

CONSTRUCT FOOD SAFETY TRACEABILITY SYSTEM FOR PEOPLES HEALTH UNDER THE INTERNET OF THINGS AND BIG DATA

M.RAVI¹, KATAKAM RITHVIK², B.SWARNALATHA³, SANIYA BEGUM⁴, SONA BEGUM⁵

ASSISTANT PROFESSOR¹, UG SCHOLAR^{2,3,4&5}

DEPARTMENT OF CSE, CMR INSTITUTE OF TECHNOLOGY, KANDLAKOYA VILLAGE,
MEDCHAL RD, HYDERABAD, TELANGANA 501401

ABSTRACT— In the context of epidemic prevention and control, food safety monitoring, data analysis and food safety traceability have become more important. At the same time, the most important reason for food safety issues is incomplete, opaque, and asymmetric information. The most fundamental way to solve these problems is to do a good job of traceability, and establish a reasonable and reliable food safety traceability system. The traceability system is currently an important means to ensure food quality and safety and solve the crisis of trust between consumers and the market. Research on food safety traceability systems based on big data, artificial intelligence and the Internet of Things provides ideas and methods to solve the problems of low credibility and difficult data storage in the application of traditional traceability systems. Therefore, this research takes rice as an example and proposes a food safety traceability system based on RFID two-dimensional code technology and big data storage technology in the Internet of Things. This article applies RFID technology to the entire system by analyzing the requirements of the system, designing the system database and database tables, encoding the two-dimensional code and generating the design for information entry. Using RFID radio frequency technology and the data storage function in big data to obtain information in the food production process. Finally, the whole process of food production information can be traced through the design of dynamic query platform and mobile terminal. In this research, the food safety traceability system based on big data and the Internet of Things guarantees the integrity, reliability and safety of traceability information from a technical level. This is an effective solution for enhancing the credibility of traceability information, ensuring the integrity of information, and optimizing the data storage structure.

Index Terms— Two-dimensional code technology, Internet of Things, big data, artificial intelligence, food safety traceability system.

I. INTRODUCTION As the global new crown virus (COVID-19) epidemic intensifies, there are more and more cases of COVID-19 spreading through cold chain logistics channels. COVID-19 has become the most important source of hazards to food safety in the The associate editor coordinating the review of this manuscript and approving it for publication was M. Shamim Hossain . cold chain logistics process. Although the overall prevention and control situation of our country's new coronavirus pneumonia epidemic continues to improve, the accelerated spread of the overseas epidemic has led to the domestic epidemic prevention situation of "foreign import and internal prevention" is still severe. In the context of epidemic prevention and control, food safety monitoring, data analysis, and food safety traceability have become more important. VOLUME 9, 2021 This work is licensed under a Creative Commons Attribution 4.0 License. For more information, see <https://creativecommons.org/licenses/by/4.0/> 70571 M. Zheng et al.: Construct Food Safety Traceability System for People's Health Especially for cold chain food imported from overseas, every food should be monitored and traced to prevent the spread of COVID-19 virus and protect the health and safety of the population. Therefore, the establishment of a safe and reliable food safety traceability management system is an urgent requirement of the

society and the people, and it is also an effective way to fundamentally solve the post-epidemic era and protect the health of the population. The food safety traceability management system is based on automatic identification and information technology to integrate information in the entire chain of food production, processing, storage, transportation and sales. A comprehensive service management platform that is presented to users and consumers in real time through the Internet, terminals, phone calls, and text messages. At the same time, the food safety traceability system involves food planting (breeding) purchase links, enterprise processing (packaging) links, storage and logistics links, and sales links [1], [2]. Through the information traceability mechanism, the responsible body of each link of food production and circulation can be clarified, so as to more effectively control the safety and reliability of breeding (planting), processing, and transportation, and indeed prevent various food safety risks, and protect the people's safety and health. The development of automatic information generation equipment represented by sensors and intelligent terminal recognition has enabled rapid development of technologies such as perception, measurement and monitoring based on the Internet of Things (IoT), artificial intelligence and big data technology. The Internet of Things and big data technology are profoundly changing people's production and life, and their significance has gone beyond the scope of communication technology [3]. The Internet of Things is the use of information technologies such as the Internet and sensors to connect people and things together, so that things can be interconnected, forming a new network of intelligent sharing of information. Artificial intelligence has the huge advantage of simplifying the process of using data, and it could play a huge role in areas such as food safety. Big data technology is a data processing and application model based on cloud computing and distributed computing. It can realize accurate prediction or analysis through the integration and sharing of data and the application of reasonable mathematical algorithms. In food traceability, the successful application of big data needs to be combined with technologies such as automatic identification and network communication, these five main links play a role through data capture, data storage, data processing, data mining, and data knowledge display. Big data realizes the aggregation and virtual management of data, optimizes the allocation of information resources, which is conducive to the realization of cross-regional and crossdomain supervision that is difficult to break through in real management. In recent years, big data has been widely used in the agricultural industry and has become an important force in promoting the transformation of traditional agriculture. At the same time, since food quality is closely related to all links of production and circulation, the construction of a food quality and safety traceability system must receive strong support and mutual cooperation from upstream and downstream related companies. Using the Internet of Things technology to build a food safety traceability system will greatly reduce the difficulty of collaboration. In this context, information technology is used to carry out food safety traceability in the context of post-epidemic situations, and IoT and big data technologies are applied to the food safety traceability management system in the post-epidemic era [4]. Ensuring food safety in the whole process of food production, inventory, distribution and sales has become a hot research issue in the field of food safety for people's health. Therefore, this research proposed a food safety traceability system based on RFID technology and big data storage technology in the Internet of Things. The use of the Internet of Things and big data technology has realized the data collection of various food data. The use of RFID technology to realize automatic recording of relevant parameters avoids the contamination of food product traceability information caused by manual data input. At the same time, a set of small food industry data search engine was designed and implemented by using big data analysis technology. The traditional traceability system is integrated with the Internet of Things and big data technology to realize the traceability of the entire agricultural

production process of agricultural and sideline products such as planting, processing, testing, warehousing, transportation, and sales. This ensured that the source of agricultural and sideline products can be traced, flow can be traced, information can be inquired, and responsibilities can be held accountable to protect people's health and food safety. The food safety traceability system constructed in this research has a perceivable realization process, traceability of the source, and early warning of risks. This is of great significance for improving the management level of China's food quality and safety, preventing food safety accidents, maintaining the balance of supply and demand, and ensuring people's health and safety.

II. LITERATURE SURVEY

1. Construct Food Safety Traceability System for People's Health Under the Internet of Things and Big Data

Miaomiao Zheng, Shanshan Zhang, +1 author Baozhong Hu Published in IEEE Access 2021

In the context of epidemic prevention and control, food safety monitoring, data analysis and food safety traceability have become more important. At the same time, the most important reason for food safety issues is incomplete, opaque, and asymmetric information. The most fundamental way to solve these problems is to do a good job of traceability, and establish a reasonable and reliable food safety traceability system. The traceability system is currently an important means to ensure food quality and safety and solve the crisis of trust between consumers and the market. Research on food safety traceability systems based on big data, artificial intelligence and the Internet of Things provides ideas and methods to solve the problems of low credibility and difficult data storage in the application of traditional traceability systems. Therefore, this research takes rice as an example and proposes a food safety traceability system based on RFID two-dimensional code technology and big data storage technology in the Internet of Things. This article applies RFID technology to the entire system by analyzing the requirements of the system, designing the system database and database tables, encoding the two-dimensional code and generating the design for information entry. Using RFID radio frequency technology and the data storage function in big data to obtain information in the food production process. Finally, the whole process of food production information can be traced through the design of dynamic query platform and mobile terminal. In this research, the food safety traceability system based on big data and the Internet of Things guarantees the integrity, reliability and safety of traceability information from a technical level. This is an effective solution for enhancing the credibility of traceability information, ensuring the integrity of information, and optimizing the data storage structure.

2. Food supply chain in the era of Industry 4.0: blockchain technology implementation opportunities and impediments from the perspective of people, process, performance, and technology

Yasanur Kayikci, N. Subramanian, +1 author Manjot Singh Bhatia Published in Production planning & control... 2 September 2020

The prevention of food loss throughout the supply chain, including manufacturers, has become a major challenge for a number of organisations. In addition, consumers are also increasingly interested in the authenticity of food and want to ensure that they receive the right quality of food. To address this issue, there is a need for reliable and robust tools to be available in the Industry 4.0 era that can trace the food throughout the supply chain from the farm through processing until it reaches the customer and, thus, ensure transparency. Using the people, process,

and technology (PPT) model, this paper develops a blockchain-enabled food supply chain framework including the future opportunities and the present impediments based on the systematic literature review and semi-structured case interviews from the context of emerging economies. The study investigates the suitability of blockchain technology in resolving major challenges, such as traceability, trust, and accountability in the food industry. The study further paves the way for future researchers to address the technological and people-related challenges in the Industry 4.0 era to mitigate the emerging problems in the food sector. Interestingly, we did not find many issues in process- and performance-related aspects. The study offers empirical evidence of blockchain technology implementation in the Industry 4.0 era that opens up the discussion for future researchers and lists the potential threats.

3. Smart Contract-Based Agricultural Food Supply Chain Traceability

Lu Wang, Longqin Xu, +5 authors Chuanheng Sun Published in IEEE Access 2021

The complexity of a supply chain makes product safety or quality issues extremely difficult to track, especially for the basic agricultural food supply chains of people's daily diets. The existing agricultural food supply chains present several major problems, such as numerous participants, inconvenient communication caused by long supply chain cycles, data distrust between participants and the centralized system. The emergence of blockchain technology effectively solves the pain-point problem existing in the traceability system of agricultural food supply chains. This paper proposes a framework based on the consortium and smart contracts to track and trace the workflow of agricultural food supply chains, implement traceability and shareability of supply chains, and break down the information islands between enterprises as much as possible to eliminate the need for the central institutions and agencies and improve the integrity of the transaction records, reliability and security. At the same time, farmers record details of the environment and crop growth data in the InterPlanetary File System (IPFS) and store file IPFS hashes in smart contracts, which not only increases data security but also alleviates the blockchain storage explosion problem. This framework has been applied in Shanwei Lvfengyuan Modern Agricultural Development Co., Ltd. Although there are still many defects, the framework has successfully realized functions such as disintermediation and tracing of agricultural product information through QR codes. Thus, the framework proposed in this paper is of great significance and reference value for enterprises to ensure product quality and safety traceability.

IMPLEMENTATION

Modules

Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Login, Browse Data Sets and Train & Test, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View All Antifraud Model for Internet Loan Prediction, Find Internet Loan Prediction Type Ratio, View Primary Stage Diabetic Prediction Ratio Results, Download Predicted Data Sets, View All Remote Users.

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like REGISTER AND LOGIN, PREDICT PRIMARY STAGE DIABETIC STATUS, VIEW YOUR PROFILE.

CONCLUSION

In the context of epidemic prevention and control, strengthening food safety data analysis based on the application of food safety traceability technology can effectively improve the effect of food safety management, which is conducive to the development of epidemic prevention and control, and has practical value for the solution of future food safety issues in China as a whole. So as to better protect people's life, health and safety. The use of Internet of Things technology to regulate food safety can effectively curb the emergence of major food safety incidents. Moreover, the problem can be diagnosed more real-time and accurately, and the source of the hazard can be quickly identified, so that the quality of the food is more guaranteed. This will have a huge impact on the food supply chain. At the same time, under the intelligent monitoring of big data, it is difficult for companies in the food supply chain to tamper with the data, ensuring the authenticity of the data. Combining big data, the Internet of Things, the Internet and the food traceability system will truly achieve openness, transparency, and completeness of information, and strictly control the various steps of the food traceability system, so that the value of the food traceability system can be truly realized. This research uses IoT technology, wireless sensor technology, RFID technology, crawler technology, database technology and other related technologies to design and implement a set of food traceability system using rice as an example. It has initially completed the traceability requirements for the entire process of food products, and also provided network data information for food-related industries. The implementation of traceability is not only a practical need to ensure food safety, but also the main means of current and future food safety measures. Through combing and researching the existing food safety traceability system, drawing on advanced domestic and foreign experience and achievements, strategically, systematically and structurally, establish a unified and standardized food safety traceability standard system, and establish a food safety traceability system for the government and enterprises Provide standardized technical guidance, it also provides standard support for the establishment of third-party certification, thereby improving the level of food safety traceability and people's health.

REFERENCES

- [1] J. Wang, H. Yue, and Z. Zhou, "An improved traceability system for food quality assurance and evaluation based on fuzzy classification and neural network," *Food Control*, vol. 79, pp. 363–370, Sep. 2017.
- [2] Q. Lin, H. Wang, X. Pei, and J. Wang, "Food safety traceability system based on blockchain and EPCIS," *IEEE Access*, vol. 7, pp. 20698–20707, 2019.
- [3] G. Alfian, M. Syafrudin, U. Farooq, M. R. Ma'arif, M. A. Syaekhoni, N. L. Fitriyani, J. Lee, and J. Rhee, "Improving efficiency of RFIDbased traceability system for perishable food by utilizing IoT sensors and machine learning model," *Food Control*, vol. 110, Apr. 2020, Art. no. 107016.
- [4] F. Liu, Y. Wang, Y. Jia, S. Hu, L. Tu, and C. Tang, "The egg traceability system based on the video capture and wireless networking technology," *Int. J. Sensor Netw.*, vol. 17, no. 4, pp. 211–216, Apr. 2015.
- [5] X. Xiao, Z. Fu, L. Qi, T. Mira, and X. Zhang, "Development and evaluation of an intelligent traceability system for frozen tilapia fillet processing," *J. Sci. Food Agricult.*, vol. 95, no. 13, pp. 2693–2703, Oct. 2015.
- [6] M. M. Aung and Y. S. Chang, "Traceability in a food supply chain: Safety and quality perspectives," *Food Control*, vol. 39, pp. 172–184, May 2014. 70582 VOLUME 9, 2021 M. Zheng et al.: Construct Food Safety Traceability System for People's Health
- [7] E. Abad, F. Palacio, M. Nuin, A. G. D. Zárate, A. Juarros, J. M. Gómez, and S. Marco, "RFID smart tag for traceability and cold chain monitoring of foods: Demonstration in an intercontinental fresh fish logistic chain," *J. Food Eng.*, vol. 93, no. 4, pp. 394–399, Aug. 2009.
- [8] T. Bosona and G. Gebresenbet, "Food traceability as an integral part of logistics management in food and agricultural supply chain," *Food Control*, vol. 33, no. 1, pp. 32–48, Sep. 2013.
- [9] F. Tian, "A supply chain traceability system for food safety based on HACCP, blockchain & Internet of Things," in *Proc. Int. Conf. Service Syst. Service Manage.*, Jun. 2017, pp. 1–6.
- [10] J. F. Galvez, J. C. Mejuto, and J. Simal-Gandara, "Future challenges on the use of blockchain for food traceability analysis," *TrAC Trends Anal. Chem.*, vol. 107, pp. 222–232, Oct. 2018.