

A Study on Governance Mechanism for Food Safety Risk Behavior of Food Enterprises in Beijing Based on the HFACS Model

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Abstract. Objective - To study the governance mechanism for food safety risk behavior of food enterprises in Beijing to effectively prevent and control the safety risks to consumers. **Methods** - The HFACS model was used to analyze the surveyed data of foodstuff enterprises. **Results** - A “one axis and four dimensions” management mechanism of food safety risk behaviors of food enterprises in Beijing was established. Taking these enterprises as the “axis” of the management mechanism, following environments were formed within the enterprises: a “responsibility identification and behavior self-discipline” spiritual environment, a “mechanism co-construction, self-inspection and mutual inspection” institutional environment, a “regular assessment and normal accountability” self-inspection environment, and an “integrity management and food security”. The safe humanistic environment is expected to give full play to the stable role of “government supervision as a leading role,” “Industry Association guidance as the hub,” “consumer supervision as the guide,” “media participation as the support” and “Four Party prevention and control” outside the enterprise to practice the food safety risk management in food industry. **Conclusion** - Food safety risk behavior is the direct cause of food safety risk. The prevention and control of food safety risk not only requires the creation of an environment to prevent slack behavior among the food enterprises but also needs the interactions between government, industry associations, the media and the consumers to jointly restrict the food safety risk behavior of the food industry as a whole.

Keywords. Food enterprise; food safety risk behavior; governance mechanism; HFACS model

1. Introduction

The modernization of the Chinese food safety governance system and capacity has promoted remarkably improved. The CPC Central Committee and The State Council have taken several major decisions on food safety governance. On December 1, 2019, China officially implemented the latest revised Regulations on the Food Safety Law, emphasizing the primary responsibility of food production and operation enterprises to “punish people the offenders” [1]. From Strategically foresight, the government’s food

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safety governance has changed from product-centered quality supervision to enterprise-centered behavior supervision. Establishing and improving the food safety governance mechanism of food enterprises has become a vital content concern to realize the proposition of a healthy China era. Food safety problems can cause serious consequences, including affecting people's citizens' health, and even threatening people's their life. Some illegal behaviors such as food processing equipment pollution, food sub-standard raw materials unqualified, and faulty food processing operation irregular caused by arising out of improper human behavior in the process of production will are the causes of serious food safety risks. These contents are reflected cited in the 2018 China Food Safety Development Report by Shijiu Yin et al. [2] (Shijiu Yin, Rui Li; 2018). Therefore, it is necessary to build a food safety risk management mechanism for food enterprises by solving the problem of food safety risk caused by arising due to human behavior factors errors. For the convenience of research, this paper named all the behaviors that lead to food safety risks, such as violating regulations violations, faulty operating procedures, and methods, in pursuit of maximizing their income in the production and operation of food enterprises as the food safety risk behaviors within the enterprise.

Of late, the joint efforts of all parties, the food safety situation in Beijing has achieved overall stability and sustainability in maintain food quality. Though, food safety has improved remarkably but frequent incidences still lessen consumers' confidence in food safety. Although, the new "Food Safety Law" Article 4 clarifies the food manufacturers and operators in their production and marketing of food safety [3], it does not specify the lack of governance for food safety risk behaviors of food enterprises in safety management [4]. Therefore, it is necessary to evolve appropriate management mechanism to maximize food safety by strengthening the risk management.

1.1 Analysis of food safety risk behaviors of food enterprises in Beijing

1.1.1 The Model Construction

Human Factors Analysis and Classification System (HFACS model) was built by Shappell et al. based on the famous "Swiss cheese theory". The HFACS model divides the causes of accidents into four levels: organizational influence, unsafe supervision, unsafe behavior premise, and unsafe behavior which emanate from the manufacturing to marketing. However, if one of these levels is prevented, the accident will not occur [5]. Both in domestic and foreign research, the HFACS model was developed for aviation safety and subsequently is widely used in coal, transportation, medical and other fields. It mainly analyzes the causes and prescribes internal rules to prevent accidents resulting by human errors. The model is related to disaster and emergency planning and management, mainly through organizational impact and behavior tracking. A modified HFACS model suitable for various industries analyzes the causes of accidents or combines it with other evaluation methods to evaluate and calculate human risk. However, it still remains to be applied to food safety risks [6-9]. Though few scholars have applied HFACS model to the food sector(Hao Jiang, 2015) , but we believe that it can also be used to conduct research on food risk management, which also is an innovative feature of this paper.

Food safety risk exists in the entire process of food production, processing, storage, transportation and distribution. This is because harmful substances or other factors affect food safety and can cause serious harm to human body [10]. In these value addition stages, the level of employees' skill and knowledge, sense of responsibility, psychological state, physiological state, operation error and violation of regulations, lack of supervision, and other risk behaviors may lead to food safety accidents. These risk behaviors belong to the category of human factors which can be easily analyzed by the HFACS model.

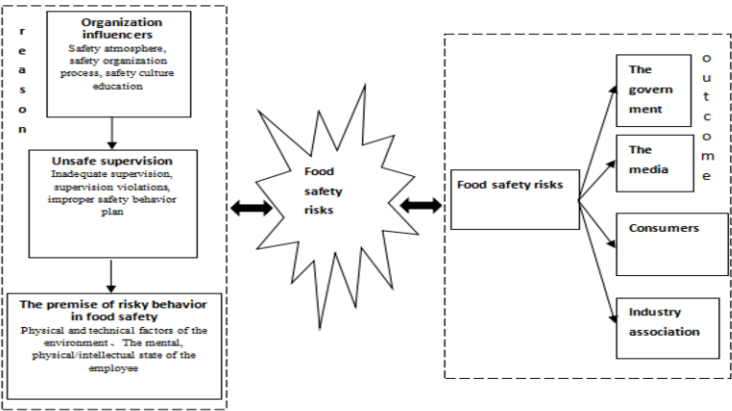


Figure 1 Analysis model of food safety risk behavior of food enterprises in Beijing

While applying HFACS model in other fields, it also needs to be supplemented and perfected. The model illustrates the relationship between human factors such as organization, management, supervision, and operator. Organizational influence can be regarded as food safety atmosphere, food safety organization process and food safety culture education. Unsafe supervision has a wide range of mandatory and preventive functions manifested as inadequate food safety supervision in food enterprises, supervision violations, and improper food safety plans. The errors and the irregularities are included in unsafe behavior in the HFACS model and the discrepancies exposed in the process of individual operations fail the operation to meet expectations. Compared with the congenital deficiency, the violation is a conscious action taken contrary to food safety rules and according to the HFACS model is an “unsafe act” from the definition of food safety risk behavior. The “unsafe behavior” in the HFACS model is applied to analyze food safety risk behavior and is regarded as food safety risk behavior. With the help of the behavioral science analysis model principle of “antecedent-behavioral process-outcome,” the food safety risk behavior analysis model of Beijing food enterprises can be constructed and is displayed in Figure 1. Among these, the organizational influence, unsafe supervision, and the premise of other risky behaviors are the “antecedents” that lead to food safety risk behaviors resulting in food safety risks. The government, consumers, media, and industry associations take corresponding feedback behaviors in the face of food safety risks.

1.2 Analysis of causes of food safety risk behaviors of food enterprises in Beijing

1.2.1 Enterprise size gap leads to negative organizational influence

According to the current classification standards of food in China, the Beijing municipal food and drug supervision bureau in 2015-2019, the complete food information public exposure data of fruit products (candied fruit), vegetable products, and convenience food (including seasonings flour, instant noodles, and other convenience foods), meat products, aquatic products, and pastries followed suit. According to the different types of unqualified food, we selected the food production and processing enterprises of fruits, vegetables, convenience food, meat, aquatic products, pastries, and other products in Shunyi, Huairou, Daxing, Tongzhou, and other areas of Beijing. The risk behaviors of middle and senior managers, such as the main person in charge of these enterprises, managers of relevant functional departments, and ordinary employees were investigated by field visits and network surveys.

A survey of food production and processing enterprises in Beijing was conducted by administering questionnaire to middle and senior managers such as the principal person in charge of the enterprise, managers of relevant functional departments and ordinary employees of the enterprise. Based on the research needs, the questionnaire is designed in three parts: the first part is the primary situation by the investigators, the second part is the background information of the enterprise and the third part is the basic information of the enterprise food safety risk behavior management comprising of the setting of risk management institutions, the establishment and implementation of the risk management system, and so on. In this questionnaire survey, 570 questionnaires were sent and received of which 548 valid questionnaires were obtained by eliminating the incomplete and invalid questionnaires, with an effective yield of 96.14%.

The enterprises in the survey were divided into four types based on to the national standard: large, medium, small and micro, of which small and medium-sized micro food enterprises account for 86.97% while the large food enterprises account only 13.03%. Due to the fierce market competition among the food enterprises, producing high-quality food requires costly raw materials, skilled personnel and equipments, organizational environment, and safety supervision standards. At the same time, it is noticed that many firms were indulged in malpractices to make huge profits with low cost inputs [11]. On the contrary, most prominent food companies tend to focus on good manufacturing processes and business innovation practices whereas, mini, small, and medium-sized enterprises do not have enough money and technology, reluctant to employ skilled and trained personnel and unprofessional enterprise culture. Therefore, the food safety awareness of the majority of the enterprises is not adequate and exploits legal loopholes.

1.2.2 External supervision contradictions lead to unsafe internal supervision

From the perspective of enterprises, the government, as a regulator, has inadequate law enforcement resources and machinery for effective vigilance. The law enforcement work of food safety is highly technical and the food administrative personnel are specialized in food safety laws, regulations, and food safety standards [12]. Though, Beijing currently has sufficient administrative examiners but less professional and technical staff. In the view of more than 70,000 licensed food enterprises in Beijing there is significant workload of law enforcement regulatory agencies. Hence, random inspections are

carried out and the grass-roots on-site supervision mostly takes place in the form of seeing, smelling and touching, which easily leads to insufficient supervision and consumers are at left to high risk [13]. There are many consumer associations in Beijing, which have to protect the interests of the consumers. But in fact, most of them are mainly interested in popular science publicity activities such as food safety Publicity Week and are not interested in raising voice on consumers' complaints instead they even cover up the food safety risks. Media and other social workers remain passive and react in vague manner with selective responses. Hence, most of the consumers in Beijing choose to give up the protection of their rights on various accounts. First of all, if they want to safeguard their rights, they have to sacrifice time money and at times there may be chances of retaliation. Secondly, it is generally difficult for consumers to obtain evidence and prove the claim. Besides, various food trading entities shift responsibility from each other, so it is difficult to identify the offender and provide enough evidence to prove their views on safeguarding their rights. As a result, consumers are often at a disadvantage for food safety problems. They are left only to swallow their pride, which encourages the arrogance of unprofessional food enterprises [14]. Besides paid media try to convey false information and conveniently ignore its role and at the end of the consumer is the scapegoat of food safety risks [15]. To sum up, the food enterprises, industry associations, media and consumers together aggravate food risks.

1.2.3 The imperfection of the system is an important premise leading to the emergence of food safety risk behavior

Majority of the enterprises surveyed (63.39%) have risk management department which reviews the reliability and feasibility of the project, implement various management systems, risk monitoring and gives early warning signals to the company. On the other hand, those who are not concerned of consumers' safety, for examples, Sanlu, where the senior managers unawareness and obsessed for large scale expansion dumped low quality dairy products in to the market. When questioned by the consumers, Sanlu chose to deceive instead of explaining the real situation, which was exposed by the media and finally led to its bankruptcy. Thus, if the risk management department can't play its due role, it will have a serious impact on the enterprise.

2. Establishment of management mechanism for food safety risk behavior of food enterprises

Based on aforesaid problems of food safety risk behaviors, this paper attempts to suggest the governance mechanism. It starts with "implementing behavioral constraints and incentives inside the enterprises" and "creating a behavioral prevention and control atmosphere outside the enterprises." Within the enterprise, the assessment mechanism of "responsibility identification and behavior self-discipline," the supervision mechanism of "system construction and self-inspection and mutual inspection," the incentive mechanism of "regular assessment and regular accountability," and the humanistic environment of "honest management and food safety and security" have to be formed. External enterprises should give full play to the stable role of "government regulation as the leading," "industry association guidance as the hub," "consumer supervision as the

guide,” “media participation as the support,” and “four-party prevention and control.” Thus, people’s safety behavior governance and environment governance are organically integrated to build a “one axis and four dimensions” food safety risk behavior governance mechanism of food enterprises in Beijing, as shown in Figure 2.

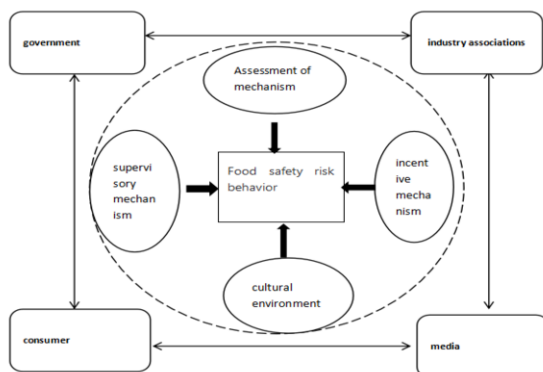


Figure 2 Governance mechanism of food safety risk behavior of food enterprises in Beijing

2.1 Constraints and incentives for the implementation of food safety risk behavior governance within enterprises

2.1.1 Establish an assessment mechanism of “responsibility identification and behavioral self-discipline”

Behavior is the external manifestation of mind and how one thinks. Therefore, in long-term, the food enterprises need proper guidance and education in the spiritual concept. When food companies realize that consumers’ safety and health are of paramount important and profit and social responsibility go hand in hand for enterprise’s long-term survival.

According to the 13th Five-Year National Food Safety Plan, in the social governance pattern contents, the enterprise self-discipline assumes the central position. Food safety largely depends on the service staff or shop-floor operators. Enterprise self-discipline also reflects the behavioral self-discipline of the employees. Therefore, the enterprise should define the “job description” of the employees and position close to reality, and follow the principle of “how do you say?” so that the employees can constantly accept the edification of food safety behavior culture.

2.1.2 Establish a supervision mechanism of “system construction and self-inspection and mutual inspection”

The compulsory principle of safety management behavior is determined by the contingency of accident loss, people’s psychology of pursuing adventure, and the irretrievability of the accident loss [16]. Psychologically, human being loves to take calculated risks, generally negative, i.e. if he neglects his work and is not reprimanded he

will continue to behave the same way. Safety enforcement can only be attained by establishing reasonable rules and regulations and administrating them strictly. However, from the perspective of the enterprises, code of conduct, intense supervision and management has to be in vogue. The enterprise must strictly implement double-check safety confirmation, post environmental risk assessment, regular self-inspection of organized employee behavior and mutual inspection. Every staff should inculcate the habit of “operating” after confirmation, to ensure that the compulsory execution is in place. Moreover, the founder of the demonstration post of food safety risk behavior management should realize the standardization and process of post-operation.

2.1.3 Build an incentive mechanism of “regular assessment and accountability”

Motivation theory points out that human behavior is oriented to satisfy the intrinsic desire. Therefore, congenial environment needs to be developed by establishing the enterprise’s internal regular checks and normal accountability, the introspection of the environment, the use of incentives or punishment to stimulate, to fully mobilize the enthusiasm and creativity of the employees, the transformation of stimulus to staff’s conscious action, and reduce irregular production practices of the employees. The scientific incentives system comprising the material incentives, emotional incentives, employee safety risk behavior governance assessment of individual performance, wage setting, developing a five-star team/gold medal team (group leader) appraisal, promote the shift automatic implementation and regular evaluation of the role models of employee safety governance will uplift the food safety in the food enterprises.

2.1.4 Establish a cultural environment of honest management and food safety and security

Psychology shows that the more we can understand the meaning of an action, the more we can generate the driving force for the action. Regardless of the size and scope of the enterprise, it is necessary to improve the staff’s food safety literacy and safety operation level through continuous publicity and education in food safety behavior so that the staff can realize the ill-effects of food safety risk behavior, establish scientific code of conduct and concept awareness, and deepen the understanding of the value and role of food safety.

2.2 Create an environment for management of food safety risk behaviors outside the enterprise

2.2.1 Strengthen government functions and play a leading regulatory role

Presently, Beijing has established six technology platforms, including dynamic monitoring of public opinion information, emergency response, risk monitoring, assessment and early warning, data collection and resource integration, regulatory technology research and development and transformation, and technical support for major events. The regulatory capacity of the government has steadily improved. As the leading regulator in the food safety risk behaviors of food enterprises, the regulatory

authorities in Beijing have made full use of administrative and legal tools through punitive measures. Micro-miniature food enterprises in Beijing still need support and push through financial schemes, policy and technical support information, empower and motivate them to take a leading initiative in food safety behavior [17].

2.2.2 Guidance by industry associations and expand the connection effect

Industry associations provide invisible hands to prevent food safety risk behaviors of food enterprises effectively. Industry associations are the government helping arms and defender of public interest. They are the critical links to connect the government, media, and consumers and supervise the behavior and self-discipline of food enterprises. Beijing Food Industry Association may refer the experience of some more mature industry associations in China, such as the “Appeal Management Measures,” “Self-disciplinary Measures for Professional Behavior,” “Interim Measures for Member Integrity File” and other self-disciplinary rules of the Asset Appraisal Association, to establish standards of conduct for industry self-disciplinary punishment, appeal system and member integrity file system for government, media and consumer inquiry [18].

2.2.3 Encourage consumers to participate in supervision and improve public governance guidance ability

Consumers need to keep an eye and actively watch food enterprise’s food safety risk behaviors. Food enterprises belong to the industry of conscience and legal restrictions for food safety management have specific limits since legal provisions are missing [19]. In the absence of specific laws, only consumer complaints and reports are essential to investigate the food safety problems. Surprised random checks by regulatory authorities can serve as an effective supplement to the law to guide food enterprises to actively participate in the management of food safety risk behaviors.

2.2.4 Improve the media publicity to ensure the supporting force of security governance

The media can disclose actual facts and effectively deter food enterprises’ food safety risk behaviors. For instance, in case of Shanghai Hushi incident, Shanghai TV news reporters went undercover for months to investigate and discovered that McDonald’s, KFC and Pizza Hut used inferior meat in their preparations, and helped to protect the legitimate interests of the consumers. Most of them were first reported by the news media and then brought to the attention of the regulatory authorities and conveyed the information to the consumers thus, acting as a deterrent to the food enterprises [20]. Food safety reports must be professional, avoid prejudice, neutral reports and be given publicity on various platforms such as the official media, web-media, and Internet public opinion to generate a resonance effect.

3. Conclusion

The food safety behavior governance mechanism for food enterprises in Beijing organically integrates human safety behavior governance with safety environment governance, enriching the connotation of collaborative governance, helping to enhance the interactions among the participants, and opening up innovative ideas and new paths for food safety risk governance of food enterprises which will pave a way to provide a reference in other big cities. However, since this is the first attempt to apply the HFACS model and the behavioral science analysis model of “antecedent-behavioral process-outcome” to study the food safety risk behavior, the constructed model is subjective to some extent. Due to the paucity of research time, funds, workforce and the limited representative research sample may affect the reliability of the research results. There is still room for further improvement and optimization in the suggested governance mechanism.

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