cold-chain logistics system framework for fresh agricultural products, including multiple Internet of things systems and information platforms. It can be seen that some progress has been made in the field of cold chain logistics in China, but there are few researches on the fourth party cold chain logistics. Quan[9] analyzed the connotation of the fourth party cold chain logistics, summarized the three development modes of coordinated operation of the axial and radial cold chain network, seamless connection of the whole cold chain and integrated alliance service, finally summarized five effective ways to develop the fourth party cold chain logistics. Yao[10] introduced the fourth party logistics into the cold chain of agricultural products, integrated the node objects in the cold chain logistics of agricultural products, and gave full play to its advantages of integrated management, so as to improve its development level by optimizing the development mode of cold chain logistics of agricultural products, finally achieved the goal of guaranteeing the quality and safety of agricultural products. Therefore, it is necessary to further explore the information platform of the fourth party cold chain logistics.

At present, many scholars mainly focus on supplier evaluation, path optimization, job integration and contract design [11]. As for the research on the fourth party logistics platform, liu [12] proposed the architecture of the fourth party logistics service platform based on SOA and the logistics resource integration framework. Wang[13] designed and implemented a fourth party logistics tracking and emergency system based on WebGIS. Yang[14] conducted in-depth analysis and research on the function and architecture of the fourth party logistics information platform. Based on transaction cost theory, Bourlakis[15] studied the establishment of the fourth party logistics network of British food retail chain. Scholars' researches on the fourth party logistics information platform are still in the stage of theoretical research and technical analysis, and it is rare to combine the fourth party logistics information platform with specific logistics formats. This paper combines the fourth party logistics with the current cold chain industry to think about the information platform of the fourth party cold chain logistics.

## **2. The Fourth Party Cold Chain Logistics Information Platform**

The function of the fourth party cold chain logistics information platform is mainly reflected in the following aspects: first, the integration of cold chain resources. Fourth party logistics will be a big supplier cold chain related resources such as cold chain resources, refrigeration freezer, third party logistics enterprise, consulting services and so on. Arrange the vehicle, distribution center, hardware and software facilities, IT technology and other resources to form a comprehensive control platform integrating scheduling, warehousing, transportation and distribution. Second, integrate information resources. The fourth party logistics service providers make use of modern information technology, network technology and advanced all-temperature layer distribution solutions to realize the integration and sharing of information,

creating a new and efficient model for the development of the cold chain market. The third is to realize the cold chain comprehensive tracking and tracing. The most important guarantee of cold chain logistics is the temperature control of the whole process. By introducing the fourth party logistics into the cold chain, the whole process of cold chain can be seamlessly connected, and the whole process of electronic monitoring can be checked.

### **2.1. Fourth Party Cold Chain Logistics Integration**

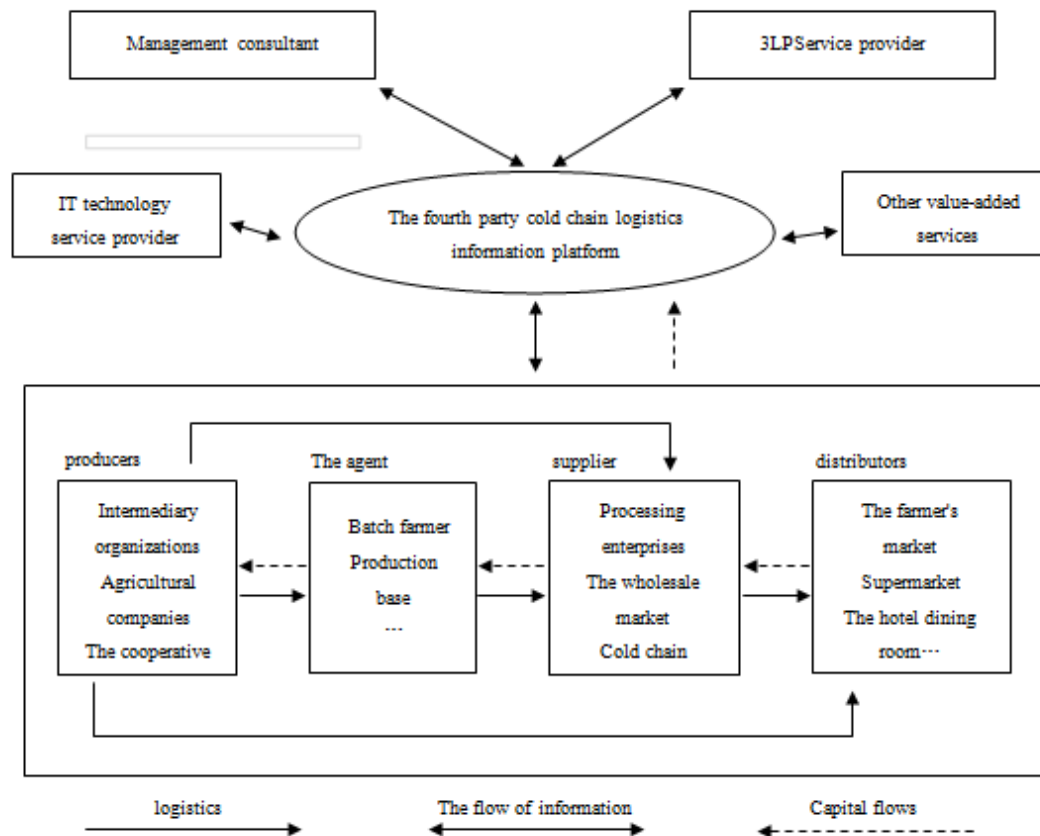
A fourth party logistics provider is a supply chain integrator that integrates and manages the resources, capabilities and technologies owned by the enterprise and complementary service providers to provide a complete set of supply chain solutions. Cold chain logistics is mainly applied in the agricultural products industry, which refers to the whole supply chain process from the production, processing, transportation, storage and sales of agricultural products to the final delivery to consumers. This process involves various aspects and has certain requirements on cold chain technology. Fourth party cold-chain logistics can not only meet the needs of cold chain logistics, or the third party logistics management and technology on the basis of integrating resources, and can solve the logistics information sharing and better utilization of resources of all parties in society, for the supply and demand both sides with the third party cold chain to provide a more comprehensive cold-chain logistics solutions.

### **2.2. The Operation Mode of the Fourth Party Cold Chain Logistics Information Platform**

According to research and practice, the fourth party logistics has three operation modes, namely coordinated operation mode, integrated operation mode and innovative operation mode [16]. In terms of the number, capacity and layout of cold chain warehouses in China, they can fully meet the overall demand at the present stage, or even have been excessive. Refrigerated vehicles and informational monitoring equipment are not in short supply [10], but problems related to cold chain logistics still occur frequently. In the whole process of cold chain logistics of agricultural products, there is great competition, little communication, low sense of cooperation and loose cooperative relationship between the upstream and downstream of the supply chain. Therefore, the cooperation of supply chain is quite limited and cannot be integrated well. According to the characteristics of cold chain logistics, this paper studies the information platform of the fourth party cold chain logistics from the operation mode of the solution integrator, as shown in figure 1.

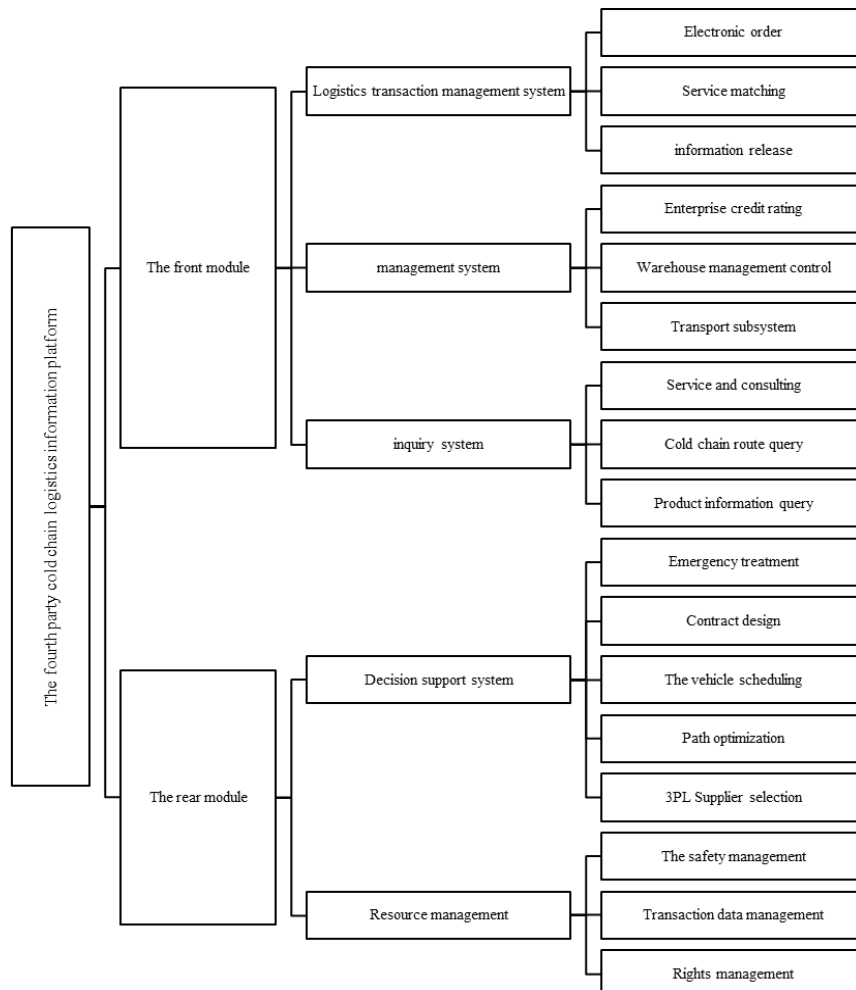
### **2.3. The Function Module of the Fourth Party Cold Chain Logistics Information Platform**

The fourth party cold chain logistics information platform consists of two modules: front module and back module; Five functional systems: trading system, cold chain logistics management system, information query system, support system and resource management system, as shown in figure 2.



**Fig. 1** operation mode of the fourth party cold chain logistics information platform

Considering the final consumers of agricultural products are scattered customers, we only consider the process of distributors in the operation mode of the fourth party cold chain logistics information platform. In this model, producers, agents, suppliers and distributors publish service demands on the information platform according to their own demand forecasts. Suppliers will also provide information on infrastructure such as refrigerated warehouses and distribution centers, as well as logistics business such as product processing, refrigeration, transportation and distribution. Third-party logistics providers can be responsible for transportation, distribution and other full-time logistics services. IT technology service providers can provide basic communication and system maintenance services of the platform, as well as information technology and related equipment in the process of cold-chain logistics. Management consultants and other value-added services at the same time, the fourth party cold-chain logistics will integrate the information flow, logistics, capital, information transmission channel, through the whole process of cold chain, the chain of visualization of transparency, and the whole process of cold chain operation makes integration service optimization, improve the operation efficiency of the whole supply chain, reduce the cold chain logistics cost.



**Fig. 2** function module diagram of the fourth party cold chain logistics information platform

The module of logistics trading system mainly includes four functions: information release, service provider matching, generation of electronic order, and support of payment and settlement. Distributor, mainly through the platform release information demand, information platform based on demand and producers, suppliers and service providers have to sift the information provided by the communication, make the whole supply chain of connection, and then generate the corresponding electronic order and pay a certain amount, the final settlement is also carried out through the platform.

Cold chain logistics management system is the most important part of information platform services. Through the integration and management of cold chain resources and industry information of the fourth party cold chain logistics information platform, basic services and value-added services of cold chain logistics are provided to meet various service needs of customers. In this module, it is divided into three subsystems, namely transportation subsystem, warehouse management control system and enterprise reputation evaluation system. Considering the particularity of cold chain logistics, the agricultural products in the course of carriage, need to be refrigerated transport, in order to avoid the "broken" phenomenon, can be real-time monitoring, condition monitoring of the product, and to have a visual display, through the server for data collection, such as can appear abnormal alarm to remind; The collected data can be analyzed and predicted, and the real-time information of products can be processed from various perspectives. Cold chain logistics is in the storage link, or in the transfer, circulation processing links need to be controlled and managed to ensure that the temperature of the product is appropriate. Finally, the enterprise reputation

evaluation, including service complaints and service evaluation, which is an important reference index for enterprise evaluation.

Logistics information query system is an integral part of the information platform, customers can through the system in a timely manner the product information query, easily dynamic and order status, or lack of goods and service providers can query to the cold chain logistics route, route selection, and accept the latest service demand, timely understanding of the objective requirements, improve the quality of service.

Decision support system is also an important module in information service platform. Function of this system is mainly based information processing, such as regional information, business scope and operation time, storage center, cold storage, transportation and operation strategies on the basis of information and decision support model [1], according to the customer's logistics demand and the existing problems on 3PL supplier selection, path optimization, cold chain of frozen management strategy, transportation vehicle scheduling and planning, contract design, and the emergency response, etc. So as to improve the efficiency of the platform, the efficiency of cold chain logistics, reduce the cost of cold chain logistics.

Resource management system includes user management, authority management, transaction data management and security management. This module is the core part of the platform and the background database of the platform, where users' information, various resource information and transaction data are stored and collected. Only by integrating these resource information can the fourth party cold chain logistics information platform run normally, which is the basic condition of the whole cold chain logistics operation.

#### **2.4. Architecture of the Fourth Party Cold Chain Logistics Information Platform**

The fourth party cold chain logistics information platform consists of four basic systems: cold chain logistics system, decision support system, transaction and evaluation system, and payment system. The four systems serve the platform with electronic order as the core, forming a good cooperation model.

The cold chain logistics system provides basic logistics functions in the product circulation process, including cold chain tracking and product traceability throughout the supply chain. Considering the characteristics of cold chain logistics, from the perspective of the whole cold chain, it is an important purpose of the fourth party cold chain logistics platform to ensure that there is no "broken chain" phenomenon in the whole supply chain, to realize the tracking and monitoring of the whole process, and to ensure product quality and safety. Nowadays, information technology develops rapidly, and advanced technologies such as radio frequency identification, GPS, wireless sensor network and temperature control management system have been widely applied in the field of cold chain logistics monitoring practice. Fourth party logistics service providers to meet the demand of customer service and other parties to the demand of the logistics business at the same time, improve the efficiency of cold chain logistics, service quality and effectively reduce cold chain cost, it is necessary to use of decision support system, based on the available information and resources, use of intelligent algorithm, generate the most optimal logistics solutions [1]. DSS provides 3PL supplier selection, cold storage matching, vehicle deployment, path optimization, contract design and other services. The trading and evaluation system supports sales business, customer experience evaluation, system rating, etc.; The payment system provides transactions, payment for goods, supply chain finance and other services [17]. These four systems cooperate with each other and influence each other to serve the whole information platform.

The transaction is combined with the evaluation system and the payment system. In the process of transaction-payment-evaluation, transaction is the premise, payment is the guarantee and evaluation is the key [17]. User evaluation and system evaluation will



determine the service provider of enterprise credit rating, will directly affect the customer to choose, the enterprise business performance, if the credit level is too low, it is likely that they will be out of the platform, these also prompted service providers have to pay attention to customer feedback, to provide customers with quality service, with new information in a timely manner, make the whole cold chain logistics operation efficiency, also can promote the development of the platform. In addition, the payment system will provide supply chain finance services, which can be carried out on the basis of credit evaluation, so that the platform can carry out other business development, such as the introduction of insurance institutions, to promote the transaction.

The combination of cold chain logistics system and decision support system makes the whole cold chain logistics activities operate more effectively with the support of decision support system. In the process of credit rating, the service quality of cold chain logistics is an important factor, so it is necessary to combine the cold chain logistics system. When making support decisions, information related to cold chain resources is not only needed, but also credit evaluation information of customers, service providers and relevant information in the payment system should be considered to make more accurate decisions. On the basis of the information platform, four architecture cooperation each other, influence each other, such a system prompted cold-chain logistics work together throughout the supply chain, in the process of making the business flow, information flow, logistics, capital, safe, smooth, free and orderly flow, at the same time the "chain" of nodes in the enterprises and resources, technology, knowledge, management, and other elements in the benign interaction and distribution information platform.

### 3. Summary

On the basis of the development status of cold chain logistics, this paper puts forward combining the fourth party logistics and cold chain logistics. To solve the problems of "broken chain", low circulation rate and high cost in cold chain logistics. Based on the analysis of the operation mode of the fourth party cold chain logistics, the information platform of the fourth party cold chain logistics is constructed, the main functions of the platform are analyzed, and the architecture of the platform is designed. However, it is only a general explanation, not involved in the specific architecture how to establish the problem. With the development of Internet information technology, the functions of information platform will be more perfect, resource sharing will be more convenient, and operation efficiency will be more efficient. It is believed that the fourth party cold chain logistics will also develop rapidly.

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