# Application of Blockchain Technology in Tobacco Commodity Information System

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**Abstract:** At present, the information management methods of tobacco commodities are mostly through manual inspection of anti-counterfeiting certificates and anti-counterfeiting codes. The information collection methods are traditional and inefficient. By printing a unique QR code on tobacco commodities, the traceability information of cigarettes can be quickly collected through QR code association. Using the distributed storage, information disclosure, and non-tampering characteristics of blockchain technology to build a tobacco product information management system can effectively improve the supervision of tobacco commodities by tobacco commercial companies and reduce the labor cost in the process of collecting tobacco product marketing data With the cost of time, timely detection of illegal sales such as fakes and channeling goods guarantees the brand value of tobacco products. At the same time, big data analysis is performed based on the collected marketing data to provide data support for tobacco marketing.

## 1. Introduction

The authenticity of tobacco products in the tobacco industry, product traceability, and marketing are directly related to the development of the tobacco industry. At present, the informatization and automation construction of the tobacco industry is in a leading position in the manufacturing industry, but at the same time, the informatization construction of the supply chain among tobacco companies still has great development space and development potential. The traditional way of inspecting and recording tobacco commodities adopts methods such as inspection of transportation permits, business licenses, and printing of commodity codes. The authenticity depends on experience or precision tests. The results are either incorrect or too cumbersome to provide reliable identification results in time. At the same time, when tobacco commodities are delivered to the retailer, they will no longer be able to track their sales, and they can only make statistics based on the retailer's account information, unable to obtain valid consumer information, and the statistical effect is poor. Therefore, it is necessary to design a tobacco information management system with strong reliability, information sharing capability, and convenient collection, in order to achieve the purpose of authentic and reliable tobacco commodity information, and diverse and scalable information collection methods.

With the development of information computing and the popularization of intelligent terminals, the application of QR codes is becoming more and more extensive. Compared with traditional barcodes, QR codes have a larger storage capacity, higher error correction capabilities, and can store numbers, letters, Chinese characters and other information. The rapid popularization of mobile Internet and smart terminal devices allows consumers to easily identify the QR code and query the traceability information of commodities to verify the authenticity. The application of QR code technology to the management of tobacco product information can effectively improve the efficiency of the collection of traceability information of tobacco products, facilitate consumer inspection, and provide powerful data support for combating illegal marketing activities such as tobacco chasing and counterfeit goods, and marketing data analysis of tobacco products .

Blockchain technology is a kind of application exploration of distributed storage, point-to-point transmission, consensus mechanism, encryption algorithm and other computer technologies. Its core

technologies include distributed ledgers, asymmetric encryption, consensus mechanism, and smart contracts. Through the above technology, it can effectively ensure that the data on the blockchain is open and transparent, the data is true and reliable, and the information on the chain can be traced to the source. It can establish a highly reliable information system with low credit costs. Blockchain relies on its characteristics of decentralization, non-tampering, and authentic and credible information. The advantage of blockchain technology in the field of tobacco traceability is that when the traceability data is stored on the chain, the results cannot be modified, and all users on the blockchain have access to the data. Greatly improve the reliability and authenticity of the tobacco product information management system, and increase the brand value of tobacco products.

## 2. Tobacco Commodity Information System Design

The characteristics of blockchain technology are very in line with the needs of tobacco commodity information management business. The basic purpose of applying blockchain technology to the information management system of tobacco commodities is to use the features of blockchain technology such as non-tampering, open and transparent information, distributed storage, and consensus mechanism to realize the authenticity and reliability of tobacco commodity information. For tobacco commercial companies, life cycle information management of tobacco commodities is divided into the following stages:

1) Raw and auxiliary materials information management stage;
2) Tobacco industry company production information management stage;
3) Purchase information management stage of tobacco commercial companies;
4) Tobacco business company sorting information management stage;
5) Management stage of purchase order information of tobacco retail households;
6) Tobacco retailer sales information management stage.

For each stage of tobacco product information, use different roles to upload and store the tobacco product information, and the commercial company's blockchain account can access all the tobacco product information of the blockchain depository. Using the tobacco business company's blockchain account to open the tobacco commodity information access interface, you can use the tobacco commodity information management system to provide a variety of services. Provide data support for tobacco commodity sales supervision and tobacco commodity marketing data analysis.

According to the whole process of production and sales of tobacco products, the QR codes of packaged cigarettes and packaged cigarettes need to be associated on the tobacco product production line, and when the packaged cigarettes are packaged into pieces, the number one project of packaged cigarettes and packaged cigarettes Code. Thus, the traceability information query of the whole process of tobacco production and sales can be realized.

Through the association of the QR code and the No. 1 engineering code, the tobacco product information can be conveniently collected throughout the entire life cycle of the tobacco product. It enables commercial companies to quickly and effectively obtain information on tobacco commodities, and utilizes the characteristics of the blockchain that cannot be tampered with, open and transparent to ensure the reliability of information. According to the QR code technology and blockchain technology, the design of tobacco commodity information management system is divided into the following modules:

(1). QR code management module

By generating and printing QR codes for tobacco commodities, it is realized that each tobacco product has a unique QR code corresponding to it, and the QR codes of tobacco products with different specifications are bound to bind to realize the entire process of the life cycle of tobacco commodities Information entry.

Use the QR code management module to generate, distribute, and bind QR codes for tobacco commodities, and provide an interface for uploading tobacco product information throughout the entire life cycle of tobacco commodities. During the circulation of tobacco commodities, by scanning the QR code of the tobacco commodities or the No. 1 engineering code, the production, binding, warehousing, sales, logistics, sorting and other information of the tobacco commodities are recorded

in real time to provide traceability for the entire process of the life cycle of tobacco commodities Full data support.

According to the whole process of tracing tobacco commodities, the module needs to include the following systems:

1) QR code production, distribution and printing management system.

2) The binding system of industrial company package conditional QR code and No. 1 engineering code.

3) Warehouse information management system of industrial company.

4) Distribution information management system of Logistics Company

5) Information management system for sorting cigarettes in commercial companies.

6) Commercial company order distribution information management system

This module is developed in the form of a web service and collects information such as the binding, logistics, and sorting of QR codes through a dedicated QR code information collection device to provide services for tobacco commodity information management.

(2). Blockchain certificate storage module

After collecting the tobacco commodity information through the QR code, the tobacco commodity information needs to be uploaded to the blockchain for certificate registration. Blockchain is divided into three major forms: public chain, private chain and alliance chain. The public chain uses a consensus mechanism based on workload, which is suitable for virtual asset transactions and is not suitable for information deposit management application scenarios. The private chain is a "weakly centralized" blockchain and belongs to a specific institution. Because there are multiple links in the entire process of the life cycle of tobacco products, it is difficult to use the private chain to provide an interface for information storage the form is also not applicable to the management of tobacco commodity information. The alliance chain is also a "weakly centralized" blockchain, but the alliance chain is a chain jointly initiated by several institutions and organizations. It combines the characteristics of public and private chains and uses improved fault tolerance (PBET) as an alliance The consensus algorithm of the chain, with low cost of certificate storage, is suitable for application scenarios of tobacco commodity information management.

According to the actual application scenarios of the tobacco industry, build a tobacco product traceability alliance chain and an intermediate database. The members of the alliance chain include: tobacco industry companies, logistics companies, warehousing companies, and tobacco commercial companies. Since the information on the blockchain is open and transparent to all members on the chain, in order to protect the business secrets of the company, the sensitive information on the chain is the hash value of the traceable information, and the anti-collision property of the hash calculation to ensure that the traceability information cannot be tampered with. Intermediate databases include: industrial company production information intermediate database, warehouse management intermediate database, logistics management intermediate database, commercial company order management intermediate database, tobacco business companies have access to all four types of databases, and are guaranteed through alliance chain query and storage The authenticity of the data in the intermediate database.

The flowchart of the tobacco commodity information on-chain certification business is shown in Figure 1, and the business process is as follows:

1) The tobacco industry generates anti-counterfeiting and traceable QR codes, and binds the box code, bar code, and piece code information.

2) After the production process is completed, the packaged goods are stored in the warehouse for warehousing, and the hash code of the piece code storage information is stored on the chain.

3) After the tobacco commercial company initiates an order to the tobacco industry company, it will deliver the specified number of tobacco packaged products, and the packaged products will be stored on the chain and stored on the chain.

4) After the logistics company receives the order for the packaged products of cigarettes, it enters the piece code information and carries out the on-chain certificate storage of the logistics order information.

5) After receiving the packaged goods, the tobacco commercial company will hash the receipt information for on-chain certificate storage, unpack the packaged goods, and put them into the sorting line.

6) After the retailer applies for a purchase order from the tobacco business company, the sorting line will sort the tobacco commodities, and at the same time bind the sorted tobacco sticks to the retailer's order and carry out the merchandise order information. Deposit certificate on the chain.

7) When consumers inquire about the traceability information of tobacco information, they can access the anti-counterfeiting traceability query interface of tobacco products opened by China Tobacco by scanning the QR code on the cigarette.

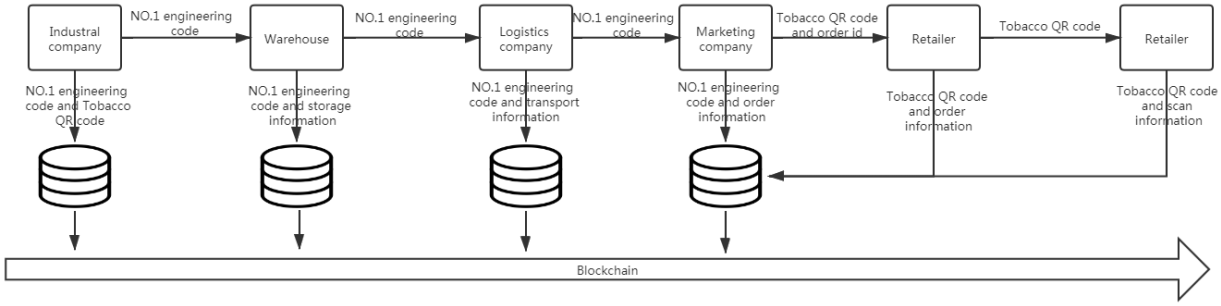


Figure 1. Business process of tobacco blockchain

(3). Anti-counterfeiting traceability service module

Tobacco commerce companies have access to tobacco product data and can obtain information on the entire life cycle of tobacco commodities. Therefore, based on the business company's tobacco product information management model, it can provide tobacco commodities information services for retail customers, consumers, and inspectors.

1) Retailer management application

Based on the tobacco business company's access and collection of tobacco commodity information, according to the retailer's store management needs, it provides retail customers with incoming commodity management and commodity inventory management services. Based on the retailer's purchase orders and distribution, the commercial company automatically synchronizes the retailer's tobacco commodity inventory; during the sales process, the retailer scans the tobacco commodity QR code to record the sales of tobacco commodities and reviews the retailer's cigarettes. Commodity inventory is automatically synchronized.

Use special QR code collection equipment for retail tobacco products to supervise retail households' sales of tobacco products. By scanning the QR code of tobacco commodities, illegal marketing behaviors such as channeling goods and selling counterfeit goods of retail households can be found in time.

2) Consumer applications

The main purpose of consumer applications is to provide consumers with brand confidence in tobacco products and to ensure the authenticity of tobacco products. At the same time, due to the popularity of mobile code scanning terminals such as mobile phones, the authenticity of tobacco commodities can be verified quickly and easily by scanning the QR code of tobacco commodities.

After consumers purchase tobacco commodities, scan the QR code of tobacco commodities through mobile terminals such as mobile phones to provide consumers with anti-counterfeiting traceability of tobacco commodities. By displaying the traceability information of the entire process of the life cycle of tobacco products and the blockchain verification ID of the tobacco product information certification certificate, the traceability information of tobacco products is guaranteed to be true and reliable.

3) Application of inspectors

By developing an application client for tobacco commodity information query for inspectors, it provides tobacco inspector information query function for inspectors. By scanning the QR code of

tobacco commodities, you can check whether the transportation, distribution and retailer orders of the tobacco commodities match, and promptly and quickly detect illegal marketing such as channeling goods and counterfeit goods.

## 3. Conclusion

From the perspective of the application of blockchain technology in the tobacco commodity information management system, the unique encoding of tobacco commodities through QR code technology, and the application of blockchain technology to the management of tobacco commodity information will greatly improve the information of tobacco commodity The reliability of management facilitates the uploading, supervision, and inspection of tobacco product information in its various processes, and at the same time provides retail customers, consumers, and auditors with true, accurate, and reliable traceability information of tobacco products, and the brand value and anti-counterfeiting of tobacco products Ability brings huge improvement. On this basis, commercial companies can also analyze the marketing information and sales data of tobacco commodities by analyzing big data of tobacco commodities to provide powerful data support for commercial companies' marketing strategies.

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