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Design of Chain Store Accounting Information System Based on Blockchain Technology

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Abstract: As the economy develops, many supermarkets, hotels, hotels and so on all exist in the form of chains. Chain stores have many branches, which is difficult to manage. Information management system is widely used in practice, which can manage information efficiently. Blockchain technology can eliminate centralized management data and fully guarantee the security of data. To make chain store management information more convenient and improve data security, this paper has proposed a chain store accounting information system. Based on blockchain technology, the system has three levels: accounting system, management system and decision support system, which can provide financial information, directional information and decision information. This system can continuously and comprehensively monitor and reflect all kinds of information of enterprises and provide basis for management and decision-making. The experimental results showed that the average coefficient of CPU (Central Processing Unit) utilization rate and memory utilization rate of the system designed in this paper is 36% in normal operation, and 62.65% in high pressure state, which indicated that the system has good performance and compression resistance, and can manage information efficiently.

1. Introduction

As the times develop, the data and information become more and more inflated, how to manage this information efficiently has become the key point of the current research. As a subsystem of information management system, accounting information system can predict the development prospect or provide the basis for decision makers to make decisions by collecting, storing, processing, transmitting and analyzing information, and its ability to process information and the security of stored information are the most important. The capacity to centrally manage data using

blockchain technology can significantly increase the security of data storage and processing capabilities.

The practical application of blockchain technology has been researched extensively. Scholar Sun Linhui introduced the information correction factor under the influence of blockchain technology, and simulated the order variability and inventory fluctuation under various demand signals using MATLAB to address the issue of information delay and asymmetry in supply chain systems and speed up the innovative development of blockchain technology in supply chain management. His simulation results showed that the application of blockchain technology improves the accuracy and stability of the inventory system [1]. Scholar Wu Jing combined with the whole process of bidding, and according to theory and practice, put forward some countermeasures to further popularize "blockchain+bidding", so as to better promote the organic and comprehensive integration of blockchain technology and bidding business [2]. In response to the current roadside parking management system's flaws, including its low efficiency and opaque transactions, scholar Xu Han proposed a blockchain-based roadside parking administration system. The solution is based on the attributes of a decentralized blockchain and irreversible data on the chain, which enhanced user privacy and transaction dependability based on business requirements [3].

Nowadays, chain stores are becoming more and more common, and the more branches there are, the more difficult it is to manage them. In order to manage it more simply and efficiently, this paper puts forward a chain store accounting information system, which is based on blockchain technology and divided into three levels: accounting system, management system and decision support system, which can ensure the safety of storing data and improve the ability of processing data. According to the experimental findings, the system proposed in this study operates with an average index coefficient of 36% under normal conditions and 62.65% at high pressure, which suggests that the system has good performance and anti-pressure ability and can manage information efficiently.

2. Blockchain Technology

Blockchain is a chain that is stored on all servers and is made up of successive blocks. The entire system can function and the blockchain is secure as long as another server is managing it [4]. A node is a server that supports the whole blockchain network by acting as a source of storage and processing power. More than half of the nodes must consent for the information in the blockchain to be changed. Therefore, blockchain technology has two core characteristics that traditional network technology does not have: decentralization and difficulty in tampering with data. These two features make the data handled centrally and the information saved by blockchain technology more safe, authentic, and reliable [5].

2.1 Types and Characteristics of Blockchain

The types of blockchain can be divided into three categories: public, private and industry blockchain.

(1) Public blockchain: it is the earliest and most extensive blockchain. Any individual or group in the world can use it to conduct transactions, and transactions can be effectively confirmed by this blockchain.

(2) Private blockchain: generally, only the general ledger technology of blockchain is used for bookkeeping. The user can be a person or a company, and the user enjoys all the reading and writing rights of the blockchain.

(3) Industry blockchain: there are designated nodes within a group as bookkeepers, and the generation of each block is decided by the designated nodes through consultation. Other nodes can participate in trading but cannot keep accounts [6-7].

There are five main characteristics of blockchain technology, namely:

(1) Decentralization: Blockchain technology does not rely on third-party management institutions or hardware facilities, removes centralized management mechanism, uses distributed accounting and storage, and realizes self-information transmission, verification and management among nodes.

(2) Security: tampering with the stored data of the blockchain requires the consent of more than half of the nodes, which can effectively avoid subjective and artificial data changes and make the blockchain more secure.

(3) Openness: blockchain technology is based on open source technology, which only encrypts private information. Blockchain data is open to all personnel, and system information is highly transparent.

(4) Independence: the whole blockchain system does not depend on the third party, and the nodes in the system can automatically and safely verify and exchange data without human intervention.

(5) Anonymity: information transmission can be done anonymously, and there is no need to publicly verify identity information [8-9].

2.2 Blockchain Architecture Model

Data layer, network layer, consensus layer, incentive layer, contract layer, and application layer are the typical building blocks of a blockchain system. In Figure 1, its architecture is displayed.

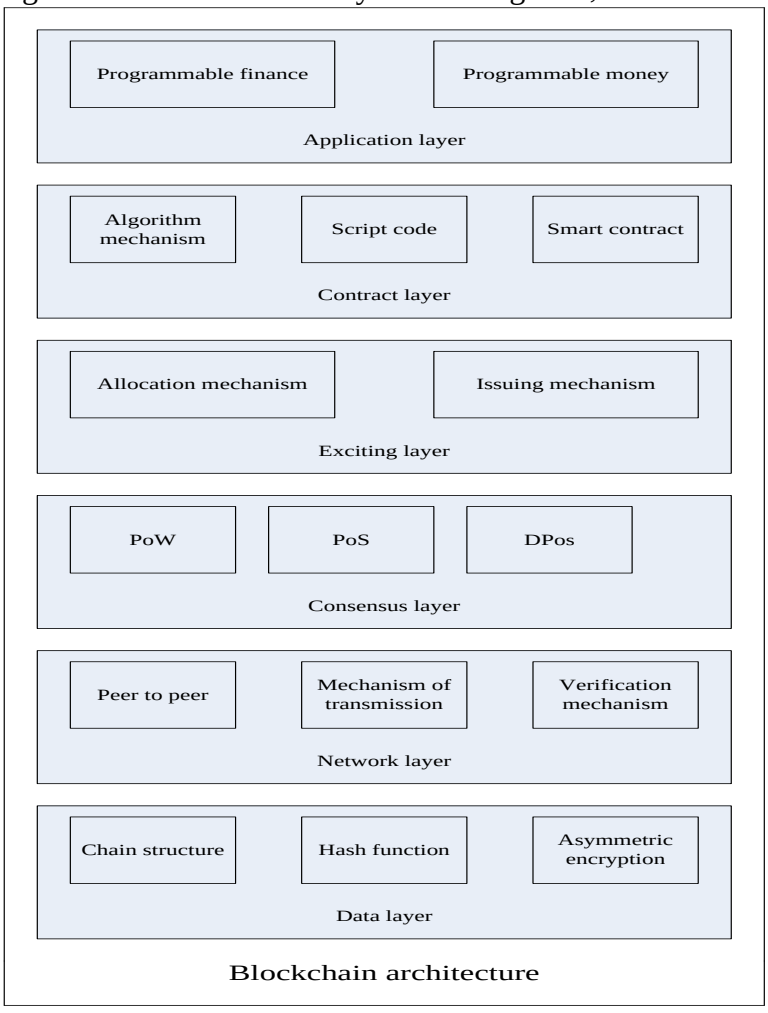

Figure 1. Blockchain Architecture Model

The functions of the data layer mainly include encapsulating the underlying data blocks, data encryption and so on. The network layer is mainly a mechanism for verifying and disseminating data. Consensus layer is used to encapsulate various algorithms of network nodes. The incentive layer integrates economic factors into the blockchain system. The contract layer is used to encapsulate all kinds of scripting algorithms. The application layer is the actual case and scenario of some blockchain applications [10].

2.3 Core Technology of Blockchain

The core technologies of blockchain are:

(1) Distributed account book technology: transaction accounting is jointly carried out by multiple nodes distributed in different blocks, and the account book recorded by each node is complete [11]. Each node of blockchain technology maintains whole data according to chain structure, in contrast to traditional distributed storage technology, which divides data into multiple portions according to set rules. While typical distributed storage technologies back up data to other nodes through storage centers, blockchain technology uses a consensus method to ensure that each node's storage is independent and consistent [12].

(2) Consensus mechanism: this refers to how all nodes reach a consensus and determine the validity of a data record.

(3) Intelligent contract: based on credible and unchangeable data, it is automatically executed according to predetermined rules.

(4) Asymmetric encryption: the transaction data information stored on the blockchain is open and transparent. The account information for trading is highly confidential, and it can only be accessed after authorization [13].

3. Information System

Information system is a system related to information processing, transmission, storage and utilization. It generally includes information management system, decision support system, automatic office system and data processing system [14-15]. There are many methods to develop information system, such as structured method, object-oriented method, rapid prototyping method and so on. Enterprise informatization needs to be based on many information systems, such as:

(1) ERP (Enterprise Resource Planning) system: it is an information system with financial accounting as the core, which is used to identify the resources of planning enterprises.

(2) CRM (Customer Relationship Management) system: customers are classified into customers who can bring profits to enterprises, customers who may lose, and customers who may become competitors after losing.

(3) SCM (Supply Chain Management) system: enterprises often have many suppliers and distributors to form a network together. This system is a supply chain management system, which can manage the relationship among enterprises, suppliers and distributors [16].

4. Detailed Design of Chain Store Accounting Information System

4.1 Design Points of Chain Store Accounting Information System

With the development of information technology, enterprises also need to make changes to have stronger competitiveness. Information technology has expanded the competitive field of enterprises and changed the competitive mode of enterprises [17]. Enterprises can use information technology to make strategy and improve efficiency and benefit. To enhance the competitiveness of chain stores

and improve the efficiency and effectiveness of management, it needs to be informationized. The key points that should be considered in the main tasks of informatization are:

(1) Informatization of management: automatic management of planning, finance, personnel, materials, office and so on. Therefore, it is necessary to build information management system, decision support system, customer relationship management system (CRM), enterprise resource planning (ERP), supply chain management (SCM), and so on.

(2) Informatization of business operation: orders, after-sales service, payment and so on are all informationized.

(3) Accounting informatization: using computers instead of manual accounting and bookkeeping, using modern information technology to integrate and control all information, and using data information to analyze and predict development prospects [18-19].

4.2 System Function Module Design

According to the analysis of the key points of system design, this paper designs a chain store accounting information system. The structural division of the system is shown in Figure 2.

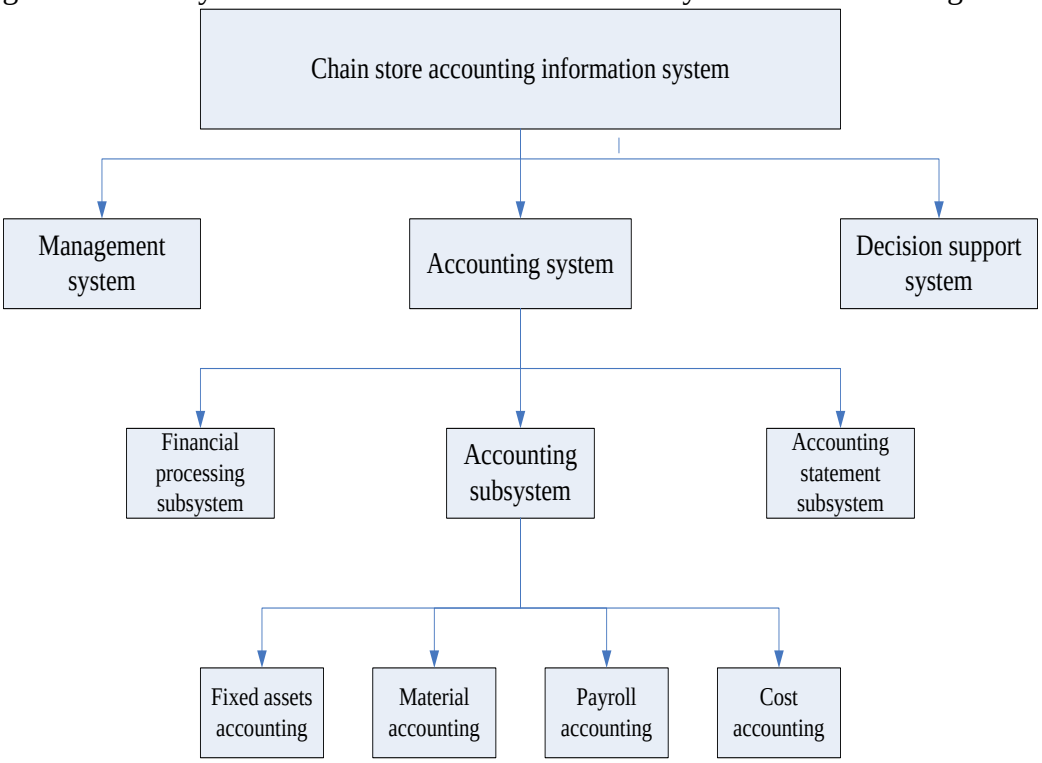

Figure 2. Division of System Structure

The system mainly has three levels, namely, accounting system, management system and decision support system.

(1) Management system: it mainly provides directional information, such as managing fixed and circulating funds, controlling profits, controlling costs, etc., which gives full play to the functions of supervision, control and management of the system.

(2) Decision support system (DSS): it mainly provides decision-making information, and its function focuses on analysis and decision-making. It can use data information to predict the development prospect and provide reliable basis information for decision-making.

(3) Accounting system: subdivision can be divided into financial processing subsystem, accounting report subsystem and accounting subsystem. The function of financial processing

subsystem is mainly to manage accounts, such as entry, review, modification and so on. The main function of accounting statements is to collect and output all information. The accounting subsystem mainly accounts for fixed assets, wages, costs and materials [20].

4.3 System Process Design

The overall operation flow of the system is shown in Figure 3.

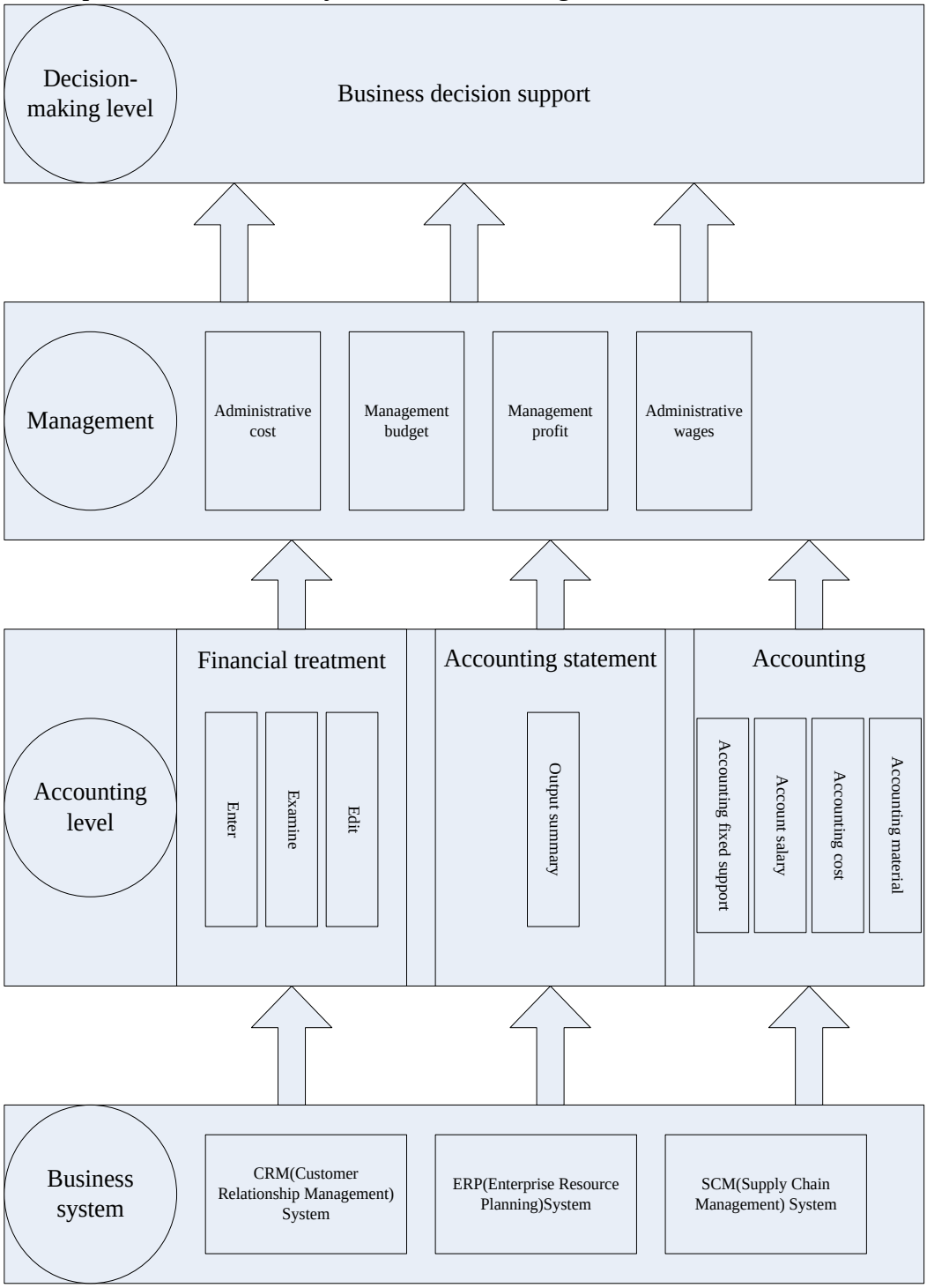

Figure 3. Overall Operation Flow of the System

There are many kinds of business systems, which are mainly oriented to enterprises and serve organizations rather than individuals. First, the cost and assets are accounted in the accounting layer, and then managed according to the information obtained after accounting, and then provided to the policy-making layer.

5. System Testing

It is necessary to test the system to see if it can operate normally and deliver good performance. The goal of the test is to maintain the system running for an extended period of time. By constantly putting pressure on it, the running situation during the period can be observed and the performance of the system can be reflected according to the running situation.

The performance indexes of the design inspection system are CPU utilization rate, memory utilization rate, network broadband and Disk time. The system runs in normal state and high pressure state, and the compression resistance and load capacity of the system are tested. When the system is running, these four indicators are observed at all times to find out the limit value and inflection point of the system and record them. The experimental results are shown in Figure 4.

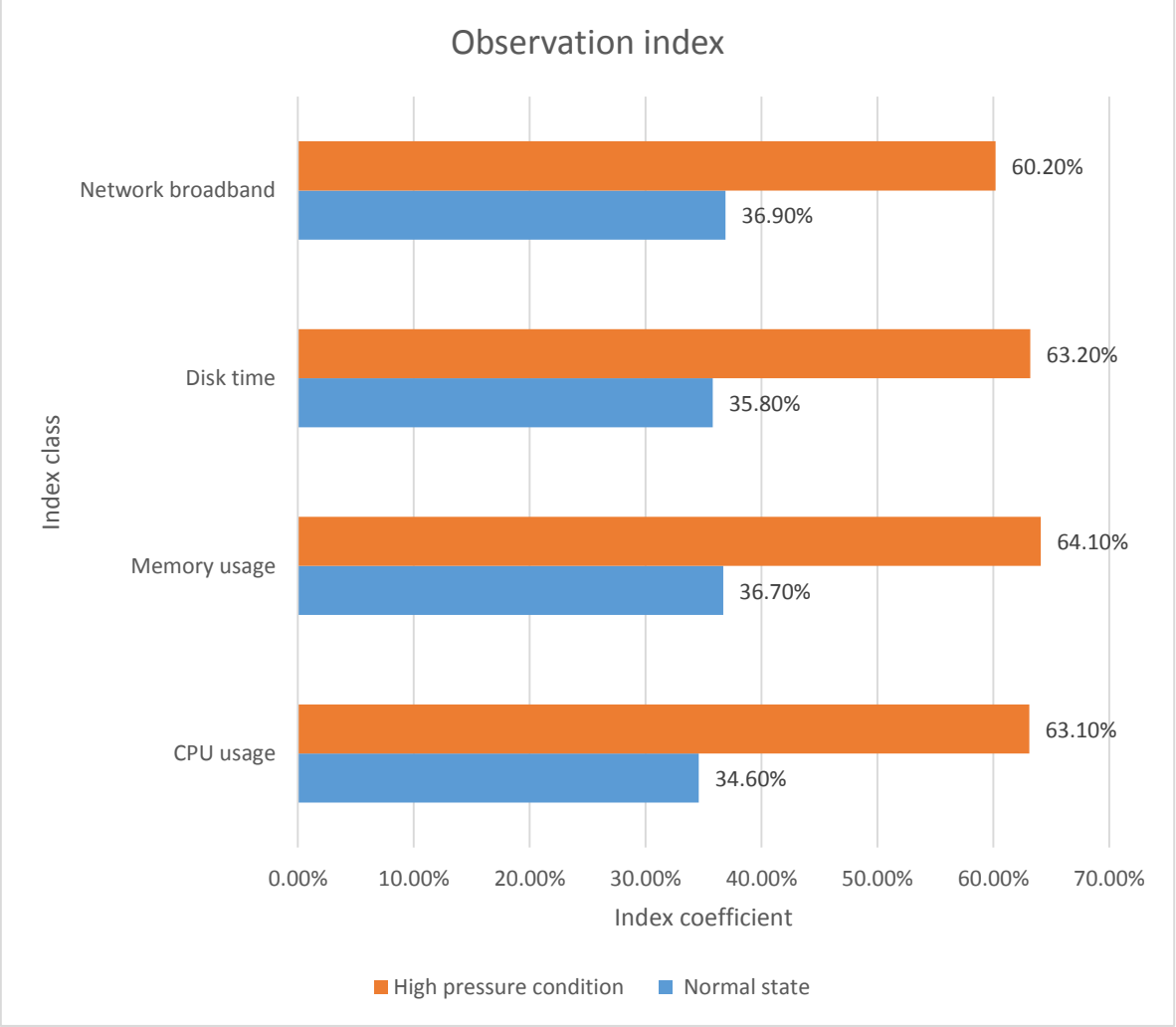

Figure 4. Observation Indicators

As can be seen from Figure 4, the indicators coefficient evaluation of the system designed in this paper is 36% in normal operation, and the average index coefficient is 62.65% in high-pressure

state, which suggests that the system has good performance and compression resistance and can also maintain good operating conditions in high-pressure state.

6. Conclusion

Aiming at the research on the design of chain store accounting information system based on blockchain technology, this paper introduces the classification and characteristics of blockchain technology in detail, and compares it with traditional technology, pointing out that blockchain technology has the advantages of decentralization and difficulty in tampering with data, which can ensure data security and manage data efficiently. By studying the information system, this paper analyzes the key points that enterprises should pay attention to in informatization, and designs a chain store accounting information system according to the key points. The system mainly has three levels: accounting system, management system and decision support system, which can provide financial information, directional information and decision information. It realizes the informationization of management, business operation and accounting, etc. In order to test whether it is effective, the experimental results show that the system designed in this paper has an average index coefficient of 36% in normal operation and 62.65% in high-pressure state, which shows that the system has good performance and compression resistance and can manage information efficiently.

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