Research and development of liquor anti-counterfeiting information platform based on blockchain technology

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Abstract. The proliferation of fake wine has brought a serious blow to the healthy development of the liquor industry. Existing public anti-counterfeiting information platform cannot be self-certified and lacks credibility; The enterprise self-built anti-counterfeiting information platform has large investment, long maintenance, and low output in the early stage. It is suitable for well-known brands with strong strength. Therefore, this paper uses block-chain technology to distribute high, open and transparent, can not cheat, can not be tampering, information security and other technical characteristics; Based on the investigation and analysis of the requirements of the anti-counterfeiting information platform based on block-chain technology, a new anti-counterfeiting mechanism based on block-chain technology is proposed; An anti-counterfeiting information platform scheme based on block-chain technology is proposed by identifying and breaking through the key technologies implemented by the system; Finally, the system application demonstration project was carried out by more than 150 small and medium-sized liquor enterprises under the Sichuan Wine Group. The results show that the platform can effectively solve the problem of authenticity of verification information, and it can be self-certified and credible.

Keywords: Liquor industry, Blockchain technology, Information security platform

1 Introduction

In recent years, the phenomenon of fake wine in the liquor industry has spread seriously[1, 2]. Although relevant measures have been taken to crack down on counterfeiting and selling, but the widespread circulation of fake wine in the market has not been fundamentally solved, resulting in a decrease in the purchasing power of white wine, and the difficulty of brand promotion faced by liquor companies has further increased. In order to reduce the serious damage caused by liquor fraud to the image of liquor companies, many wine companies have developed anti-counterfeiting technology related to liquor[3-5]. These anti-counterfeiting technologies can curb the circulation of counterfeit liquor in the market to a certain extent, but in the process of implementation. The economic cost is too large, making it difficult for many small and medium-sized liquor companies to complete independently. Enterprises are eagerly looking forward to creating a white wine information anti-counterfeiting platform that can effectively

verify the authenticity of information, simple verification, simple credibility, and low operating cost to purify the liquor market order. This platform can reduce the sales loss of liquor enterprises, improve the competitiveness of enterprises, and promote enterprise informatization .

Therefore, the anti-counterfeiting information platform based on blockchain technology has broad market prospects in the process of the development of liquor industry with its high feasibility, simple operation and low operating cost.

2 Blockchain concept and application analysis

2.1 Blockchain related concepts

Blockchai[6-9]is a new application mode of computer technology such as distributed data storage, point-to-point transmission, consensus mechanism, and encryption algorithm. The blockchain system is generally divided into a public chain, a coalition chain, and a private chain according to different application scenarios and design systems. Among them, each node of the public chain can freely join and exit the network, and participate in the reading and writing of data on the chain. The operation is interconnected in a flat topology, and there is no centralized server node in the network. Each node of the alliance chain usually has an organization corresponding to it, and can only join and exit the network after authorization. Each organization organizes an interest-based alliance to jointly maintain the healthy operation of the blockchain. The write permission of each node of the private chain is controlled by internal control, and the read permission is selectively opened to the outside. The proprietary chain still has a common structure for multi-node operation of the blockchain, which is suitable for internal data management and auditing of specific organizations.

2.2 Analysis of the application of blockchain technology in the field of anti-counterfeiting

Ve-Chain [10]released the world's first NFC anti-counterfeiting chip based on blockchain technology based on blockchain technology, and proposed Android mobile phone application for ordinary users to solve the problem of true and false checking and making supply chain issues transparent. Ve-Chain hopes to build a transparent supply chain platform based on blockchain technology which can re-define the relationship between brand, producer and consumer by giving each product a “V identity” and “VID” on the blockchain. Resulting in an era of consumption without fakes and only trust.

The Industrial Bank [11] determined to build a pilot project based on the blockchain technology anti-counterfeiting platform. After comprehensive consideration of the current development status of the blockchain, external application cases and the actual needs of the Industrial Bank .The platform can quickly and effectively solve certificates and anti-counterfeiting problems of the various types of contracts and certificates. The results show that the use of the platform creates more economic benefits for the Industrial Bank in the field of security and anti-counterfeiting.

An Rui [12] and other use blockchain technology combined with IC card chip, designed a safe anti-counterfeiting system. The system integrates the chip technology, blockchain technology and Android technology to give the user an Android program installed on the phone to check the authenticity of the jewelry. Through the program to quickly identify the authenticity of the product, it can be foreseen that the anti-counterfeiting of high-end items in the market will be carried out on the blockchain platform.

Ding Qingyang etal [13] use blockchain technology to achieve information asymmetry and product information in B2C sales by means of distributed storage architecture, blockchain connection, waterfall effect, combined with cryptography, consensus algorithm, smart contract and other technologies. Traceability and anti-counterfeiting issues. The ultimate goal is to achieve the spread of counterfeit and shoddy products which is no one in the online retail market.

Yang Yunyong etal [14] proposed a wine anti-counterfeiting traceability application scheme based on the combination of secure RFID and blockchain technology. By adopting the alliance chain mode of secure RFID products and authentication nodes, the production of chips, the production of labels, the issuance of keys, the association of labels and wine information are added to the alliance chain, and all nodes are transparent in production information.Breaking through the drawbacks and weaknesses of the traditional traceability anti-counterfeiting system, such as easy copying, opaque information, easy data tampering, poor security, relatively closed, etc., it has laid a solid foundation for creating a brand new wine product credit system.

Blockchain technology is widely used in the field of anti-counterfeiting. In view of the serious problem of counterfeiting in the liquor industry, this paper considers the establishment of a liquor anti-counterfeiting information platform based on blockchain technology.

3 Research and development of liquor anti-counterfeiting information platform based on blockchain technology

In recent years, regulatory authorities, industry associations, and wine companies have developed anti-counterfeiting technologies and anti-counterfeiting information platforms. However, the phenomenon of fraud is still difficult to contain. First of all, the anti-counterfeiting information platform developed by the wine companies, the regulatory authorities, and the industry associations cannot be self-certified, lacking credibility, and consumers have doubts about using them. Secondly, due to the commercial data leakage problem on the public platform, the willingness of the wine companies to participate is not in the end, the construction methods of individual security platforms have repeated problems, high development costs, serious waste of social resources, and problems that small and medium-sized liquor companies cannot afford. Therefore, the development of a liquor anti-counterfeiting information platform based on blockchain technology has important significance both in theory and in practice.

The construction of liquor anti-counterfeiting information platform based on blockchain aims to realize the sharing and sharing of alliance chain resources by virtue of specialization, process and scale. Focusing on providing customized services, it mainly

includes anti-counterfeiting technology design, anti-counterfeit label printing and client development for anti-counterfeiting identification. The anti-counterfeiting information platform uploads the information of alcohol products to the blockchain in time, breaking through the drawbacks of traditional anti-counterfeiting traceability system information opaque, data tampering, poor security, relatively closed, etc., laying a solid foundation for creating a brand new wine product credit system. . The overall plan design implementation route is as follows(see in Fig.1)

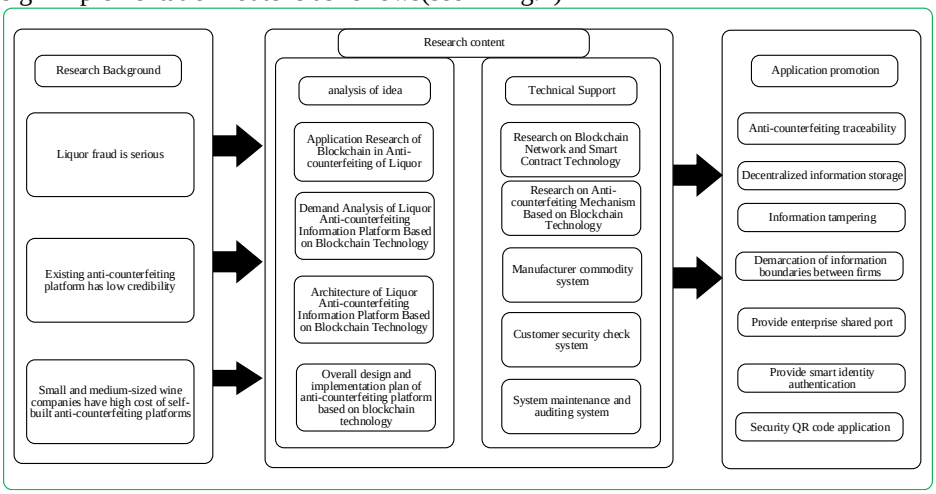

Fig.1. The overall plan design implementation route

3.1 Construction steps of liquor anti-counterfeiting information platform based on blockchai

Overall planning and system design of liquor anti-counterfeiting information platform based on blockchain technology

*Application of blockchain in anti-counterfeiting of liquor.*Select the in-depth research of liquor industry, systematically analyze the use effect of blockchain in anti-counterfeiting of liquor, anti-counterfeiting ability, large-scale application potential, reduce the ability of counterfeit and shoddy products, and indirectly enhance the brand reputation of liquor industry and improve the market development ability of liquor enterprises. .

Demand analysis of liquor anti-counterfeiting information platform based on blockchain technology. Organize liquor research, extensively demonstrate and study the pain points and strategic needs of enterprises in anti-counterfeiting, analyze the advantages and disadvantages of existing systems, and clarify the functional requirements, technical requirements, product requirements, implementation requirements, operation and maintenance of blockchain-based anti-counterfeiting platforms.

Architecture of liquor anti-counterfeiting information platform based on blockchain technology. The application architecture of the blockchain-based anti-counterfeiting information platform is studied. The architecture includes the system's functional model,

network model, data model, technology platform structure, and engineering implementation structure.

Overall design and implementation plan of anti-counterfeiting platform based on blockchain technology. The overall design of the liquor anti-counterfeiting platform based on blockchain technology, after in-depth study and demonstration of various schemes, determine its preliminary framework, and then carry out the overall system design and study the detailed technical implementation plan.

Development of liquor anti-counterfeiting information platform based on blockchain technology . Focusing on the research and breakthroughs of the following five major key technologies, through a large number of research and demonstration, technical research, a set of anti-counterfeiting systems based on blockchain technology with relatively complete functions and large-scale implementation in the liquor industry can be realized.

Research on blockchain network and smart contract technology. Establish a dedicated distributed network of blockchains for small and medium-sized liquor companies. The liquor company joins the distributed network through the license, and submits data information to the network according to the requirements. The enterprises in the network realize the transparent sharing of data, data anti-tampering and data traceability through the blockchain technology. The main research contents include security licensing technology application, data encryption and decryption mechanism, and the combination of smart contracts and commodities.

Research on anti-counterfeiting mechanism based on blockchain technology. Based on the characteristics of blockchain network and the status quo of liquor industry, combined with computer technology, research on the anti-counterfeiting mechanism of liquor products and improve the anti-counterfeiting effect of liquor products. It is required to have the characteristics of simple mechanism, reasonable cost, convenient use and outstanding anti-counterfeiting effect.

Manufacturer's commodity system. The manufacturer's commodity system collects the manufacturer information, product information, and production information of liquor products, and establishes virtual liquor products on the blockchain network, and through the unique logo, makes the virtual liquor products one-to-one corresponding to the actual liquor products. The research content includes the commodity information data chain-up mechanism, the anti-counterfeiting label generation mechanism, the construction of the commodity information database.

3.2 technical solutions

Overall software architecture of liquor anti-counterfeiting information platform based on blockchain. Based on the blockchain, the liquor anti-counterfeiting information platform combines the blockchain technology with the liquor industry characteristics, develops and builds application service software, and forms a complete liquor anti-counterfeiting information platform with blockchain technology as the core. Its overall system software architecture is shown(see Fig.2).

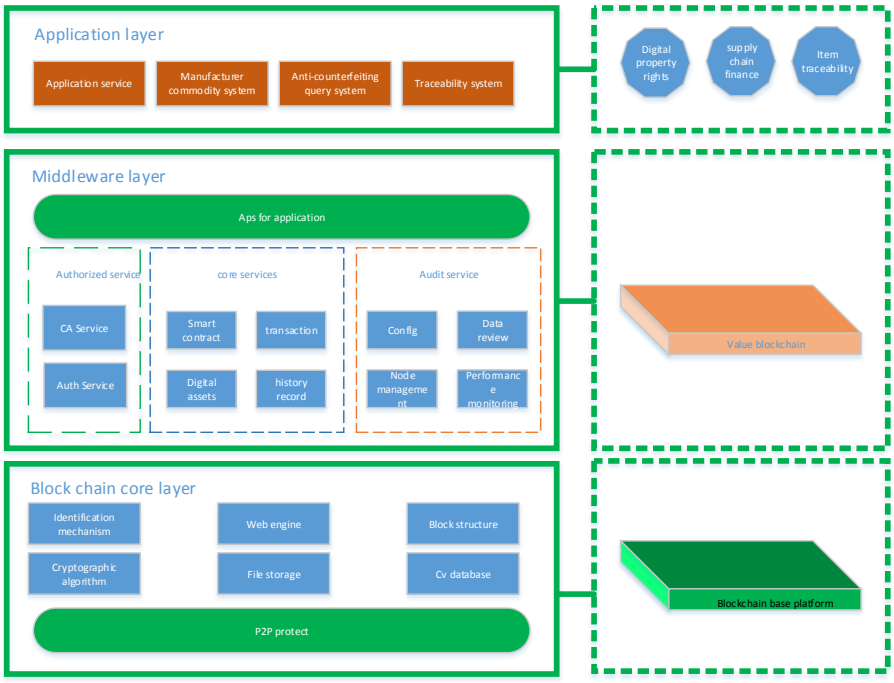

Fig. 2. system software architecture diagrams

As shown in Figure 2, the core layer is the core technology of the blockchain network, and provides software functions such as distributed network, block storage, state storage, encryption and decryption algorithms, consensus mechanism, and smart contract virtual machine. It is a blockchain application. The middle layer is the middleware of the interaction between the application layer and the core layer. The smart contract of the anti-counterfeiting information platform is written in the middleware layer. The data structure of the liquor commodity information is also established in the middleware layer. The application layer provides the anti-counterfeiting business logic and system. Maintenance audit, business data storage, human-computer interaction, etc.

Topology structure of liquor anti-counterfeiting information platform based on blockchain technology. This platform is based on blockchain network, combined with Web services technology, database technology, cryptography technology, front-end human-computer interaction technology and other technologies to form a complete information technology architecture. Its software topology is shown (see in Fig.3):

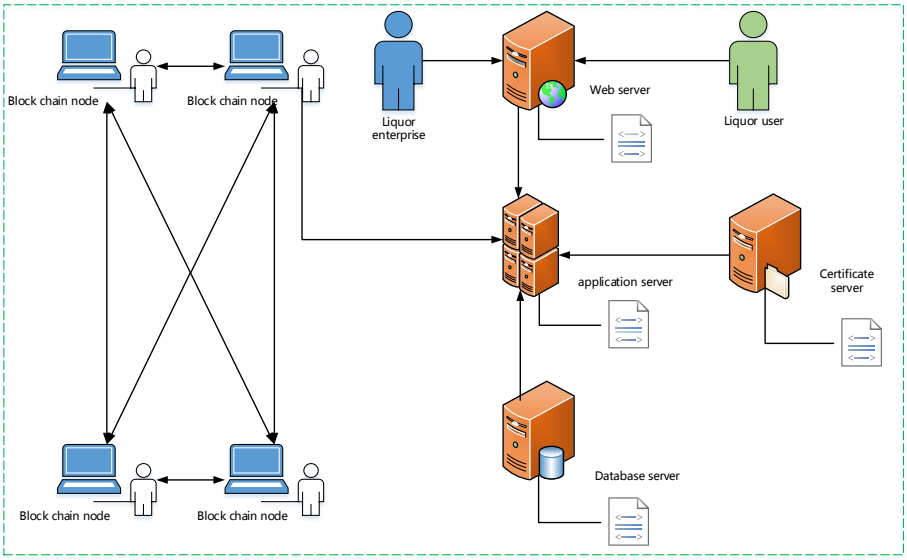

Fig. 3 . software topology

4 Application analysis of liquor anti-counterfeiting information platform based on blockchain in Sichuan Wine Group

The liquor anti-counterfeiting information platform based on blockchain technology is supported by the alliance chain of blockchain and color two-dimensional code. The innovation of the chainchain's alliance chain technology lies in the adoption of a distributed storage structure, which is a distributed ledger, a technical solution for collectively maintaining a reliable database through a decentralized approach. It has the characteristics of decentralization, openness in the alliance, autonomy, and inability to tamper with information. It uses cryptography, consensus algorithms, smart contracts and other technologies to achieve tamper-proof and anti-counterfeiting of information in the process of information collection, circulation, and sharing. Traceable and leak proof. The color two-dimensional code is not easy to be counterfeit, and is not easy to be damaged. The special printing method prevents the two-dimensional code from being worn, and has the characteristics of being exposed and damaged, and the identification is difficult to be transferred; the compatibility is strong, and the two-dimensional code security label can be used by the mobile phone or other terminal equipment. Automatic Identification. It has strong practical value and is promoted by Sichuan Wine Group and its more than 150 small and medium-sized wine enterprises. The expected functional value is:

Decentralized information storage. Each enterprise saves a large amount of hardware or management organization that stores information, avoids the high operation and maintenance cost of the centralized structure, improves the transparency of alcohol anti-counterfeiting management, records and tracks the changes in the asset attributes of goods in the supply chain, and obtains the consensus of the whole network. Realize

the record, evidence and accountability of trading behavior, and realize the dynamic tracking and traceability of liquor.

Anti-counterfeiting information cannot be tampered with. The data stored by the blockchain is more stable and has no tampering and non-repudiation. It increases the cost of fraudulent repudiation by all parties and further clarifies the boundaries of responsibility of all parties.

Defining the information boundary between wine companies. The platform ensures that the confidential information and core data of the wine company will not be leaked, and the enterprises are in an equal state. Every anti-counterfeiting inspection will generate relevant data to be provided to consumers, and at the same time, it will refuse to view other enterprise nodes through encryption, and improve its own security.

Provide enterprise shared port. It makes anti-counterfeiting more convenient, efficient, and saves money. Especially for small and medium-sized wine companies, it can greatly reduce its anti-counterfeiting development costs, concentrate on better products and services, and focus on building a wine supply and demand environment that will make consumers safe and secure. .

Intelligent identity authentication. Combining the characteristics of blockchain technology to design an identity authentication scheme, complete the relevant smart contracts for node joining, each enterprise has only a unique public key and corresponding private key in the blockchain network, and strictly examines the enterprise nodes joining the platform. To ensure the confidentiality of the information pool.

Use QR code. The two-dimensional code replaces the RFID technology, does not require a dedicated reading and writing machine, and has low manufacturing cost. At the same time, it meets the labeling requirements for storing alcohol traceability information; it has the characteristics of being non-reproducible and not transferable seamlessly, which increases the difficulty of counterfeiting; and has strong prevention. It can also be used as a traceability source for alcohol to protect its brand.

5 Conclusion

The blockchain-based liquor anti-counterfeiting information platform not only can reduce the operating cost of wine enterprises, but also enhance the reputation of liquor brands. It also lays a solid foundation for creating a brand-new wine product credit system through the establishment of liquor big data platform. In addition, the platform can be applied to other liquor companies in the country to provide complete sets of technology, implementation experience and application demonstration models.

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