

## Research on Information Sharing Strategy between Levels of Food Industry Supply Chain Based on Toughness Enhancement

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**Abstract:** With the rapid development of information technology, the world has entered the era of information economy. The core idea of supply chain management is embodied in centralized information processing based on information sharing, so that enterprises in the supply chain can directly obtain the demand information of end users and minimize the uncertainty. Consumers' awareness of the demand for safe food and food safety risks has also been improved in a series of food safety incidents. In the information society, information has become an important resource related to the survival and development of enterprises. Under the environment of supply chain management, whether information is sufficient and whether enterprises can share information with each other is very important to the production, control and circulation of enterprises. This paper analyzes the problem of information sharing among different levels in food industry supply chain management, and discusses the level of differentiated information sharing and the implementation mechanism of information sharing. Finally, the solution of information sharing in food industry supply chain is put forward from the perspective of toughness enhancement.

### 1. Introduction

The food industry has always played an important role in the world economy, but China's food industry is facing the survival challenges under the new operating conditions under the huge development space, and the main competition challenges come from the vertical integration and low-cost competition of the industry [1]. China's food safety incidents continue to break out, causing consumer concerns and concerns about food safety [2]. Food insecurity factors run through the production, processing, packaging, circulation, consumption and other links. At present, the main causes of food safety incidents in China include the abuse of food additives, excessive harmful chemical substances, excessive microorganisms and adulteration [3]. Consumers' awareness of the demand for safe food and food safety risks has been improved in a series of food safety incidents. Consumers are eager to pursue traceable foods with higher quality and higher truth of traceable information. At the same time, endless food safety incidents also put forward higher requirements for the food market. Faced with so many business challenges and problems, the only way out for China's food industry is to introduce supply chain management strategy, implement supply chain collaborative management, and realize the overall benefits of product supply chain [4]. In the information society, information has become an important resource related to the survival and development of enterprises. Under the environment of supply chain management, whether information is sufficient and whether enterprises can share information with each other is very important to the production, control and circulation of enterprises.

Enterprise informatization is to digitize the material movement, production process, cash flow, customer interaction and other business processes of an enterprise, generate new information resources through various information system network processing, and provide people at all levels with insight and observation of all kinds of dynamic business information, so as to make decisions conducive to the optimization of production factor combination [5]. With the popularization of computer and Internet in the world, the deepening development of information revolution in various

fields, the application of information technology is more and more widely. In the era of information and knowledge, the realization of food industry supply chain management must rely on information technology and information management means, through efficient management system and information sharing platform [6]. How to eliminate the information asymmetry at all levels of the food supply chain and effectively solve the problem of food safety is a major issue facing the society. However, some enterprises are not willing to cooperate with the sharing of food traceability information, because the transmission of traceability information requires a certain information cost, and enterprises usually choose to conceal part of the information from their own interests, which leads to the difficulty of effective information transmission between enterprises [7]. This paper analyzes the problem of information sharing among the middle levels of food industry supply chain management, and discusses the level of differentiated information sharing and the implementation mechanism of information sharing. Finally, the solution of information sharing in food industry supply chain is proposed from the perspective of resilience enhancement.

## 2. Analysis on the Behavior Characteristics of Food Supply Chain Coordination Decision

### 2.1 Connotation and Characteristics of Food Supply Chain

With the new trend of domestic economic development and the constant change of residents' consumption habits, the domestic food industry is facing new situations and new problems under the large-scale development. Food supply chain is a network system of food production, supply and consumption, which is connected by agriculture, food processing industry, wholesale and retail trade, logistics and other related enterprises through logistics, information flow, technology flow, standardization flow, quality flow and value-added flow. The relationship between logistics capability and supply chain performance is shown in Figure 1.

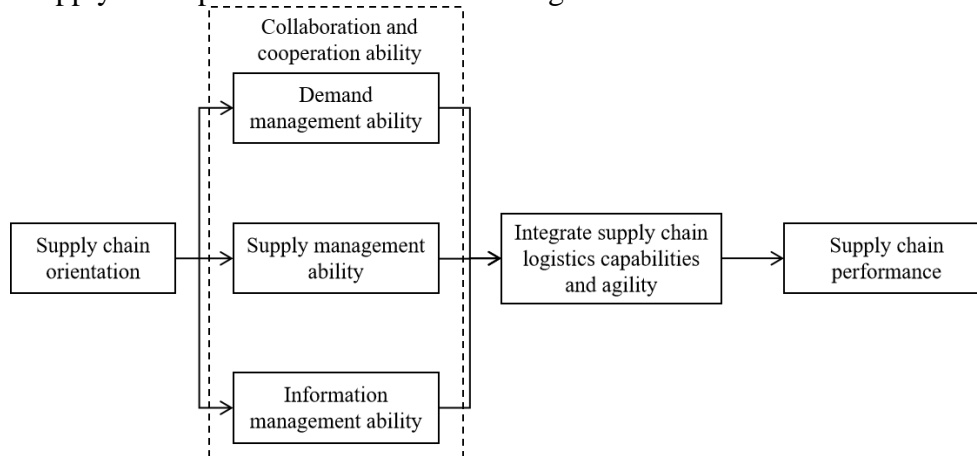


Fig.1 The Relationship between Logistics Capabilities and Supply Chain Performance

In line with the overall supply chain management development level of catering enterprises, the supply chain management function and facilities construction of food industry are in a relatively leading position, higher than the overall level of catering enterprises. As the production and management object of food supply chain, food has the following characteristics: it is perishable and vulnerable. Seasonal and instability caused by natural growth cycle of agricultural products. It has wide geographical distribution and scattered production. The unit product has low value and large volume. The shape, specification and quality of products are uneven. The quality of raw materials has a great influence on the quality of final products. Consumers are very concerned about products and production methods. At present, most of the information systems in the food industry are basically separated, and only aim at some aspects or functions for informatization [8]. The lack of a holistic and systematic thinking in the food industry leads to the fragmentation of various systems in the food industry and the failure to form a complete supply chain management system, which leads to the failure of the food industry to achieve the best efficiency. The consequences and adverse effects of food problems often can not be eliminated in a short time, or even make the

supply chain collapse, which requires the enterprises in the chain to carry out strict quality control from the selection of raw materials, transportation to production, sales and other links, and to refrigerate and transport the perishable primary agricultural products, semi-finished products and finished products.

## **2.2 Adaptability Analysis of Food Supply Chain Coordination Decision Behavior**

The store marketing of food and beverage industry is mainly to carry out marketing activities according to the specific conditions of each store, and at the same time, accurately transmit customer needs to the headquarters marketing system. Marketing of food industry headquarters is responsible for the whole marketing system, which is also in the overall marketing control. It can inspect the marketing situation of stores and be responsible for the whole food industry. In the operation process of food supply chain system, there are two main problems caused by the inconsistency of decision-making among various subjects: one is the huge storage cost caused by meeting customer demand in time, that is, the bullwhip effect of food supply chain system. Second, in the process of coordination and decision-making, the food safety problems caused by the non-sharing of food safety information. Enterprises in the food supply chain often choose to hide part of the information and not share all the information of the food for sale for self-interest, which will lead to lower traceability of food quality information in the food supply chain and affect the construction of food traceability system [9]. At this time, an appropriate information coordination mechanism is needed, which can promote information communication among enterprises and share traceability information among enterprises, so that traceability information about food quality among enterprises can be fully transmitted, and finally realize the construction of food traceability system. The timely and effective supply of food in food supply chain is to meet the market demand, at the same time, weaken the bullwhip effect as much as possible, and realize the coordination and balance between the cost and timely response of food supply chain system. In the food and beverage industry, in order to reduce decision-making costs and enterprise risks, it is inevitable to establish relevant decision-making systems, and adopt scientific decision-making methods and means to analyze multiple alternative implementation schemes and determine the optimal decision-making scheme.

## **2.3 Mechanism and Principle of Information Sharing**

With the development of information technology, electronic information technology has become the main way of information sharing among enterprises in food supply chain nodes. Information covers a wide range, including basic information such as food quality information and price, as well as production capacity of food suppliers, manufacturing capacity of processors, sales information of sellers and forecast information of market demand. Each enterprise will intentionally hide its own information such as cost, output, purchase price, etc., in order to maintain its information superiority. Excessive information sharing may reveal business secrets of enterprises, which may cause huge losses to enterprises. Although information sharing can solve many problems in the operation of the supply chain, improve the overall performance of the supply chain, and achieve a win-win situation for upstream and downstream enterprises, this concept of information sharing has encountered many obstacles. It takes a certain amount of manpower, time and money to collect, transmit and process information, and it takes a lot of investment to build a network platform. In addition, information sharing through information technology requires constant training for employees, which also increases the cost of human resources in enterprises. The framework of information construction mode of food industry supply chain is shown in Figure 2.

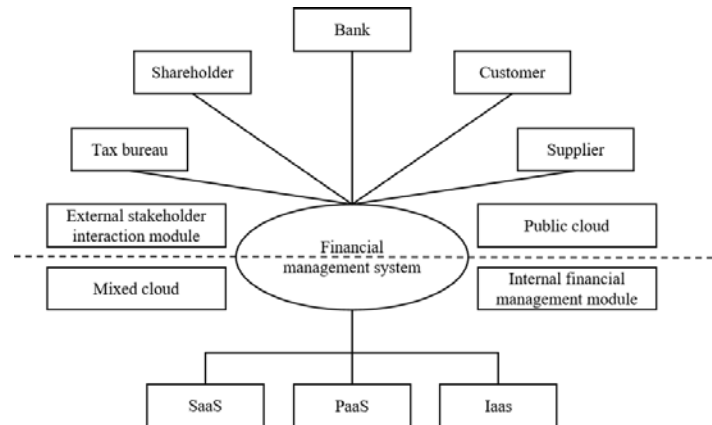


Fig.2 The Information Construction Model of the Food Industry Supply Chain

Information mainly comes from downstream enterprises, while the increase of profits is mainly reflected in upstream enterprises. The value of information sharing is mainly aimed at the overall interests of the supply chain. If the increase of the overall profit can not be reasonably distributed to the member enterprises, it will inevitably cause some enterprises to resist, and may even destroy the cooperative relationship of supply chain enterprises. Due to the implementation of supply chain collaborative management, each performance index has been significantly improved, but there is still a certain gap with the ideal value, which is the same as the usual application process of management software. The implementation process of the whole system needs some guidance and monitoring, so that the application effect gradually increases steadily. When information sharing is implemented, an information management system must be established within the enterprise to collect information within the enterprise, which will inevitably lead to the adjustment of the enterprise organization. Part of the tables and calculations originally prepared by hand are replaced by computers, and the corresponding staff will be cut. The renewal of organizational structure will impact the management of enterprises and affect the stability of business operations.

### 3. Construction of Food Supply Chain Information Coordination Model

#### 3.1 Model Building Principle

The development of information sharing inevitably requires the participation of information sharing participants, including the publishing body and sharing body of shared information. In the whole process of food industry supply chain management, the corresponding information is involved, so every node enterprise and individual in the supply chain is the participant of information sharing. When a system is in a stable state, affected by external factors, the whole system can still be in the original stable state through internal coordination of the system. For a stable food supply chain, each node enterprise in the supply chain can share the traceability information of food quality and coordinate and cooperate to maximize the overall benefits of the supply chain. Participants of information sharing not only publish their own information, but also share the information published by other enterprises in the supply chain, so they are both the main body of information publishing and the main body of information sharing.

Due to factors such as enterprise credit, business frequency, close relationship and length of business cooperation, the enterprises in the food and beverage supply chain have different cooperative relationships. This difference in cooperation leads to the different sharing degree of information sharing subjects on catering materials, which involves the setting of sharing authority. For products, it is necessary to locate the mode of products. The product mode positioning is shown in Figure 3.

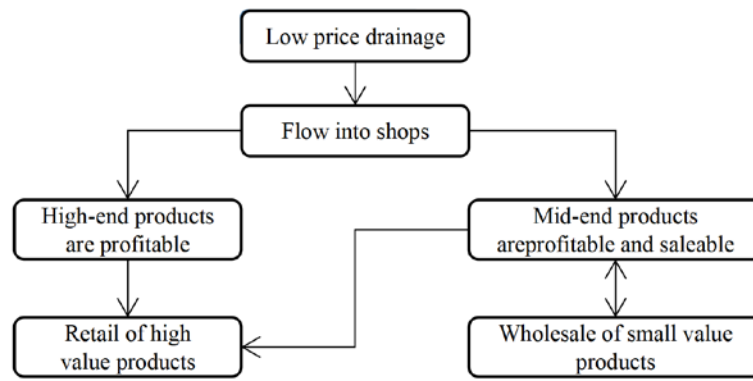


Fig.3 Positioning Diagram of Product Model

Supply chain managers like to make the chain rigid. The quantity and quantity of supply and delivery are fixed, the frequency and time are fixed, and the delivery place and transportation mode are also fixed. However, in the event of disaster, the rigid supply chain is very fragile, and it is easy to break, resulting in production suspension and delayed delivery. Resilience is that the batch, quantity, frequency and time of the supply chain have changed when the disaster occurs, but it can still maintain the connection of the chain, and the channels of supply and delivery are still smooth, but the form has changed under the external force of the disaster. By controlling and managing the information flowing among the members in the supply chain, we can realize the effective transmission of information flow, and reduce the situation of each other because of lack of information communication, thus reducing the conflicts between each other and the internal friction of the system. At this time, the system is more stable and consistent because of the coordination and cooperation of all members, and the integrity of the system can be more prominent, making it easier to play the overall functionality.

### 3.2 Model Operation Mechanism

The sharing of food quality information in food supply chain is related to national food safety. Traceability of food information in supply chain eliminates the serious asymmetry of food quality information between enterprises and consumers to a certain extent, reduces the frequency of food insecurity incidents, and increases consumers' trust in food supply chain and promotes the toughness of food supply chain.

All members of the food supply chain, that is, the coordinating bodies, have shared information. However, due to the lack of coordination among the coordinating bodies in the system, the interests of some system members are damaged, and the food supply chain system is still in an unbalanced state. At this time, the main body of the supply chain is directly coordinated through the coordination mechanism to balance its overall supply chain system. The information coordination model of food supply chain is shown in Figure 4.

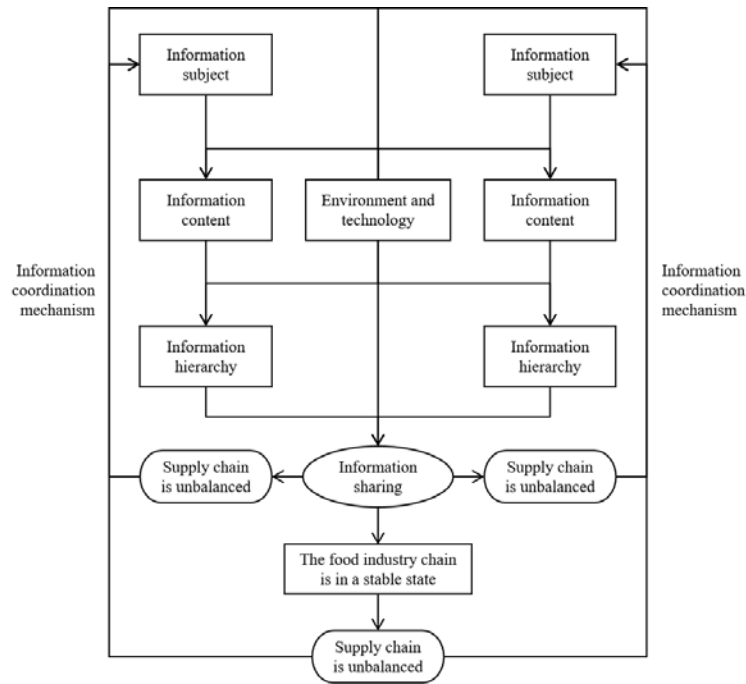


Fig.4 Information Coordination Model of Food Supply Chain

In order to realize the resilience of supply chain, it is necessary to grasp the flexibility of supply chain operation when disaster breaks out. When the equilibrium state of any system is destroyed, the system itself will re-establish a new equilibrium state. The system is already in a balanced state through information sharing. When it is in an unstable state due to external stimulation, it can be adjusted by coordination mechanism to make it in a balanced state again. To realize the toughness of the supply chain, we must insist on maintaining the relationship with the supply chain partners [10]. Many enterprise supply chains attach importance to the relationship with customers, despise the relationship with production workshops, and neglect the relationship with suppliers and service providers. However, suppliers and service providers are often in the upstream of the supply chain. When a disaster occurs, whether they can do their best to support the enterprise supply chain is very important.

#### 4. Conclusions

In the future, the competition of enterprises is no longer the competition between products, but the competition between supply chains. With the rapid development of information technology and social productivity, the catering industry is facing increasingly fierce market competition. It has become an inevitable trend of supply chain management of catering industry to realize informationization by using information technology. Supply chain collaborative management is an important direction of enterprise management at present, and it is also the most potential development field of enterprise management. By strengthening supply chain management, sharing resources, reducing procurement and logistics costs and implementing agile production, the competitiveness of enterprises can be improved. The mode of supply chain management plays an important role in integrating the internal structure and utilizing external resources of food industry. It is an effective way for food industry to gain a dominant position in the fierce market competition by vigorously promoting the supply chain management of food industry and continuously optimizing and perfecting it with advanced technology. The universality and complexity of principal-agent relationship in supply chain must be considered to realize the information sharing among members of supply chain. Therefore, a mechanism must be designed to ensure the realization of information sharing. The public health disaster caused by Covid-19 will soon be brought under control and everything will return to normal. For the enterprise supply chain managers, they should see the lack of their own supply chain management from this unexpected

disaster, learn lessons and strengthen the supply chain resilience.

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