Research on the Application of Big Data Technology in Food Safety Management

Lifu Chen¹, Yanchun Ruan¹*

¹College of Cuisine Science and Technology, Jiangsu College Tourism, Yangzhou, Jiangsu, China, 225100

*Corresponding author e-mail: hfj@jstc.edu.cn

Abstract. When we think of the term food, we think of all kinds of eating and drinking related to our health. Of course, what we should think of most is the health of the body. In the form of today's data, computer technology plays a very distinct role in the safety management of some well-known food companies at home and abroad[1]. Since the establishment of the food industry, foreign food safety management technologies have been synthesized by computers. As far as my country's food technology is concerned, we still use a combination of manual and electronic machinery for food safety management. There is no doubt that the efficiency of this management method is very low. In order to greatly improve this efficiency, we should use big data technology in food safety management to conduct multi-faceted research.

Keywords: Big Data, Food, Safety Management

1. Introduction
It can be said that from the current status of various industries in the field of modern technology, computer technology related to the food industry is relatively sluggish. This phenomenon also shows from the side that our country does not pay attention to the safety management of the food industry. It is also the reason why our country's food safety laws are not standardized. This is also the reason for the occurrence of various human health problems caused by food safety problems. However, the reasons for these phenomena cannot all be entangled in my country's unregulation. In the process of food production by food companies, food needs to go through production, transportation and various operations before it can be delivered to consumers. If there is a safety problem in any part of these links, then the food may be contaminated by dirt.

In recent years, some information technology and applications have been applied to our daily lives in the process of continuous expansion by people. In an effective network similar to the mutual development of cloud computing and the Internet, there is no doubt that big data will become their link. However, in our country, the application of big data is only limited to the Internet. The use of technologies similar to big data in the food industry is also rare. To effectively alleviate this situation, we need to effectively integrate big data technology and food safety management. Only in this way can we conduct applied research in the field of food safety with the support of big data.
2. Discussion on application skills based on big data

2.1. The concept of big data and data flow
From the perspective of computers and electronic devices, big data is a very abstract concept. The reason why we discuss big data in this way is that the number and types of data streams are very diverse. However, big data can gather all data streams into the same electronic device for effective integration. However, there are still many disagreements in the academic community regarding the main concepts of big data and data flow. This is also the main reason why we need further research.

2.2. Types of technologies related to big data
In the face of such a growing data form, the processing model of pure big data can no longer meet people's data processing requirements[2]. In today's trend of high data standards, people have discovered that big data technology can be proliferated and added. Among the types of technologies today, data value exploration technology and data mining technology have always been the most widely used types of big data technology (see Figure 1).

2.3. Application Scope of Big Data
According to the above description, we know that the application range of big data technology is very wide. However, this widespread application does not refer to data methods that promote the intensive social economy. It refers to the technical ability of pure competition among industries. In today's society, in the fields of commercial intelligence, corporate decision-making, and public services, we often see the presence of big data.

2.4. The relationship between big data and food safety control
If we think that big data technology has nothing to do with food safety control, this idea is a false argument. In fact, big data technology and computer technology are the same. The characteristics of their applications are also very similar. In the process of food safety control, big data can provide technical and data guarantees for food safety. We can also use the combination of big data and computer technology for food safety management.

3. Analyze the clear effect of big data on food safety governance from theory

3.1. It is an urgent need for food safety supervision
From the emergence of the food industry to today, health issues regarding food safety have always appeared. Since our country has a large population, food transportation and food consumption are also very large. In this situation, my country's food safety management mechanism is very weak compared
with foreign countries. The technology of food safety governance with big data participation will become an urgent need for safety management.

3.2. It is also an innovation in food safety technology
From the innovation of the food industry to the current prosperous stage, we will find that there is no innovation in the related technologies of food safety management. In other words, my country’s food safety management is still using outdated control mechanisms. In theory, food safety management based on big data will become an innovative technology for food management. From the historical process, it is also an innovation in food technology.

3.3. It created a new batch of food governance systems
According to the Food Supervision Bureau, there are still many deficiencies in my country’s food safety governance system. But there has never been a law or a very advanced technology that can change it. The emergence of big data has broken this balance. We can completely think that the emergence of big data has created a new batch of food governance systems. Although the role of this system is only theoretical. We still need to look at it with great confidence.

3.4. It also strengthens the formulation of food safety laws from the side
From the perspective of the public, the food safety law is an unfair law for consumers. This is not a problem that arises because of the law itself. Its problem is mainly the lack of implementation in the process. The application of big data in food control has strengthened the implementation of the food safety law. Of course, it is also possible that in the future, the country will formulate a new food safety law based on big data technology.

4. Application of big data technology in food safety management

4.1. The first is the establishment of food quality supervision
Those who have studied engineering may know that the machinery industry has a quality management program for mechanical products. In the same way, it is possible to have a very sophisticated food safety management plan in the food industry. What the technician needs to do is to input the main method of food safety management into a computer language into the software system supported by big data. With the system's control of the safety and quality of the food industry, the technician can obtain the effective quality management of the company’s food data.

4.2. Supervision system of food production process
Food problems may not necessarily appear in the later packaging. In many cases, food problems will appear in the production process. The intelligent identification system supported by big data can be used to monitor the production process. Once there are food unsafe problems in the production process, the system will automatically report the data to the core electrical equipment. Enterprises can monitor the production process based on this system.

4.3. Supervision system for food packaging
After the food is produced, it will go through the packaging process. Since the packaging process will involve the use of vacuum and some chemical gases, the food packaging process needs to undergo precise supervision and quality management. This includes the leakage of food packaging and the internal safety inspection of food packaging. Some time. Food is safe during the production process, but it becomes incomplete when it passes through the packaging process.

4.4. Establishment of a food transportation management system
After the food is completely produced, the company will transport the food. To ensure food safety. Companies can use big data technology to make a system similar to logistics management. In
this way, companies can always know the location of each food logistics. Through electronic identification and some data collection, companies can track the entire logistics process. This is also an important step in managing food safety.

5. Some innovative applications of big data technology in food safety management

5.1. Data control of the storage of food raw materials
The storage of raw materials is an innovative food production principle that some foreign food industries have come up with\(^4\). This is a precautionary measure to prevent insufficient supply of raw materials for food production caused by emergencies. With the help of big data, the storage of these raw materials can be controlled with appropriate data to ensure the safety of raw materials. This will ensure the safety of future foods (see Table 1).

Table 1. Innovative applications in food safety management.

| Innovative application                  | Innovation skills                        |
|-----------------------------------------|------------------------------------------|
| Raw material storage data control       | Prevent emergencies                      |
| Sampling detection                      | Sample survey is simple and easy to understand |
| Quality tracking system                 | Tracking system does not leak traces     |
| Outer packaging quality system          | Pay attention to the safety of product packaging |

5.2. Sampling and testing of products in the production process
Sampling and testing use a sampling survey under mathematical thinking. In this survey system, companies can sample food at will to ensure food safety. After sampling the food through big data analysis technology, it can be seen whether its internal chemical properties are stable. In addition, computers can be used to analyze the chemical toxic effects of sampled foods based on the idea of chemical experiments.

5.3. Certification of quality management tracking system
The process of food management in our country is mainly to check the quality management. However, some foreign food industries have turned this quality management system into a tracking system. With the support of big data, this system can effectively track food production, transportation and some major processes involving quality issues. In the process of tracking, the supervision error of this system is relatively small. However, in terms of economics, the cost of certification of this tracking system is also very large.

5.4. Establishment of Outer Packaging Quality System
From the perspective of foreign research fields, the establishment of the packaging quality system started very early. However, in our country's quality system, it seems that we do not pay attention to the safety of outer packaging. This is actually a bad phenomenon. Innovative applications based on foreign product quality management are also worth learning. However, it depends on whether our funds can withstand the research of these techniques.

6. The application of big data technology in food safety management is insufficient in my country's implementation

6.1. Unclear application of electronic data technology
As some companies pay insufficient attention to food safety management, some companies are not clear about the application of electronic data technology\(^5\). In many cases, in order to reduce the cost of food management, some companies will use manual quality inspection as much as possible to conduct product quality inspection. Their intention to adopt electronic data technology is not clear. This is the lack of food safety management of some small and medium-sized enterprises in our country.
6.2. My country’s food industry lacks mandatory legal requirements
No system can survive the restrictions of the law. If there is a problem with the system of a certain industry in a country, it can be fully proved that the law of this country is not up to the standard. In my country’s food industry, there are almost no mandatory legal requirements for food safety. This can also be regarded as an insufficiency of our laws and lack of social care.

6.3. Underdeveloped domestic software and hardware technology
For now, the development prospects of some foreign software and hardware for food quality control are very good. Not only that, the software and hardware technology they can use is much higher than our country's standards. In contrast, the software and hardware technology of data management in my country's food companies is underdeveloped, which severely restricts the role of food safety. It is also under this trend that the quality of food in my country has always been unqualified.

7. Conclusion
In fact, looking at my country's food quality and safety management system, compared with other countries, we are very backward[6]. In today's big data situation, what we need to do is to make big data technology more famous so that more companies can fully realize the important role of big data and computer skills in food safety management.

Acknowledgements
Sichuan cuisine Development Research Center, Sichuan provincial key research base of philosophy and Social Sciences (CC20Z16).

References
[1] T.A. McMeekin, J. Baranyi, P. Dalgaard, et al.. Information systems in food safety management [C]// Book of Abstracts New Tools for Improving Microbial Food Safety & Quality, International Ifcmh Symposium Food Micro, Ljubljana, September. 2004.
[2] International Commission on Microbiological Specifications for Foods Staff. Microbiological Testing in Food Safety Management [M]. Springer US, 2002.
[3] Skovgaard N. Microorganisms in foods 7: microbiological testing in food safety management. [J]. International Journal of Food Microbiology, 2003, 89(2): 291-292.
[4] Mensah L D, Julien D. Implementation of food safety management systems in the UK [J]. Food Control, 2011, 22(2): 1216-1225.
[5] Milios K T, Drosinos E H, Zoiopoulos P E. Food Safety Management System validation and verification in meat industry: Carcass sampling methods for microbiological hygiene criteria – A review [J]. Food Control, 2014, 43: 74-81.
[6] Jacxsens L, Kussaga J, Luning P A, et al. A Microbial Assessment Scheme to measure microbial performance of Food Safety Management Systems [J]. International Journal of Food Microbiology, 2009, 134(1-2):113-125.