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Research on traceability and anti-counterfeiting management system of Chinese Baijiu based on big data

Zhangjie Yuan [12*], Xiaoping Cao [2],Keyu Chen [34] ,Ting Wang[3]
1 SEGI University, Kuala Lumpur, Malaysia
2 Artificial Intelligence College, Chongqing Creation Vocational College, Yongchuan District, Chongqing City, China
3 Luzhou Wenjie Technology Co., Ltd., Longmatan District, Luzhou City, Sichuan Province, China
4 School of Information and Control Engineering, China University of Mining and Technology, Nanhu Campus, No.1 Daxue Road, Xuzhou City, Jiangsu Province
***Corresponding author,E-mail: yuanzhangjie111@qq.com**

Abstract:
As a traditional alcoholic drink and cultural symbol in China, Chinese Baijiu has developed and accumulated for many years, forming many world-class well-known brands such as Maotai, Wuliangye, Luzhou Laojiao and Langjiu. However, with the gradual expansion of Chinese Baijiu consumption industry scale and Chinese Baijiu consumption market, these brand Chinese Baijiu with high brand value and commercial profits were targeted by many counterfeiters, so that a large number of fake and inferior Chinese Baijiu products appeared in the market, disrupting the market. Due to the limitations of the current anti-counterfeiting and traceability technology, it is easy to be imitated and broken through by counterfeiters, making consumers unable to identify the authenticity of Chinese Baijiu products, which seriously infringes the interests of consumers and production enterprises. As a hot topic in many fields, big data can record information from one or more fields, forming a massive digital resource library with high utilization and research value. This project breaks through the traditional technical ideas, changes the single route, and designs and develops a traceability and anti-counterfeiting management system suitable for the field of Chinese Baijiu based on big data, combined with intelligent algorithms, integrating traceability, anti-counterfeiting, sales management and other functions. The key path of this system is one object dual code, digital coding, intelligent algorithms, multi client management, and front-end and back-end separation development.

Keywords:
Chinese Baijiu, Big data, Traceability, Anti-counterfeiting, Management system

1. Introduction

1.1 Research Background

Chinese Baijiu is the main daily consumption of Chinese residents, and the scale of Chinese Baijiu industry is expanding day by day. According to the data reported by the China Alcohol Industry Association at the 2023 conference, the total output of enterprises above the scale of the national brewing industry will continue to grow. In 2022, the total output will reach 54 million kiloliters, the product sales revenue will reach 950 billion

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yuan, the growth rate will exceed 9%, and the total accumulated profit will be nearly 250 billion yuan (China national radio net, 2023). At present, there is a wide range of Chinese Baijiu products in the market, including many well-known brands such as Moutai, Wuliangye, Luzhou Laojiao, and many series of products under each brand, with fierce competition.

However, with the development of the market economy, brand value has been paid more and more attention. Some lawbreakers have "twisted their minds" and extended their illegal hands to Chinese Baijiu, cosmetics and other products with high brand value, producing and selling fake and inferior products, which has seriously disrupted the market order and seriously damaged the interests of production enterprises and consumers. In 2022, the State Administration for Market Regulation of China increased its administrative enforcement efforts in key areas and regions with high incidence of infringement and counterfeiting. It investigated and dealt with 44000 illegal cases such as target infringement and counterfeit patents, and organized the destruction of over 3000 tons of infringing, counterfeit, and inferior food products worth 500 million yuan (China National Intellectual Property Administration, 2023). According to the data released on the official website of the Chinese Ministry of Public Security in 2023, 27000 cases of intellectual property infringement and the production and sale of counterfeit goods were solved in 2022 (People's Daily Online, 2023). As the largest Chinese Baijiu consumption market and production area in the world, China has a high commodity value and brand value of Chinese Baijiu products, which is a high incidence area of counterfeiting and shoddy events. According to the report of CCTV in June 2023, the police in Yunnan, China, successfully cracked a huge case of selling Chinese Baijiu with counterfeit registered trademarks, seized 161000 bottles of counterfeit and shoddy Chinese Baijiu, involving more than 530 million yuan (China national radio net, 2023). Although the production enterprises have invested a lot of money to improve the anti-counterfeiting technology and gradually improve the regulatory policies, the data of these counterfeiting infringement cases shows that the current work of commodity traceability and anti-counterfeiting management is still facing many difficulties, especially in the Chinese Baijiu industry in the food field. Fake and inferior products have become a problem for the production enterprises.

In February 2017, the Ministry of Commerce, the Ministry of Industry and Information Technology, the Ministry of Public Security, the Ministry of Agriculture, the General Administration of Quality Supervision, Inspection and Quarantine, the State Administration for Safety and Administration, and the State Food and Drug Administration of China jointly issued the Guiding Opinions on Promoting the Construction of Information Technology Traceability Systems for Important Products, which clearly pointed out the importance of building product traceability systems. In China, the government has begun to implement the national big data strategy, sounding the horn of accelerating the development of the digital economy and building a digital China. It has made strategic deployments to promote the innovative development of the big data technology industry, build a digital economy with data as the key element, use big data to enhance the modernization level of national governance, use big data to promote and improve people's livelihoods, and effectively ensure national data security. It is very necessary to use big data related technologies to research and develop the traceability and anti-counterfeiting management system of circulation commodities, use digital technology to serve the circulation commodity economy, build the traceability system, anti-counterfeiting system and management system of circulation commodities, and improve and solve the problems related to counterfeiting, infringement and circulation management in the Chinese Baijiu industry through technical means.

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1.2 Research questions

The market scale of Chinese Chinese Baijiu has expanded year by year, and the consumption capacity of Chinese residents for Chinese Baijiu has improved, and the market is booming. As the world's largest Chinese Baijiu production and marketing place, China has emerged many well-known Chinese Baijiu brands, such as Moutai, Wuliangye, Luzhou Laojiao, and Langjiu. According to the financial reports of several Chinese Baijiu listed companies in China, the Chinese Baijiu industry generally has higher profits, and the Chinese Baijiu products of well-known brands have higher profits. Under the temptation of high profits, many fake and inferior Chinese Baijiu products have emerged, which has seriously damaged the interests of Chinese Baijiu producers and consumers. In order to better solve this problem, the idea of building a traceability and anti-counterfeiting management system for Chinese Baijiu based on big data was proposed, and three research issues were identified, as follows:

Q1. How to build a big data information platform and system for Chinese Baijiu products?
Q2. How to use the big data information of Chinese Baijiu products to build anti-counterfeiting algorithms?
Q3. How to build a commodity circulation management system based on the big data information of Chinese Baijiu products?

1.3 Research Status

The research on anti-counterfeiting technology is closely related to the technology of the times. Mainstream anti-counterfeiting technologies include network system anti-counterfeiting, biotechnology anti-counterfeiting, chemical technology anti-counterfeiting, physical technology anti-counterfeiting, Internet of Things technology anti-counterfeiting, frequency technology anti-counterfeiting, etc. These technologies are widely used in the circulation of food, cosmetics, agricultural products and other products. However, due to the fact that these technologies mainly rely on various verification systems to distinguish the authenticity of products, there is a potential risk of being imitated.

The anti-counterfeiting traceability technology of the famous Chinese Chinese Baijiu brands "Moutai" and "Wuliangye" Chinese Baijiu products is mainly the combination of radio frequency identification technology and physical technology anti-counterfeiting. Radio Frequency Identification technology writes the production information and part of the circulation information of Chinese Baijiu products in advance by constructing electronic information labels. Consumers obtain the information of the electronic labels through the NFC function of mobile phones or exclusive identifiers to achieve authenticity identification. Physical anti-counterfeiting technology mainly sets anti-counterfeiting marks through printing technology, anti-counterfeiting patterns, and packaging materials. Some high-tech counterfeiters use methods such as "recycling packaging", "punching holes", and "removing caps" to make real wine bottles contain fake wine, achieving the purpose of counterfeiting and selling fake products. Some counterfeiters seize the weak point of consumer discrimination and directly imitate the production process of production enterprises to produce and sell counterfeit and inferior products.

The anti-counterfeiting traceability technology of the famous Chinese Chinese Baijiu brand "Luzhou Laojiao" Chinese Baijiu products is a combination of two-dimensional code+anti-counterfeiting pattern+anti-counterfeiting verification code. Consumers scan the QR code on the outer packaging of the product through

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WeChat, obtain the anti-counterfeiting verification code through the coating under the QR code, input the verification code, and provide feedback on an anti-counterfeiting pattern set during production. If the pattern is consistent with the pattern on the QR code, it is judged as true. Objectively speaking, many studies currently focus solely on the traceability management, anti-counterfeiting management, and commodity management of circulating commodities. Few have utilized big data related technologies to develop management systems that integrate traceability, anti-counterfeiting, and management.

1.4 Research significance

At present, many fake and inferior Chinese Baijiu products are flowing into the market, which has seriously damaged the Chinese Baijiu market order, the interests of Chinese Baijiu production enterprises, distributors, consumers and other groups, and also caused a lot of resource waste by the market supervision department. Therefore, it is very necessary to develop a traceability and anti-counterfeiting management system suitable for Chinese Baijiu based on big data technology, and it can solve the difficulties faced by many parties.

For Chinese Baijiu production enterprises. Through the construction of Chinese Baijiu commodity circulation system, realize the management of commodities by channels and regions, and strictly prevent the circulation of goods in parallel. By constructing a commodity data information system and collecting and analyzing commodity circulation data, it can assist in planning production decisions. By constructing a sales merchant management system, various levels of management for sales merchants can be achieved to assist market business operations. By building a product anti-counterfeiting information system, we can crack down on counterfeit, inferior, and pirated products, and establish a good brand image. By constructing a commodity production, sales, and circulation management system, we aim to optimize the allocation of production, sales, personnel, and finances in production enterprises, and solve the problem of resource optimization.

The role for consumers. The combination of mobile phone code scanning and verification information and big data information can help consumers effectively identify fake Chinese Baijiu products and avoid buying fake Chinese Baijiu products. As for the role of the market supervision and administration department, Chinese Baijiu production enterprises adopt advanced Chinese Baijiu traceability and anti-counterfeiting management technology, which helps the market supervision and administration department and consumers better identify fake and substandard products, provide technical convenience for supervision, and reduce the living space of counterfeiters of fake and substandard Chinese Baijiu products and reduce the waste of resources caused by the investigation and handling of fake and substandard Chinese Baijiu.

Currently, there is relatively little research on the use of big data related technologies to develop management systems that integrate traceability, anti-counterfeiting, and management, and there is even less literature available. In the process of exploring the construction of Chinese Baijiu traceability and anti-counterfeiting management system based on big data, this research will provide some literature from system design to completion of construction, which can enrich relevant literature and provide reference for other researchers and production enterprises in other industries.

2.Literature review

2.1 Definition of Big Data

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Due to the rapid development of digital technology, the technologies for data generation, storage, processing, and application are constantly being updated and developed. Researchers at different times have different opinions on what exactly big data is. Therefore, this article collects and organizes relevant theories on big data in different periods by consulting relevant materials, and puts forward its own views.

The concept of big data first appeared in 2008, when researchers such as Bryant R. E from the Computing Community Consortium Committee of the Computing Research Association proposed in a white paper titled "Big data computing: Creating revolutionary breakthroughs in commerce, science, and society" that what truly matters about big data is its new uses and insights, Not the data itself (Bryant R E, Katz R H, Lazowska E D, 2008). In 2011, the National Science Foundation (NSF) defined big data as "a large-scale, diversified, complex and long-term distributed data set generated by multiple data sources such as scientific instruments, sensor devices, Internet transactions, e-mail, audio and video software, and online click streams" (Hilbert M, Lopez P, 2011). In the same year, the McKinsey Global Institute also defined big data as a collection of data that is so large that it greatly exceeds the capabilities of traditional database software tools in terms of acquisition, storage, management, and analysis. It has four characteristics: massive data scale, fast data flow, diverse data types, and low value density (Yang Chengxin, 2019). In the "14th Five Year Plan" for the development of the big data industry released by the Ministry of Industry and Information Technology of China in 2021, a new definition was given to big data. Big data is a collection of data, characterized by large capacity, multiple types, fast speed, accurate accuracy, and high value. It is a new driving force for promoting economic transformation and development, and a new way to enhance government governance capabilities, It is a new opportunity to reshape the national competitive advantage (Ministry of Industry and Information Technology of the People's Republic of China, 2021).

The author of this article puts forward his own viewpoint based on the era and practical work experience. He believes that big data is data generated through artificial intelligence technology or collected through modern information technology. These data are stored in a certain structure, recording information related to one or more fields, and continuously increasing over time. It is a digital resource library with a particularly large amount of data.

2.2 Big Data Features

Based on the current practical situation of big data applications, a brief summary of the characteristics of big data is provided as follows:

Firstly, data is generated through artificial intelligence technology or collected through information technology means. Today, multiple scenarios of people's daily life, production activities, and economic activities have been assisted by artificial intelligence technology, which actively stores various data of human activities and system operation data (Li Hao and Zhou Yuanyuan, 2023). In addition, in today's rapidly developing information technology, the combination of information technology means and data collection equipment can effectively collect various data on the natural environment, social environment, and human activities. The emergence of artificial intelligence technology and the collection of data through information technology have gradually formed big data for the entire society.

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Secondly, data is stored according to a certain structure. The core of big data is data, and according to the current form of data, we can divide it into two types: structured data and unstructured data (Feng Zhiyan, Guo Xunhua, Zeng Dajun, Chen Yubo, Chen Guoqing, 2013). Structured data consists of clearly defined information, stored and managed according to predefined databases, and can be analyzed and studied based on predefined data models. Unstructured data refers to data that does not have a fixed organizational structure, such as video, audio, images, text, and other information, and has the characteristics of complex and diverse types of data. Today, both structured and unstructured data are stored in large-scale distributed storage systems according to a predetermined structure.

Thirdly, data records information from one or more domains. The generation of data comes from a certain activity or application scenario, which belongs to a certain field or is a fusion of multiple fields. The data generated from these scenarios will record information about the domain or domains to which the scenario belongs. For example, the data recorded in the medical service scenario of a hospital belongs to the medical field, and this data also belongs to the public service field. It is integrated with data from other fields such as education, housing, and transportation to form urban big data.

Fourthly, it is a digital resource library with a particularly large amount of data. All kinds of data collected through artificial intelligence technology and modern information technology are stored digitally and distributed according to a certain structure, and data interaction is conducted through the Internet to form a digital resource database with a particularly large amount of data. This digital resource library is jointly constructed by the entire human society, forming data information that records the entire society over a certain period of time. The data in the digital resource database is public, which can be accessed by the public through the Internet. The vast majority of data is privatized and controlled by data owners (including but not limited to government agencies, enterprises, social organizations, individuals, etc.), who can conditionally authorize third parties to view it.

Fifth, data has high value. Due to the emergence of big data, massive, unordered, and multimodal scientific data has been generated (Luan Meisheng, Li Junchu, Yuan Li, 2023), which has economic value and research value. Data itself does not generate value, but it can be analyzed and utilized to serve business and generate economic value, including data assisted decision-making, data driven business, data transactions, data analysis, etc. For example, in the Internet marketing business, big data can better help businesses find target customers and achieve accurate customer marketing. Big data is a new phenomenon formed with the development of information technology and artificial intelligence technology in the 21st century, and has high research value. Scientific research itself will form big data, which is an important component of scientific research. More importantly, big data itself has its own patterns of generation, as well as the natural states and models formed by data, and there are also inherent connections and patterns within data. The study of these patterns, connections, and models can help humans better study human society and utilize big data.

3. System design and development

3.1 Main Technologies

Cloud Native technology. Cloud Native technology is a hot technology in current cloud computing. This project will use this technology in the development of Chinese Baijiu traceability and anti-counterfeiting system.

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The main advantage is that the cloud platform is the core, and the application uses an automated, scalable and reusable architecture. Cloud Native is a software development and deployment strategy based on cloud computing, specifically referring to a flexible software project engineering team that adheres to the principle of rapid development, uses a lot of automated development tools during the development process, and develops multiple specific business applications deployed on cloud platforms to meet the ever-changing customer needs of the business. The development philosophy of Cloud Native technology mainly includes containerization, microserviceization, management automation, distributed architecture, API declarative, continuous development, and application transferability.

Microservices. Microservices are the core concept of cloud native, which can be independently deployed, small, and autonomous business components that interact with each other through information. The components of microservices can scale independently according to requirements, with good coupling and fault recovery capabilities. The essence of microservices is to divide a large application into several low coupled small applications, with each application interconnected and running independently for maintenance. A microservice application is an independently running program module with certain functions, which provides data services for the entire system application. If there is a problem with this program module, it will not affect the operation of the entire system application and other applications. The main reason why our project team adopts microservices in development is due to the actual situation faced by project development and the advantages of microservices themselves. The project is funded by the company where the project team members work. The development needs to rely on the cloud platform provided by the company. The business is mainly aimed at Chinese Baijiu manufacturers in southwest China. The demand of each manufacturer varies greatly, so using microservices can adjust some applications according to the demand. Microservices are the mainstream in the era of big data and cloud computing, with advantages such as cross platform application, fast launch, independent deployment, independent operation, easy application expansion, and convenient operation and maintenance. This can help project teams improve work efficiency, save time and funds in development.

Data security management technology. The core of data security management technology is data isolation storage, with independent logical and physical layers, building a secure and effective data warehouse, and hierarchical prevention. After the completion of the project system, it will be used by Chinese Baijiu production enterprises. The system will produce Chinese Baijiu production, circulation, anti-counterfeiting and other big data related to the Chinese Baijiu production enterprises. This data is very important for enterprises, and is the business secrets and business values of enterprises. Therefore, the security management of system data is very important and also an important part of this project construction, so the security management technology of data isolation storage is used. The main contents of data security isolation storage management technology include data independence, data security, data integrity, concurrency control, and fault recovery.

Intelligent algorithms. Intelligent algorithms are based on data from different application scenarios, combined with certain mathematical and algorithm models, to complete the analysis of relevant data and provide feedback on the results. The algorithms applied in this project mainly include intelligent validation algorithms and data mining algorithms. The intelligent verification algorithm is mainly aimed at the anti-counterfeiting query verification scenario. During the production of Chinese Baijiu products, according to the internal code and external code produced by the algorithm, combined with the product circulation data and the data such as the

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time, place, frequency and method of consumer queries, it is processed according to the scoring model designed by the project team, compares the evaluation score with the preset judgment score, and feeds back the product authenticity judgment results. The data mining algorithm is designed to better analyze and utilize the data generated by the system. Based on the needs of enterprise production and sales, combined with classification and regression models, custom algorithm rules are used to obtain new data sets, laying the foundation for data visualization.

3.2 Design Principles

Build an integrated platform. The overall project adopts the technical architecture of "cloud platform as the center, microservice as the connection, application as the interaction, and content as the extension". This advantage lies in the realization of data unification, interaction unification, and strong scalability. System integration is realized through "converged services", and business flexibility and convenience are realized through microservice development framework, thus promoting the integration of Chinese Baijiu traceability and anti-counterfeiting management system resources from fragments to multiple clients, To achieve the goal of decentralized application and centralized management.

Integrated design of design, implementation, and operation and maintenance. The project follows the principle of integrated design, fully considering the entire process requirements for preliminary design, mid-term implementation, and later operation and maintenance. The entire process system is incorporated into the design requirements from the beginning to ensure the continuity of construction and future sustainable development requirements, and achieve closed-loop management of iterative optimization and improvement services. Normativeness and standardization. Strictly implement the relevant standards and norms of the Chinese government and industry organizations, and refer to the current mainstream technology route for promotion if there are no relevant standards and norms. In terms of architecture, advanced enterprise architecture methods are applied, and the development direction applies relevant standards and specifications such as microservices and adaptation. In terms of security, OWASP standards are applied.

Flexibility and maintainability. The project system should be easy to expand, upgrade, and transplant, and have flexible parameterized configurations to support business processing, flexibility in restructuring and updating business functions, and the ability to flexibly add new business applications without affecting the original business functions of the system. It should be able to adjust according to the needs of different enterprises and reduce the need for duplicate development. Having a flexible and evolving technological structure.

Scalability and scalability. It has an open and scalable system architecture that allows the system to integrate with other application systems, and new functional modules can be quickly added or customized. It has smooth distribution, upgrading, and flexible scalability, allowing different computing tasks to be distributed to different machines without hindering the operation of other parts.

Usability. The system design is aimed at the end user and must ensure ease of operation, understanding, and control; The problems that occur in the system can be predicted in a timely manner and resolved quickly. The users of this system include Chinese Baijiu production enterprises, market sales management personnel of Chinese Baijiu enterprises, dealers, retailers, and consumers. It is necessary to fully consider the character-

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istics of various types of users, in order to make users operate more conveniently. In particular, retailers and consumers can complete relevant operations only by scanning their mobile phones.

3.3 Critical Route

One item with dual codes, combining internal and external codes to achieve anti-counterfeiting management. In view of the loophole that one thing one code technology is easy to copy in many current Chinese Baijiu products, the Chinese Baijiu traceability anti-counterfeiting management system developed this time will use one thing two code technology, the external code is the circulation information code, and the internal code is the anti-counterfeiting key code. The external code and internal code of each commodity are different. There is an algorithm verification relationship between internal code and external code. This algorithm can intelligently identify the authenticity of Chinese Baijiu products through internal circulation information data and user query data.

Write permission hierarchical management, build Chinese Baijiu information data system, and achieve traceability management. According to the production, circulation, sales and other different links of Chinese Baijiu products, different user terminals and information writing permissions can be set according to the different roles of each link, which can realize the construction of Chinese Baijiu commodity information data system and traceability management. That is, a certain Chinese Baijiu product leaves the factory from the manufacturer, and can enter the circulation data only after entering the circulation link, and can enter the sales data only after entering the sales link. After consumers verify and query, they can enter the write off link, which can accurately record the data of each link of the Chinese Baijiu product from production to consumers, and achieve traceability management.

Digital coding adopts channelized and regional management to build a commodity circulation and distribution management system. Chinese Baijiu production enterprises carry out digital coding for Chinese Baijiu products. The coding adopts the channelized and regionalized management mode, that is, the product codes of different channels, dealers and regions are different. Each commodity is strictly managed according to the channels, dealers and distribution regions. Information needs to be entered in each link, and channels, dealers and regions are bound to build a commodity circulation and distribution management system. In this way, we can obtain the inventory data of production enterprises, the purchase and shipment data of dealers, the purchase and sales data of retailers, and the use data of consumers after verification, so as to better understand the distribution of Chinese Baijiu products, which can provide a powerful reference for production decisions.
Multi client management, precise grasp of data. Chinese Baijiu traceability and anti-counterfeiting management system is mainly composed of production enterprise client, merchant client and consumer client. The production enterprise client and merchant client support PC and web applications, and consumer client mainly uses WeChat applet. The production enterprise client mainly has functions such as product production information coding, product distribution channels and regional coding, product distribution management, and user management. The dealer merchant client mainly has functions such as product sales management, circulation information input, and retailer management. The retailer merchant client mainly has functions such as product sales management. The consumer client mainly has functions such as product information inquiry, anti-counterfeiting verification, and information feedback.

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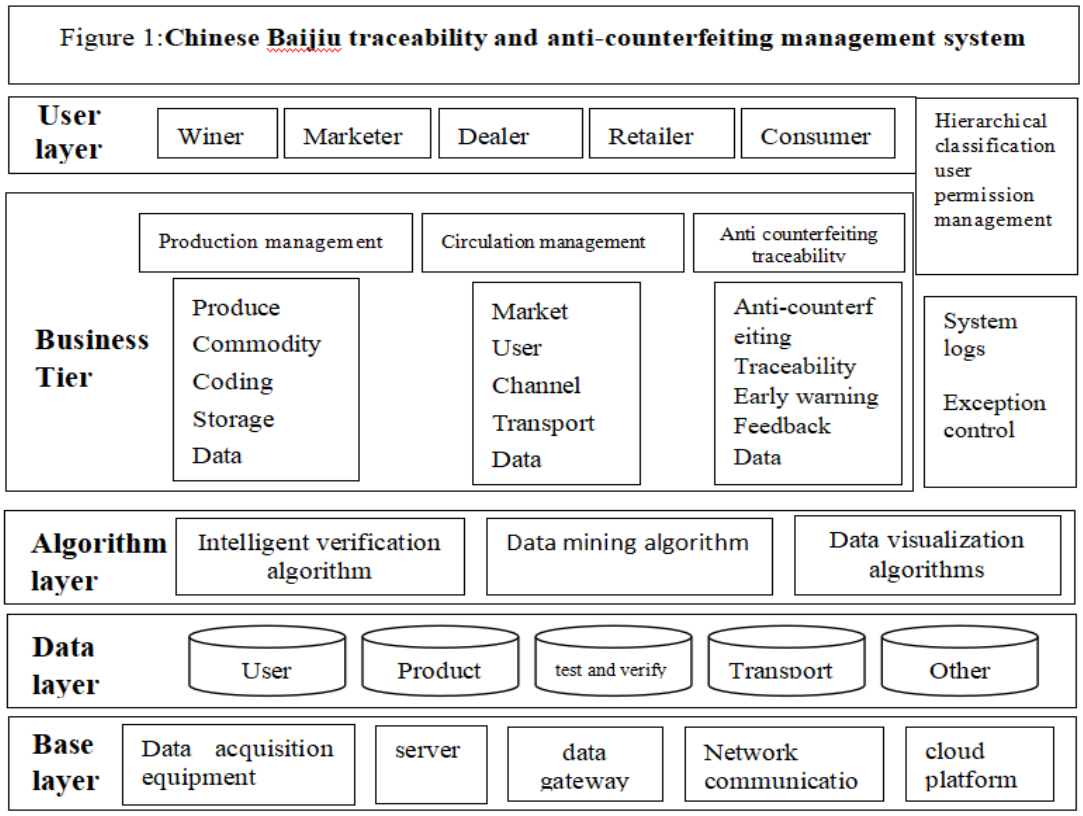
Development method of front-end and back-end separation.For the application system in the mobile Internet era, the front end focuses on user experience, and adapts to the terminal type, while the back end focuses on business logic and system performance. Traditional application software has a tightly coupled front-end and back-end, and developers generally need to develop the front-end and back-end together, which cannot be separated. However, in fact, the process and technology used for front-end and back-end development, as well as the requirements for the abilities of developers, are different. Traditional application software development cannot achieve separation of front-end and back-end development due to architectural and technical limitations. This project requires the integration of new technologies such as microservices and HTML5, using a development technology that combines cloud native and microservices to achieve a front-end and back-end separation development model.

3.4 System Design

The design of Chinese Baijiu traceability and anti-counterfeiting management system fully consulted the opinions of Chinese Baijiu industry experts, manufacturers, dealers and retailers. The system design focuses on three modules: traceability, anti-counterfeiting, and sales management. From the collection of enterprise Chinese Baijiu production and sales data design to intelligent algorithm design, it took three months to determine the system design scheme. The system adopts B/S development mode, builds a service-oriented system architecture, and determines the overall architecture of the Chinese Baijiu traceability and anti-counterfeiting management system at the basic layer, data layer, algorithm layer, business layer, and user layer, as shown in Figure 1.

Figure 1:**Chinese Baijiu traceability and anti-counterfeiting management system**



3.5. System development and testing

The front end of the Chinese Baijiu traceability and anti-counterfeiting management system is mainly com-

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pleted through HTML5, Vue3, WeChat applet, etc., and the back end is mainly completed through PHP+Java (PHP is responsible for the WEB layer, Java is responsible for the data layer and algorithm layer). At present, the project team has completed the development of the test version of Chinese Baijiu traceability and anti-counterfeiting management system. The project team is trying to deploy it on the company's Alibaba Cloud proprietary cloud platform. It plans to manage the project through the unified cloud management platform, and conduct online running tests at the same time.

After completing the test version of Chinese Baijiu traceability and anti-counterfeiting management system, the project team simulated a Chinese Baijiu enterprise according to the system application scenario, selected three Chinese Baijiu products, and simulated multiple pieces of data from multiple users such as manufacturers, dealers, retailers, and consumers. The testing methods include black box testing and white box testing. According to the test results, the traceability, anti-counterfeiting, and sales management functions of the system have been well implemented, and the system runs relatively stably. Although there were 57 error messages or bugs during operation, they have been resolved through analysis and repair by the project team.

4. Summary and Discussion

4.1 Summary

The traceability and anti-counterfeiting management system of Chinese Baijiu is mainly oriented to the industrial application of Chinese Chinese Baijiu industry. The project breaks through the traditional anti-counterfeiting technology ideas, traceability technology ideas, and commodity sales management technology ideas, changes the single scheme route, integrates traceability, anti-counterfeiting, and sales management functions, takes big data technology as an opportunity, data information as the basis, cloud native and micro service as the technical route, and intelligent verification algorithms and data mining algorithms as the core to build a comprehensive Chinese Baijiu commodity information data system. Strictly control each link of data collection, data storage, data processing and data mining, and realize the traceability, anti-counterfeiting and sales management functions of Chinese Baijiu products with big data as the support. Through big data as the bridge, the functions support and contact each other to improve the reliability of intelligent verification algorithms. The project team has currently completed the development of the beta version, and further modifications and adjustments need to be made according to the actual needs of the enterprise. For the two-dimensional code scheme of encryption and coding algorithm, the project team has submitted a patent application to the China National Intellectual Property Administration of China, which is a part of the project and also helps to protect the intellectual property rights of the project.

4.2 Discussion

Although the design of Chinese Baijiu traceability and anti-counterfeiting management system fully considered the opinions of industry experts, Chinese Baijiu enterprises, dealers, retailers and consumers, and a certain number of data tests were conducted by simulating Chinese Baijiu products, there are still some places that the project team did not think of, which requires the project team to adjust and improve according to the actual operation results of the system in Chinese Baijiu production enterprises. Meanwhile, although the first generation intelligent encryption algorithm's QR code scheme has applied for patent protection, there is still a risk of being cracked, which requires the project team to continue designing a more secure second generation intelligent encryption algorithm's QR code scheme. The Chinese Baijiu traceability and anti-counterfeiting

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management system is mainly aimed at the industrial application of Chinese Baijiu industry. There are many products similar to Chinese Baijiu in the market. The project team proposed the assumption that the system can be applied to other high value-added fast food and cosmetics after revision.

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