Research on Social Co-governance Innovation Model of Food Safety--Based on CAS theory

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Abstract: In the information asymmetry environment, food safety is a major focus of social livelihood, because consumers can not get the information of food production and circulation. Based on the CAS theory, this paper establishes a government-enterprise co-creation model of food safety, which takes the government and the food safety behavior of food enterprises as the main body, and it is found that the pertinence of government policies and the exemplary role of leading enterprises are the core of co-creation of food safety.

1. Introduction

At present, due to the frequent occurrence of food safety accidents, consumers' confidence in food safety is constantly declining, which has a negative impact on the economy of the food industry and has a negative impact on the national and international economy in general. Therefore, food safety not only depends on the macro-control of the government but also on the micro-autonomy of food enterprises.

In the increasingly fierce competition in the current market environment, the development of the enterprise should not be limited to their own resources, historical achievements and enterprise qualifications. The more materials, information and energy with other enterprises or organizations are also important, which can improve the adaptability to environment and strain capacity. The development of complexity science, especially the theory of complex adaptive systems, meets this phenomenon. The basic idea of CAS theory is that the micro-subject adapts to the changes in the environment through continuous learning and accumulation of experience, which leads to the evolution of the macro-system complexity, so as to study how the change of local details highlights the overall behavior evolution.

The enterprises and the government of food industry chain are the main responsible persons for collaborative innovation and co-governance of food safety. The food safety policies and regulations issued by the government are the leading documents to regulate the food market and guide consumers, while the constraints and compliance with the macro policies of food enterprises are independent to maintain the food safety market, and the two supplement each other to form the leadership group of food safety collaborative innovation co-governance. As we all know, food enterprises have different departments and levels, such as purchasing department, sales department, production department and finance department, and each department is divided into different operation teams and individuals. Due to the influence of external environment, such as the replacement of market environment or the promulgation of new policies by the government, enterprises will adjust their strategies in time to adapt to the changes, and ultimately allows the whole system to evolve. This complex adaptive process has a good fit with CAS theory.
2. Literature review

The food system is under increasing pressure from a variety of factors, such as dynamic environmental, political and socio-economic. Addressing the complexity of this interaction requires a new form of "adaptive governance". Regarding the collaborative innovation and co-governance of food safety between food enterprises and the government, Ren yan believes that the government is the macro guide and supervisor of the food safety control and management of enterprises, and the enterprises are the micro subject and direct executor of the food safety management of the government[1]. Through semi-structured interviews, Sirinya believes that the effective implementation of government policies depended on the compatibility of policies with the enterprise background, the support of government officials, the sound financial management mechanism of enterprises, the inter-organizational network and the consistency of the motivation of implementing policies[2]. Laura M. Pereira et al. argue that the food system is becoming more complex and that government strategies should increasingly adapt to this change, and that complex issues such as sustainability and food security should be addressed through cross-sectoral partnerships[3]. Julia et al. identified four different types of interactions between the government and farmers of agricultural products, which are inclusion, selection, competition and cooperation, and it can strengthen the cooperation between the government and farmers[4]. Zhang yongan et al. construct the echo model of regional enterprises response policy innovation and found that enterprise response policy innovation is reflected in capital preference, resource preference, cost and benefit preference[5]. But in many countries, strong government enforcement of healthy food and nutrition policies is relatively lagging, largely because the food industry is resisting on its behalf[6].

The obstacles to policy implementation may be due to the lack of knowledge and skills of the organization, the imperfect governance system, the lack of funds and resources, the influence of the food market environment, and the incompatibility of organizational culture and structure with the government[2]. According to the literature review, there is still a long way to go to study the co-governance of food safety by using CAS theory in the collaborative innovation between the government and food enterprises. Therefore, this paper starts from this point to analyze the government-enterprise joint governance of food safety.

3. The design model

Food safety is the result of a complex interplay of fields. Through correlation analysis, the government is mainly responsible for food safety (43%), followed by manufacturers (27%) and farmers (26%), and only 3% of the respondents think that supermarkets are mainly responsible for food safety.

3.1 Mechanism analysis of government - enterprise cooperation

Based on the above literature analysis and the current situation of food safety governance, the macro process of collaborative management of food safety between food enterprises and government based on CAS theory is constructed (figure 1).
On the basis of literature review, whether enterprises can make good use of the resources and policies provided by the government will have a certain impact on the cost, the income, the purchasing trend of consumers and the production cycle of food raw materials. The best way for enterprises is to combine the government's food safety policy with the actual situation of enterprises, and establish a response mechanism that responds to the policy to the greatest extent. At the same time, in order to maximize the benefits for the enterprises, the government should adjust the policy according to the situation of enterprises.

If the financial resources provided by the government cannot effectively meet the needs of enterprises, enterprises will not respond to policies, and there may be opportunistic behavior. If enterprises judge that the funds provided by the government can only cover the cost of expenditure or only obtain a small income, then they tend to passively implement food safety behaviors. In this case, other enterprises in the food industry chain cannot obtain valuable information flow, and similar enterprises cannot gather together. If the government policy can meet the demand of enterprise's income, this is advantageous to the enterprise to pursue its own interests, and enterprises will not only get corresponding subsidies for the production and circulation of this kind of food, but also take the initiative to gradually evolve into a part of implementing food safety behaviors. Thus, the collaborative innovation mode of food safety regulation under the guidance of government policies is formed.

3.2 Food industry chain enterprises cooperate to innovate food safety

At present, the phenomenon of independent development of companies is no longer suitable for social development, and the cooperation with heterogeneous enterprises has become a trend. Professor Holland proposed system evolution and the main interaction of 7 basis points, containing all the CAS for general mechanism of three and four characteristics, such as identification, internal model, building blocks, gathered, nonlinear, flow, diversity, which embody the characteristics and mechanisms of all complex adaptive systems. Based on the above analysis, this paper constructs the conceptual model of collaborative innovation of food safety among enterprises in the food industry chain (figure 2).

Each subject in the food supply chain has different characteristics, functions and roles, and these subjects aggregate to form complex large-scale behaviors. For a certain food, raw materials need to flow from suppliers to manufacturers for processing and manufacturing, and from distributors to retailers until they are delivered to consumers. Enterprises in the chain gather into a whole through the correlation of products and serve the interests of the whole. The whole process involves three mechanisms, which are identification, internal model and building block.

Identification is to help subjects to identify and select each other in the process of collective formation, so as to realize information exchange. Different types of enterprises have different identification, such as “abcd” in the figure.

Internal model refers to the algorithm, rules and process that the subject adjusts its own behavior, and it has the function of predicting the future state. The food industry chain is closely related to the external environment. After being stimulated by the external environment, each subject will make different reactions and adjust its own structure to adapt to the change of environment.

The building block mechanism is a function of the elements that can be repeatedly arranged and combined, which has been proven to work well through natural selection and learning. Under the changes of market environment, such as consumer utility, policy change and enterprise restructuring,
enterprises will face various new problems. The solution to the new problems can be divided into familiar problems and then combined, and the solution can be obtained.

In the whole supply chain, the upstream and downstream enterprises are connected with each other through information technology, and the exchange of materials, energy and information between each subject and the environment is also ongoing. Under the effect of multiplier effect, the information that a manufacturer gains benefits under the guidance of policy will spread in the social network, so that other manufacturers will see the benefits and then follow the example of the manufacturer and cooperate with the government. The same is true for other types of enterprises, which eventually lead to various types of enterprises to implement food safety behaviors and innovate the food safety ecosystem.

4. Summary and Suggestions
The analysis of the relationship between food supply chain and government shows that the system is a complex one. Due to the depth and breadth of the system, the relationship between the subjects is complicated, and the complexity of the social system is further improved due to the existence of people. By using the CAS theory, we can analyze each part of the main body and its connection, and find the breakthrough of food safety behavior in food network enterprises.

First of all, government policy should be more targeted. Different policies and guidelines are applied to different types of enterprises. Secondly, the policy aimed at the enterprise scale of qualification must be strong. Government should work with the enterprise which should be larger, higher credit, leading role in the industry. This can lead other enterprises to actively implement the corresponding policies, so that the whole chain can cooperate and create a food safety circle. Finally, it is difficult and time-consuming for the government to set different incentives for different types of enterprises. Therefore, the government can adopt a series of favorable policies for relevant enterprises, but the product quality and consumer utility should be checked regularly, and the feedback information should be evaluated to determine whether to continue to implement relevant policies. As a result, the government and enterprises still have a long way to go to achieve collaborative innovation in food safety management.

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