SciencePG
Science Publishing Group

Research on the Management Mode of College Financial Electronic Archives Based on Block Chain Technology

Yuan Xuemei

Department of Finance, Jiangsu University, Zhenjiang, China

Email address:
edianxue@qq.com

Abstract: In the context of electronicization, this article focuses on the four prerequisites for direct archiving of electronic accounting documents based on block chain technology. It is believed that there is a high correlation between the authenticity and reliability of financial electronic records and block chain technology, the access rights of university financial electronic records and the trustworthy authentication mechanism of block chain, the construction of financial electronic record supervision system and block chain consensus mechanism, and the limitations of financial business rules and block chain smart contracts. On the basis of correlation analysis, a block chain based university financial electronic record management model was constructed from the aspects of application layer, smart contract layer, business node, and data layer. The main positions and roles of various entities on the chain were analyzed in detail, including bill issuers, bill users, bill receivers, and bill searchers. This model has the characteristics of fast response speed, high security, and the ability to achieve paperless financial records, and can effectively meet the needs of university financial electronic record management. However, this electronic record management model still faces significant challenges in deployment mode, ecosystem establishment, security management, smart contract design, and other aspects, which need to be given attention in practical work. On the one hand, block chain technology can enhance the informatization level of financial electronic record management in universities; On the other hand, it can effectively improve the convenience of searching for financial electronic archives information in universities. With the continuous integration of block chain technology and the education field, establishing a secure, reliable, convenient, and open university financial electronic record management system will inevitably become a reality.

Keywords: University Financial, Electronic Archives, Block Chain

1. Introduction

With the continuous development of higher education in China, the scale and teaching quality of Chinese universities are constantly expanding and improving. The economic exchanges have correspondingly become more frequent; this directly leads to a rapid growth trend in the number of financial archives in universities. As the number of archives continues to increase and the number of data searches also increases, the traditional management model of financial archives in universities is no longer suitable for the development of this situation. With the birth and development of information technology, universities have also begun to apply information technology to financial archive management, and there have been models of post copying and scanning paper archives to form financial electronic archives.

However, this model is not only time-consuming and labor-intensive, but also the electronic archives formed are not truly financial electronic archives. They can only meet the needs of inquiry and do not meet the requirements of direct reimbursement and entry of electronic accounting vouchers. According to the Notice on Standardizing the Filing and Reimbursement of Electronic Accounting Vouchers (Cai Kuai [2020] No. 6) [1], legitimate and authentic electronic accounting vouchers, i.e. various electronic forms of accounting vouchers received by units from external sources, have the same legal effect as paper accounting vouchers and can be used for reimbursement and accounting filing; But there are also four prerequisites for electronic accounting vouchers: firstly, they have been verified to be legal and authentic; 2. Transmission and storage are secure and reliable, and any tampering should be detected in a timely manner; 3.

Electronic accounting vouchers and their metadata can be accurately, completely, and effectively received and read, and comply with national regulations, and can effectively prevent duplicate entry of electronic accounting vouchers; 4. The relevant archiving and management needs to comply with the requirements of the Accounting Archives Management Measures, including establishing a retrieval relationship between electronic accounting archives and other related paper accounting archives, and attaching electronic signatures that comply with the provisions of the Electronic Signature Law of the People's Republic of China. In practice, financial archives are only archived and stored in electronic form, which already has a legal basis. However, in practice, it is still necessary to study and explore how to achieve the four prerequisites mentioned in the Finance and Accounting [2020] No. 6 document.

2. The Construction of Financial Electronic Archives in Universities and Literature Review

Electronic accounting vouchers have been popularized nationwide, and various electronic invoices, electronic passenger tickets, electronic itineraries, electronic customs payment books, and bank electronic receipts are being fully applied.

Electronic accounting vouchers have been accelerated nationwide, and various electronic invoices, electronic passenger tickets, electronic itineraries, electronic customs payment books, and bank electronic receipts are being fully applied. However, in terms of current technology, the direct archiving of electronic accounting vouchers still has a long way to go, and there are the following problems that need to be solved: (1) How to quickly and efficiently achieve the authenticity and legality of bills. (2) How to ensure the security of transmission. (3) How to securely and reliably store and backup mechanisms. Due to the characteristics of decentralization, tamper resistance, transparency, data traceability, and anonymous security, block chain technology has advantages in obtaining, storing, and tracing expense reimbursement information. It has great application value in solving the authenticity and secure transmission problems in the direct archiving process of electronic accounting vouchers. Therefore, this article draws on block chain technology to conduct research on the management of electronic financial archives in universities.

With the deep integration of technologies such as big data, cloud accounting, and robot process automation with accounting informatization, the academic and practical communities have explored the application of block chain technology in the accounting industry in the block chain era. Cheng Ping and Dai Jia [1] optimized the robot process automation in core modules such as reimbursement application, automatic approval of bills, and fund payment management around the expense reimbursement process of the financial sharing center, providing practical reference for the optimization of enterprise expense reimbursement processes. Li Jun and Yu Yongsheng et al. [2] focus on the source of accounting information and explore how to utilize the information transparency characteristics of block chain technology to ensure the authenticity and reliability of accounting information from the source. Hao Susu [3] believes that accounting informatization can utilize the technological features of block chain to effectively integrate data acquisition, storage, transmission, processing, and other aspects of accounting informatization, solving the difficulties of existing accounting informatization in these aspects. Zhou Xiaoyun [4], Qian Xiufang [5] and others focused on exploring the applicability and application value of block chain technology in the management of university student archives, and initially proposed a university student archive management model based on block chain technology. Wang Xiaoman [6] summarized and looked forward to the application status and trends of blockchain technology in electronic record management in China. Shen Yu [7], Dong Miao [8] and others conducted research on the system architecture of university finance based on block chain technology, constructed a university finance system architecture based on block chain technology, and finally proposed application suggestions for block chain technology in the development of university financial management. Dong miao [9] proposed an intelligent financial system architecture for universities based on block chain technology.

Based on the coupling analysis between block chain and procurement sharing, Hu Qilei [10] proposed the idea of building a block chain based procurement sharing big accounting system, providing more application ideas for block chain in procurement sharing and financial management work.

Zhang Yan [11] analyzed the problems in the current informationization construction of financial archive management in universities, and proposed some specific measures to carry out informationization construction in financial archive management in universities. AL-SAQAF W, SEIDLER N [12] believed that block chain not only accelerates the transaction speed of the supply chain, but also reduces costs and enhances trust. MACKEY T K, NAYYAR G [13]assert that block chain can improve supply chain information sharing, making the pharmaceutical supply chain more trustworthy and secure. Zhu Wentao [14] Medical digital archives store medical information in digital form, which helps to provide more convenient medical services. Through data sharing, the quality of medical services can be improved, promoting the positive development of the medical industry. KUO T [15] believes that the decentralization, distributed storage, immutability, and traceability of blockchain have the potential to solve the challenges faced by medical digital archives.

Looking at the above literature, existing research mainly discusses the entire financial activities of units from a macro perspective, elaborating on the changes and challenges that block chain technology brings to the entire accounting industry. Some studies have proposed the application of block chain in student file management, but although there are

requirements for tampering resistance between student file management and financial file management, there are also significant differences. The formation of financial files involves multiple links and a wide range. The application of block chain in the management of electronic financial files in universities has not yet been studied.

3. Correlation Analysis Between Electronic Archive Management and Block Chain Technology

The reliability, security, tamper resistance, and trustworthiness mechanisms of block chain technology are highly correlated with the authenticity, reliability, anti-duplication, traceability, and immutability requirements of university financial electronic archive management. The specific content of the correlation will be analyzed below.

3.1. The Fit Between the Tamper Proof Nature of Block Chain and the Authenticity and Reliability of Financial Electronic Archive Information

Block chain has a unique timestamp function, as long as information is entered on the chain, it will leave a permanent mark, and no one has the right to change it.

By using block chain technology, transaction information is automatically synchronized to the school's accounting information database at the same time as each transaction occurs, effectively preventing improper operations afterwards and fundamentally ensuring the authenticity and reliability of information. This feature ensures that in electronic archive management, ticket information cannot be modified on the block chain, thus ensuring the authenticity, integrity, reliability, and security of electronic archives. Therefore, the tamper proof nature of block chain is used for the management of financial electronic archives information, which can effectively achieve and ensure the authenticity, reliability, traceability and other requirements of university financial electronic archives. At the same time, by applying block chain, the system will automatically connect the school's own management information system with external trading systems, truly achieving consistency between internal and external information, solving the problem of information asymmetry, reducing the internal approval authority of universities, preventing fraudulent behavior in technology, and curbing the motivation for accounting fraud.

3.2. The Fit Between the Trusted Authentication Mechanism of Block Chain and the Granting of Access to Financial Electronic Archives in Universities

Financial electronic archives require that the recording, management, and usage units of vouchers are absolutely trustworthy and have certain permissions. In the block chain network, the computers and other terminals used by various entities involved in the maintenance of block chain data are referred to as a node on the block chain. In the block chain of financial electronic file management in universities, nodes including the government, bill regulatory departments (financial or tax departments), invoice issuing units, and bill reimbursement units (invoice header departments) are all registered with government departments or tax authorities, The bill user does not have permission to modify the bill information during the bill transfer process, which ensures the credibility of each node on the block chain, so that the competent department, sales company, purchase company, handling personnel, financial personnel, auditors, etc. can access financial information after obtaining certain usage permissions, effectively improving the efficiency of accessing and viewing financial files.

3.3. The Fit Between Block Chain Consensus Mechanism and the Construction of Financial Electronic Archive Information Management and Supervision System

The consensus mechanism can prevent financial fraud by utilizing the block chain network to establish an alliance chain between the government, bill regulatory departments (financial or tax departments), sales units, and purchasing units. As long as the information entering the alliance chain is reliable and trustworthy, an electronic archive information supervision system can be effectively established.

3.4. Compatibility Between Smart Contracts and Financial Business Rules

The code that smart contracts verify, execute, and store on the block chain is based on pre designed instructions to complete the business logic assigned by the user. A smart contract designed based on business logic can effectively eliminate non-compliant factors in bills, such as overdue bills and incomplete itineraries, thereby improving the quality of accounting information. Smart contracts can be applied in the early stages of the formation of electronic financial records in universities, by setting rules and business logic to avoid the occurrence of non compliant bills and events.

3.5. Compatibility Between Smart Contracts and Financial Electronic Archives with Separate Permissions for Query

Smart contracts can be used to connect two block chains, enabling users to smoothly read electronic accounting vouchers. The smart contract reviews the user's identity and authorization status, triggers the smart contract based on identity information and business rules, and completes access to the electronic accounting voucher block chain. A smart contract is a bridge connecting electronic accounting vouchers and users, and the docking and transmission of data are executed and implemented through logically related smart contracts. The design rules of smart contracts can adopt the process of utilizing financial electronic records.

4. Design of Electronic Archive Management Mode for University Finance Based on Block Chain

Electronic archive management has the characteristic of involving the bill management department, sales units, operators, purchasing units, and auditors, and jointly maintaining the main entities on the chain. Therefore, the block chain alliance chain system is selected to build a weakly centralized ecological alliance led by the bill management department, including sales units, purchasing units, operators, and auditors.

4.1. Architecture of University Financial Electronic Archive System Based on Block Chain

Based on the analysis of block chain technology and university financial electronic archive management system mentioned above, a university financial electronic archive system architecture is constructed as shown in Figure 1.

4.1.1. Application Layer

Sales units and handling personnel can generate or select invoices through computers or mobile devices, without being limited by time and location. This ensures convenient work while ensuring data security.

4.1.2. Smart Contract Layer

The smart contract layer automatically recognizes the content of bills, generates computer code that can be automatically executed by generating complex reimbursement rules, and automatically removes bills that do not comply with reimbursement rules, greatly reducing the workload of bill review.

4.1.3. Business Nodes

In specific business scenarios, each node relies on its own scope of responsibility to manage and audit data, making judgments on the rationality and compliance of the data.

4.1.4. Data Layer

The principle of block chain division is to create a private chain for each invoice or business. The financial system uses each transaction or invoice as a block in data storage, and the data of various business blocks does not overlap. Only the business nodes of the private chain, that is, the parties associated with the invoice, can use the private key to complete the business and view the data. On a private chain, each business node completes data verification work according to their own responsibilities and permissions, writes node related information, and confirms the validity and compliance of the data. After each node completes the work, the system stamps it with a timestamp. After all nodes complete the operation on the ticket, the system converts the ticket data into a hash value, encapsulates it with timestamp and block header information into the block, and uses asymmetric encryption technology to encrypt the block. The hash value is used to connect the front and back blocks, record them on the main chain of the private chain, and form a backup at each business node to achieve distributed storage.

Therefore, each invoice private chain will cover basic information of the invoice, sales unit information, sales content and amount information, purchasing unit information, handler information, invoice reimbursement information, invoice archiving information, etc., which can be viewed by all parties related to the invoice according to their permissions.
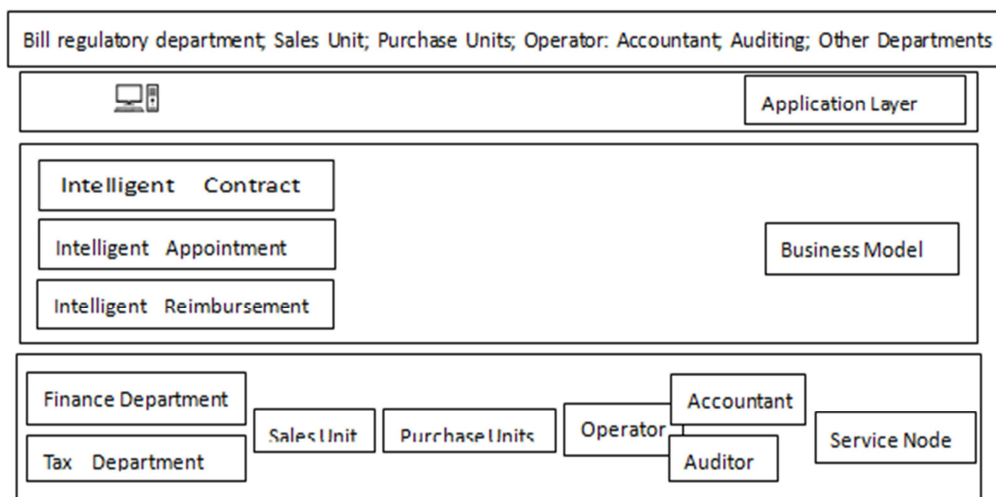

Figure 1. *Architecture of Electronic Archives System for University Finance Based on Blockchain.*

4.2. Main Body Positioning on the Chain

Establish an alliance chain between tax departments, financial departments, sales units, purchasing units, auditing units, and users. The entities on the chain include tax departments, financial departments, sales units, purchasing units, operators, auditors, etc. The process of forming electronic accounting vouchers for the alliance chain is shown in Figure 2.
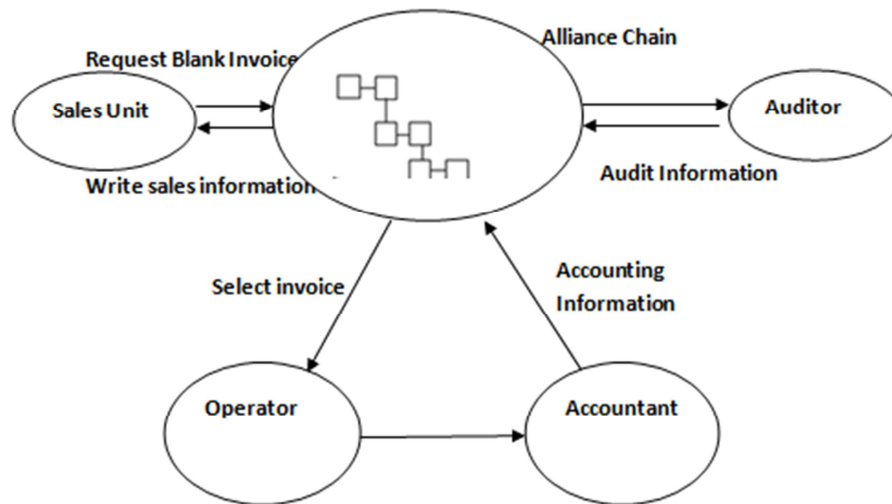
Figure 2. Schematic diagram of the formation of electronic archives in the alliance chain.

According to Figure 2, it can be seen that the positioning of each entity in the financial electronic archive alliance chain is as follows:

The tax department and the finance department are the bill regulatory departments and the founders of the alliance chain. They provide blank bills, are responsible for the establishment of the block chain and the authentication of node joining, ensure that all nodes joining the block chain are trustworthy, and grant corresponding permissions to different entities to jointly operate and maintain electronic archive data on the block chain.

The sales unit is responsible for reading available blank bills from the chain, writing the purchasing unit information, purchasing name and amount based on the information provided by the consumer, and affixing the electronic seal and signature of the sales unit.

The purchasing unit can read all invoices of the purchasing unit on the chain based on their permissions and use them for reimbursement. Due to the trusted mechanism on the block chain, invoices read from the block chain do not require further authentication. After the read invoice is reimbursed by the purchasing unit, the purchasing unit will write the reimbursement related vouchers or other information into the block chain.

The handling personnel are responsible for selecting the electronic accounting vouchers they handle on the chain and making reimbursement appointments. The system automatically records the status of the ticket as booked by the operator.

Accounting personnel read in electronic accounting vouchers and appointment information based on the appointment form, and perform voucher preparation, review, payment processing, and modify the processing status of electronic accounting vouchers.

After the payment is completed, the financial voucher is automatically associated with the bank electronic receipt, forming the completed financial electronic file.

Auditors, handlers, and other functional departments can view relevant financial electronic accounting vouchers according to their authority.

4.3. Characteristics of Block Chain Based Electronic File Management Technology for University Finance

The management of electronic financial archives in universities not only has similarities with other archives management, but also has its own high frequency of query and high requirements for authenticity and reliability. The block chain based electronic archive management model for university finance can precisely meet the requirements of electronic archive management in universities, with the following characteristics:

4.3.1. Fast Response Speed

The block chain of financial archives is equivalent to a transmission chain of bills. Bill information is securely and orderly transmitted on the chain, and the latest status is recorded. There is full trust between various entities on the chain, eliminating repetitive work such as bill verification, and the response speed is fast.

4.3.2. High Safety

The distributed chain storage structure of block chain ensures the fault-tolerance of block chain, that is, if a few nodes encounter problems, it will not affect the data security of the entire block chain; Secondly, block chain ensures that the data on the chain cannot be tampered with and traceable, ensuring the security and reliability of the data. Even if errors occur, real-time positioning and effective processing of errors can be achieved. Finally, based on the block chain architecture of the alliance chain, it ensures that all nodes on the block chain are trusted and authenticated, effectively avoiding illegal intrusion of invalid nodes into the block chain.

4.3.3. Realize Paperless Financial Archives

Under the block chain model, the financial electronic archive management model can meet four conditions for electronic bills to be directly recorded and archived: 1) verification is legal, and the data on the block chain itself is safe and reliable, with sufficient trust, and there is no need to

verify legality; 2) The transmission and storage are secure and reliable, and block chain technology itself can ensure that data on the chain cannot be tampered with and traceable; 3) Accurately, completely, and effectively receiving and reading electronic accounting vouchers and their metadata can achieve the goal of direct entry of electronic bills. From this, it can be seen that the financial electronic file management model under the block chain model can meet the four conditions of direct entry of electronic bills, providing a reference for the management of future financial electronic files in universities.

5. The Difficulties Faced in the Construction of Financial Electronic Archive Management Models

As a new thing, block chain and electronic archives, especially their integration, inevitably face various difficulties and risks in practical applications. Only by overcoming these difficulties and risks can this management model exert its effectiveness in practice. The specific difficulties and risks are as follows:

5.1. Breaking the Deployment Model of Financial Privatization in Universities

The privatization deployment model is widely adopted in the financial system of universities. Under the block chain model, university finance must form an alliance chain with the bill management system, sales units, purchasing units, audit departments, etc. of tax and finance departments, and establish a trustworthy mechanism. This requires that university financial data can be shared within the alliance chain with permission, which will inevitably break the existing privatization deployment model of university finance, Establish a trusted sharing mechanism for the alliance chain.

5.2. Establishing an Ecosystem Is Relatively Difficult

Establishing an alliance chain consisting of a large number of bill regulatory departments, sales units, and purchasing units requires establishing a good ecosystem, which may take a relatively long process.

5.3. Pay Attention to Safety Management

University electronic archives based on block chain have many advantages such as security and non tampering, but data security is particularly important. The block chain technology based distributed storage of university financial electronic archive information in various business nodes significantly improves the requirements for node data security. When deploying the system, each business node should establish a system where private and public networks complement each other. Private networks should be used for data communication within departments or units, and public networks should be used for communication between units. Isolation and connection of data between private and public networks should be done well. The access permissions of private networks should be strictly controlled. When connecting private networks with public networks, professional hardware devices should be used. At the same time, attention should be paid to preventing network attacks, using high security level protection software, and strictly preventing data theft.

5.4. Design and Application of Smart Contracts

The design of smart contracts covers two aspects: on the one hand, they are designed based on business logic. The specific business of universities is often cumbersome and complex, and it is necessary to extract reimbursement rules that need to be followed from specific business and systems, adapt to all businesses, and have a certain degree of stability. After policy adjustments, smart contracts often need to be adjusted in a timely manner. The workload of refining, testing, and adjusting smart contracts is high, with strong logic, which puts higher demands on accounting personnel.

On the other hand, smart contracts stipulate the permissions of various entities and personnel to operate and access financial electronic archives, so that block chain can achieve standardized data usage, precise authorization, and prevent data abuse and illegal use.

5.5. Talent Cultivation

The block chain based electronic file management model for university finance requires accounting personnel to not only have solid accounting theoretical knowledge, but also possess certain block chain management capabilities. Employees in the finance department of universities generally have higher educational qualifications and strong learning abilities. The training of financial department practitioners in universities should add content on block chain and related computers from the traditional accounting personnel training system, so that university financial personnel can better grasp and adapt to modern accounting work.

6. Conclusion

By utilizing block chain technology to manage electronic financial archives in universities, on the one hand, it can enhance the informationization level of electronic financial archives management in universities, promote the digitization and paperless management of financial archives, and ensure the authenticity and traceability of financial archives; On the other hand, it can effectively improve the convenience of querying financial electronic file information in universities. With the continuous development of block chain technology, its integration with the education field will also become increasingly high, providing a feasible path for establishing a secure, reliable, and convenient electronic file management system for university finance.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Ministy of Finance, national Archives Administration. on standardizing reimbursement of electronic accountng vouchers notice of account entry filing, Finance and Accounting [2020] No. 6, March 2020.

[2] Cheng Ping, Dai Jia. Research on Cost Reimbursement Business Big Accounting Based on Block chain Technology [J]. *Friends of Accounting*, 2020(3): 154-160.

[3] Li Jun, Yu yongsheng. The Impact of Block chain Technology on Accounting Information Transparency [J]. *Accounting Research*, 2018(12): 48-51.

[4] Hao susu. Exploration of the Integration of Block chain and Accounting Informatization [J]. *Modern Business*, 2018(25): 145-146.

[5] Zhou Xiaoyun. Exploration of the Application Mode of Block chain Technology in Student File Management [J]. *Journal of Nanjing University of Science and Technology (Social Science Edition)*, 2019, 32(6): 52-57.

[6] Qian Xiufang. Exploration of the Application of Block chain Technology in the Management of College Student Archives [J]. *Office Automation*, 2020(6): 43-45.

[7] Wang Xiaoman. The Application Status and Prospects of Block chain Technology in Electronic Archive Management in China [J]. *Office Automation*, 2020(9): 22-23, 16.

[8] Shen Yu. Application Architecture Design of Block chain Technology in Financial Informatization of Universities [J]. *Journal of DongHua university (Social Science Edition)*, 2019(2): 220-224.

[9] Dong miao. Research on the Architecture of Intelligent Finance System for Universities Based on Block chain Technology [J]. *Friends of Accounting*, 2020(12): 157-161.

[10] Hu Qilei. Construction and application of a blockchain based procurement sharing big accounting system [J]. *Finance and Accounting Monthly*, 2021(13): 75-81.

[11] Zhang Yan. Analysis of Financial Archive Management in Universities under the Background of Informatization [J]. *China's Management Informatization*, 2019, 22(17): 41-42.

[12] AL-SAQAF W, SEIDLER N. Block chain technology for social impact: opportunities and challenges ahead [J]Journal of Cyber Policy, 2017, 2(3): 338-354.

[13] MACKEY T K, NAYYAR G. A review of existing and emerging digital technologies to combat the global trade in fake medicines [J]. Expert Opinion on Drug Safety, 2017, 16(5): 587-602.

[14] Zhu Wentao. Research on the Digital Management Path of Medical Archives [J]. Inside and outside of Lantai, 2019(28): 3-4.

[15] KUO T T, KIM H E, OHNO-MACHADO L. Block chain distributed ledger technologies for biomedical and health care applications [J]. Journal of the American Medical Informatics Association, 2017, 24(6): 1211-1220.