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Retraction

Retracted: Framework Design of Science and Technology Venture Capital Salary Management System Driven by Blockchain Technology

Mobile Information Systems

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] R. Yang and P. Niu, "Framework Design of Science and Technology Venture Capital Salary Management System Driven by Blockchain Technology," *Mobile Information Systems*, vol. 2022, Article ID 6784385, 10 pages, 2022.

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Research Article

Framework Design of Science and Technology Venture Capital Salary Management System Driven by Blockchain Technology

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The aim of this article is to study the framework design of science and technology venture capital salary management system driven by blockchain technology. Firstly, it expounds on the background and research significance of enterprise salary management. According to the current theory and research direction of salary management in domestic science and technology enterprises, combined with the mode of salary management in domestic enterprises, it analyzes the current situation and existing problems of enterprise salary management and the relevant algorithms driven by blockchain technology, among which the typical is consensus algorithm. Then, the salary management system is established, and the use cases of the system are analyzed according to the operation and business process of the system. Finally, according to the system requirements analysis, the overall network and software framework of the system are designed, the main business processes of the system are designed, and the database solution is put forward. The system test shows that the system finally completes the basic business of enterprise salary management, the operation interface is simple and convenient, the program runs stably, and can achieve the expected effect of demand analysis.

1. Introduction

With the rapid development of Internet technology, the Internet is infiltrating all aspects of human life. The salary management of technology start-ups, which is the main support for the daily operation of enterprises, is being affected by Internet technology. In recent years, with the increasing investment of enterprises in the construction of information system and the gradual popularization of enterprise informatization, people pay more and more attention to the change in enterprise management by science and technology. The domestic enterprise salary management system still stays in the traditional management mode(Figure 1). With the rapid expansion of data, such as salary management and employee management, enterprise management is also facing greater data processing work, and the contradiction between the serious backwardness of the management system has become more and more obvious. The voice of a new management system is getting higher and higher. The traditional information management still stays in the manual work mode. With the increase in work pressure, various disadvantages of manual processing have seriously affected all aspects of enterprise salary management [1].

Nowadays, with the rapid development of computer technology, the advanced information management concept based on blockchain technology gradually begins to have an impact on the enterprise salary management system [2]. It has become an inevitable trend to integrate advanced blockchain technology and advanced management concept into the enterprise salary management system. The enterprise salary management system based on blockchain technology can not only greatly improve the simplicity of management but also greatly reduce the impact of human factors on the information management system. The most important thing is to standardize the efficient information management system through the computer management

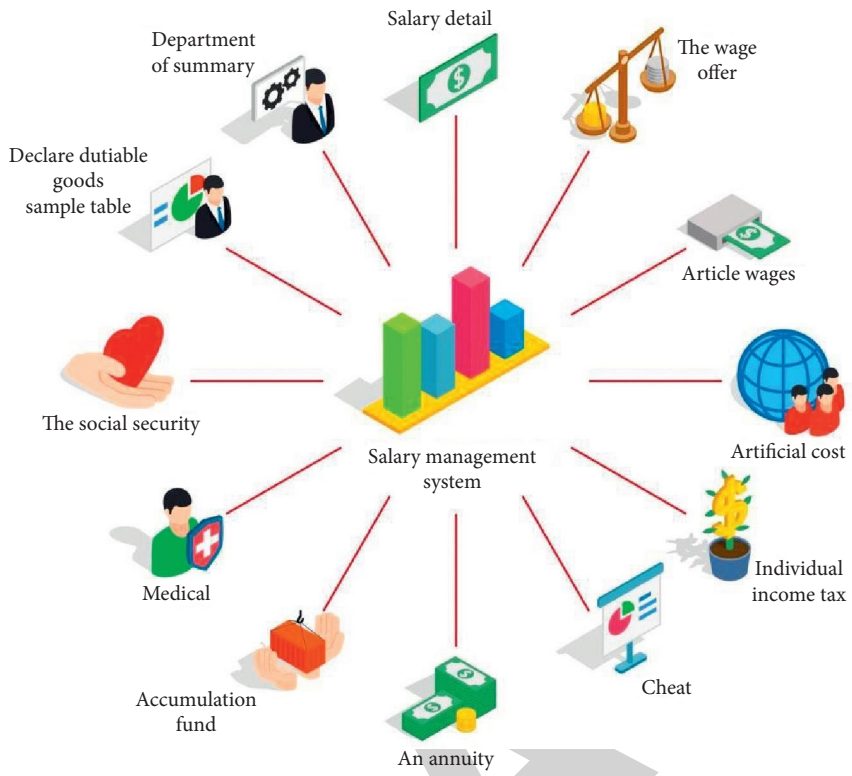

Figure 1: Salary management system.

system. While maintaining the basic functions of the original management system, the information management system realized through blockchain technology can greatly improve all aspects of the characteristics of the system, such as improving the retrieval speed of employees' salary information, improving the information security level of the enterprise, and reducing the labor expenditure of the enterprise. Therefore, the modernization of enterprise information management is a process that must be experienced by enterprise development.

The application of blockchain technology in the accounting field has achieved remarkable results, but the integration of blockchain technology with specific business activities is still insufficient. At the same time, there is also a lack of research on the application of blockchain technology in enterprise management activities. Then, based on the current situation and demand analysis of salary management, according to the technical characteristics of blockchain, the correlation between blockchain technology and salary management activities is analyzed. And we have established a system of salary management based on blockchain technology [3]. This article integrates the traditional ERP system architecture into blockchain technology, transforms and improves it, proposes a blockchain-based ERP system framework model, and analyzes it.

2. Literature Review

In recent years, academic and practical circles have carried out extensive research on the application of blockchain technology in accounting and supply chain. Cheng Ping and Wang Liyu have clearly demonstrated the international and domestic research hotspots and cutting-edge trends of blockchain in accounting applications by using CiteSpace knowledge map software. Mathivathanan et al. introduced blockchain technology to solve the problems encountered by enterprises in financial activities, providing a reference for enterprises to optimize financial work [4]. Surjandy et al. analyzed the innovation breakthrough brought by the integration of blockchain technology and supply chain management based on the characteristics of blockchain and designed and implemented a supply chain management system based on blockchain technology [5]. Stephan et al. integrated blockchain technology into a specific link of accounting. For example, Cheng Ping and Dai Jia built a large accounting model of expense reimbursement based on blockchain technology, analyzed the framework and contents of the model at all levels in detail, and discussed the practical application value of blockchain in expense reimbursement from the aspects of financial accounting [6]. Jaoude et al. further introduced the concept of strategy into salary management activities and put forward different salary strategies according to different strategy groups within the enterprise. The concept of strategic salary management gradually began to be valued by scholars and enterprises [7]. Jang et al. analyzed that work involvement and alienation belong to one and two sides, which are two opposite extremes at the same level. When work involvement is reduced to a certain degree, alienation will occur, while when work alienation is reduced to a certain degree, work involvement will occur. A person may be very engaged in his current work, but he may not think that work is an important thing

in life. On the contrary, a person may feel that work is an important thing in life, but he may not devote himself to his current job. It changes with personal cognition and personal cognition of the working environment. Different from job satisfaction, job satisfaction is the psychological state of the degree to which needs are actually met, while work input is the result of the satisfaction of personal cognitive needs [8]. Flovik et al. put forward that there are two main reasons for the high turnover rate of employees: one is the change of the external environment, that is, the recovery of the labor market and the enhancement of employees' self-awareness; and the other is that there are problems in the company's internal staff management, employment forms, and other human resources practices [9]. Wang et al. believe that in addition to environmental changes and company management factors, employees' personal reasons are also one of the reasons for the high turnover rate of workers. The factors affecting employee loyalty are personal factors, enterprise factors, and external environmental factors. Among these three factors, the core influencing factor is the enterprise factor [10]. In modern society, Surjandy et al. believe that the salary structure of employees has two levels, which can be generally divided into a single salary system and a multiple salary system. In the designed project, it is affected by six factors: (1) job (position) and skill evaluation, (2) salary survey, (3) basic salary structure, (4) bonus, (5) welfare, and (6) salary survey [11].

3. Blockchain Technology

From a technical point of view, blockchain technology is a distributed database technology [12]. Blockchain also represents a data storage structure. Structurally, the blockchain is a chain structure consisting of blocks. A block represents a group of data. It consists of a transaction or behavior data generated by the user at a particular time node. Data segmentation and connection are based on time. Structurally, each block can be divided into a block header and a block body, the block header is the core section, consisting of hash values, timestamps, Mercado routes, difficulty coefficients, and the current target hash value of the previous block; the block body stores a hash value tree structure for all transaction information [13].

(1) The hash value of the previous block is an irreversible binary set that encrypts data (text, images, audio, video, etc.) associated with the block header of the previous block with a hash function. This set of values is stored in the block header of the next block to form an anchor between blocks. Most existing blockchain systems use the Sha 256 hash algorithm for encryption.

(2) Timestamp, is used to record the generation time of the block. Timestamp can be used to determine the time sequence of blocks. Through timestamp, block data can be traced and is not easy to tamper and forge.

(3) Merkel tree represents a tree structure that stores the hash value of each transaction information of the block. The root of the tree exists in the block header, and the branches of the tree are stored in the block body.

(4) Difficulty coefficient is the value used to determine the target value of the generated block. The blockchain agreement stipulates that the target value range should be obtained by dividing the specific constant by the difficulty factor. From the calculation relationship, it can be seen that the greater the difficulty coefficient, the smaller the target value. The validity of the hash value is closely related to the target value. When the target value becomes smaller, it will increase the possibility that the hash value is less than the target value and increase the number of operations of the target value. Therefore, the difficulty coefficient determines the production speed of the new block [14].

3.1. Basic Technology of Blockchain

3.1.1. Hash Operation. Hash operation technology can generate a fixed-length string from the content of any length through operation, and the output string content is called hash value. In the blockchain system, hash operation is used for irreversible encryption of block information data. If the input result of the hash operation changes slightly, the output result will be completely different and there is no rule to follow. As shown in the example, the hash function calculator is used to calculate two slightly different words using the sha256 hash algorithm commonly used in the blockchain system. The results obtained by comparison are quite different in numerical performance.

3.1.2. Digital Signature. A digital signature, also known as an electronic signature, refers to a string encrypted by cryptography used to identify the signer's identity and declare rights in digital content. At present, a digital signature has been recognized by more than 20 countries, including China, and has the same legal effect as a handwritten signature or seal. The working principle of digital signature mainly uses the private key of asymmetric encryption technology to encrypt the digital summary generated by digital content information and generate a digital signature, and then it can be sent out or attached to digital content products. If the digital content receiver can use the public key to realize information verification, it represents that the copyright owner of digital content has realized the declaration of rights. An excellent digital signature algorithm can improve transaction efficiency and protect the integrity and accuracy of digital content while ensuring accurate identification on both sides of information exchange [6]. In blockchain, this technology is mainly used for information integrity verification during transactions between nodes. Only after the verification is passed, the subsequent transaction process be carried out, to ensure the security of transactions [15].

3.1.3. Consensus Algorithm. The blockchain system generates and records block data information by reaching a consensus between nodes [16]. The mechanism used to ensure the consistency of accounting between nodes and solve the consensus problem between nodes is the consensus algorithm [17]. The consensus algorithm plays a key role in the blockchain system. The performance superiority of the consensus algorithm has an impact on the correctness and security of the whole blockchain system. At present, there are many kinds of consensus algorithms used in the blockchain system, which can be roughly divided into four categories.

The first type of workload proof consensus algorithm is applied to blockchain e-money systems such as bitcoin, which is also the well-known mining consensus algorithm. The operation mechanism of this kind of algorithm is to encourage the competition among nodes, who can calculate the target value faster, and the node that calculates the target value can obtain the corresponding reward to encourage and promote the node to carry out block production.

The second type is the voucher consensus algorithm, which is derived and innovated based on the defects of the workload proof mechanism. Its main working principle is to determine the difficulty and priority of calculating blocks for nodes by comparing the advantages and disadvantages of nodes in one or some attribute values. Each block-out task is the responsibility of the node with the best evaluation ranking. This algorithm can reduce the waste of computing power and other resources, but improve the centralization of the blockchain system because when some nodes master a large number of computing power resources and ensure that they are always dominant in the evaluation attributes, they can master the generation rights of blocks for a long time, which deviates from the original intention of the design of decentralized system to a certain extent [18].

The third type is BFT algorithm, such as pbft algorithm (Practical Byzantine fault tolerance). The design idea of this kind of algorithm is completely different from the first two. There is no computing power competition between nodes, and the generation of blocks is completed through negotiation and consensus between nodes. This kind of algorithm not only solves the problem of low efficiency and waste of computing power but also is one of the most widely used algorithms in the blockchain system. The blockchain digital copyright protection application model designed in this article will also use such algorithms, which can maximize the blocking efficiency and accuracy of the system. It is the consensus algorithm most in line with the application scenario of the copyright protection model at present.

Suppose there are three nodes N_1, N_2, and N_{nel} in the blockchain. The first two are honest nodes and the last one is Byzantine nodes. If the transaction vector of N_2 received by N_1 is TX_{21} and the transaction vector of N_{el} received is TX_{erl}, the algorithm must meet the following requirements, if correct consistency is to be reached:

$$\begin{aligned} TX_{21} &= F\left(TX_{21}, TX_{\text{erl}}\right), \\ \text{Store}\left(TX_{\text{erl}}\right) &= \text{false}. \end{aligned} \tag{1}$$

The classical pbft algorithm adopts a three-stage protocol to ensure consistency, but it increases a lot of communication overhead. Moreover, the system can not dynamically monitor the changes of nodes. In the supply chain scenario, the consensus node has no subjective malicious motivation. Usually, the Byzantine node will appear only when the network is down or the communication is disconnected, and the probability of this situation is very low. Therefore, it is not necessary to conduct a three-stage broadcasting every time to reach a consensus.

The number of consensus nodes in the system is 0, and each node corresponds to a view. Each consensus is carried out in one view, so that the view number is P and v is the node number, and the numbering rule of view and main node is [19]:

$$P = v \bmod n. \tag{2}$$

In the classical pbft algorithm, the transmission consumption in the network is determined by the number of nodes n, the size of blocks, and the size of verification messages. The communication overhead of the network in pbft algorithm is:

$$\text{Total consumption} = N^* N^* (\text{blockhead}) + N^* (\text{block}). \tag{3}$$

Here, n is defined as the number of nodes, block is the data volume of verification messages, and head is the data volume of blocks. It can be seen that since three broadcast communications (two verification broadcasts and one block broadcast) are required for each consensus, the data transmission volume is quite large. The average consumption of the improved algorithm is:

$$\text{Total consumption} = N^* (\text{blockhead}) + N^* (\text{block}). \tag{4}$$

This index is also reflected in the throughput of the whole system. We verify it by experimental data.

Figure 2 shows the TPS comparison of various blockchains when using different consensus algorithms under the condition of a single node and normal operation of system nodes. Firstly, it can be seen that in the environment of the private chain (Alliance chain), the throughput of the whole system has been greatly improved compared with the consensus algorithm used in the public chain, and the improved pbft algorithm not only reduces the transmission consumption of consensus but also reduces the time of consensus algorithm. Therefore, the TPS of the algorithm is greatly improved compared with the classical pbft algorithm.

Figure 3 shows the CPU utilization of pow, pbft, and the improved consensus algorithm under the condition of a single node. It can be seen from the figure that the consensus algorithm based on workload proof is 100% because each node is consuming computing power to provide workload proof as much as possible, so the CPU is running at full load. The improved pbft algorithm uses the way of the master node out of the block, so there is no need for computing power competition, and the CPU utilization has been significantly reduced [20].

Figure 4 shows the comparison of TPS of the two algorithms with the increase of nodes.

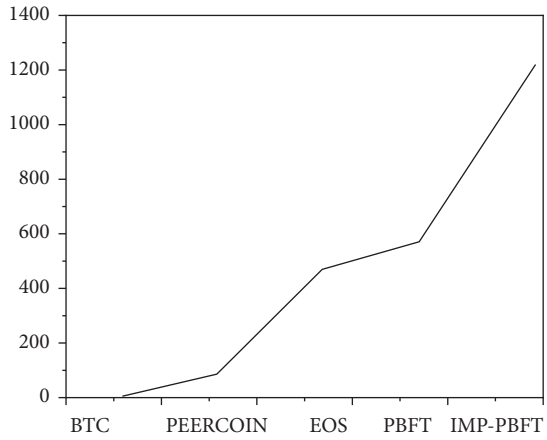

Figure 2: Comparison of swallowing volume of the consensus algorithm.

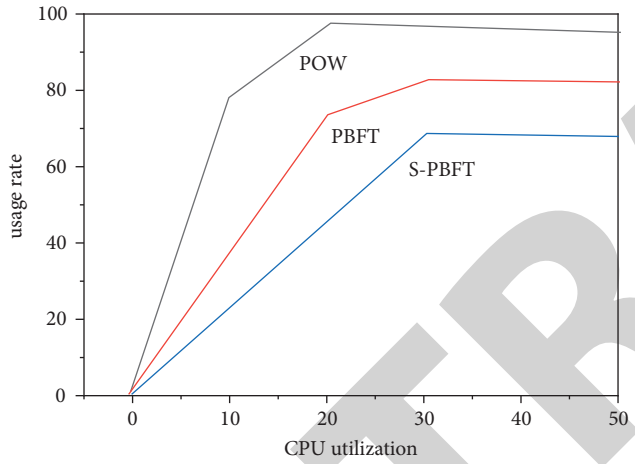

Figure 3: Comparison of CPU utilization of different algorithms.

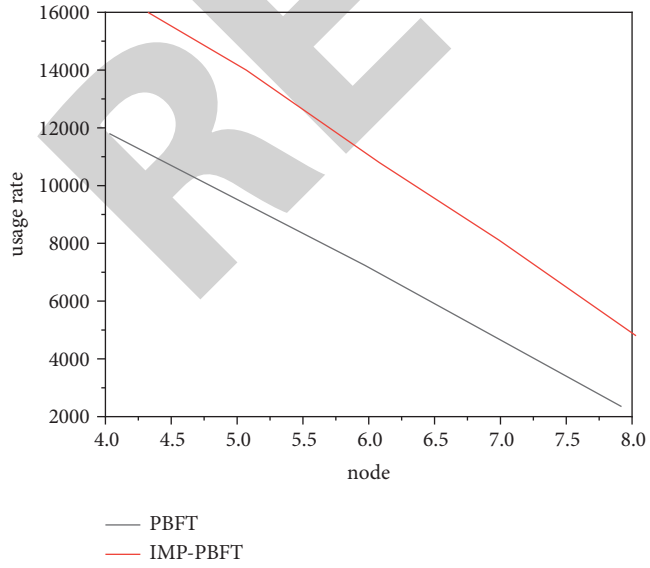

Figure 4: Comparison of TPS of the two algorithms with the increase of nodes.

The fourth type is the consensus algorithm combined with the trusted execution environment. This kind of algorithm is different from the first three types of software systems. This kind of algorithm uses hardware facilities. Its characteristic is to use the trusted execution environment to limit the nodes that may have malicious behavior in the system, reduce the abnormal scenes in the system, and improve the performance of the consensus algorithm. However, this algorithm isolates the nodes in the open network and is not suitable for open Internet application scenarios.

3.2. Salary Information Setting Function Analysis. Based on blockchain technology, the salary information setting module is mainly divided into setting the basic salary of employees, setting the amount of other items, and setting the salary calculation formula. The use case diagram of the salary information setting is shown in Figure 5.

See Table 1 for specific function description.

The salary management module is mainly divided into attendance statistics, query salary, calculate salary, and export salary table. The use case diagram of salary management is shown in Figure 6.

The system management module is mainly divided into user management and authority management. The system management use case diagram is shown in Figure 7.

Through the investigation of the salary management of the technology enterprise, if the system wants to complete the processing of the enterprise salary management process well, it is required that the system can provide a safe and secure data connection, handle thousands of tasks on average every day, and ensure that the system can respond to customers' queries in the shortest time. Specific requirements [21]:

(1) Reliability: for a stable system, reliability requirements are necessary. For such systems in special industries, the system is required to have a fairly perfect error handling mechanism, and the error rate requirements are quite strict. At the same time, the backup work of the system should be in place enough to ensure that the system can not only recover quickly in case of accidents but also ensure that the user's safety data cannot be irrecoverably damaged.

(2) The requirement of high efficiency. For the complex operation of salary management in science and technology enterprises, how to reduce the complexity of operators' operation through an effective collection is an important aspect of testing a system. How to improve the operation efficiency of the system through effective integration and optimizing the structure of the database is a key point to be considered in the process of system design.

(3) Security requirements. As mentioned above, there is a certain intersection between security and reliability. However, for such systems, due to the security data of enterprises of a certain scale and the company data of enterprises, all effective data

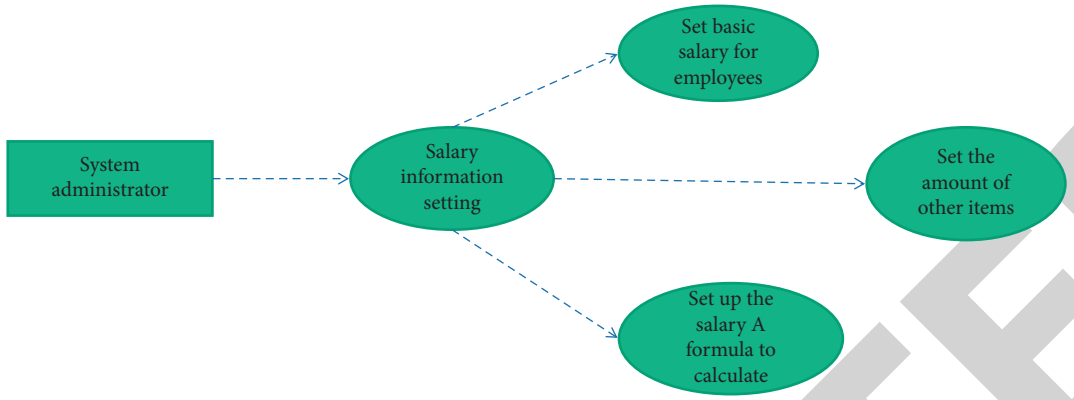

Figure 5: Use case diagram of the salary information setting.

Table 1: Salary information setting.

Salary information setting	Description of the function of the module
Set employee basic salary	Set the basic salary of employees according to their departments
Set other item amount	Set the employee project amount according to the project undertaken by the employee
Set salary calculation formula	The calculation formula of employee salary is determined according to the employee's basic salary, project amount, and employee welfare

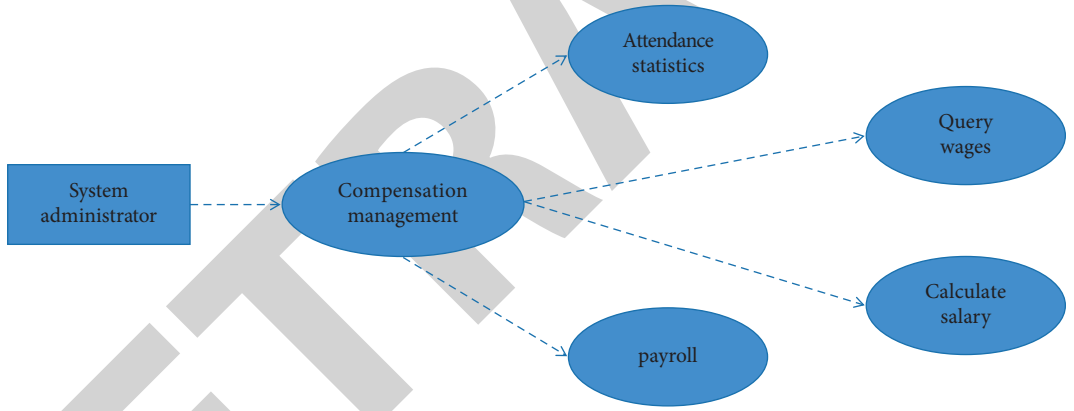

Figure 6: Use case diagram of salary management.

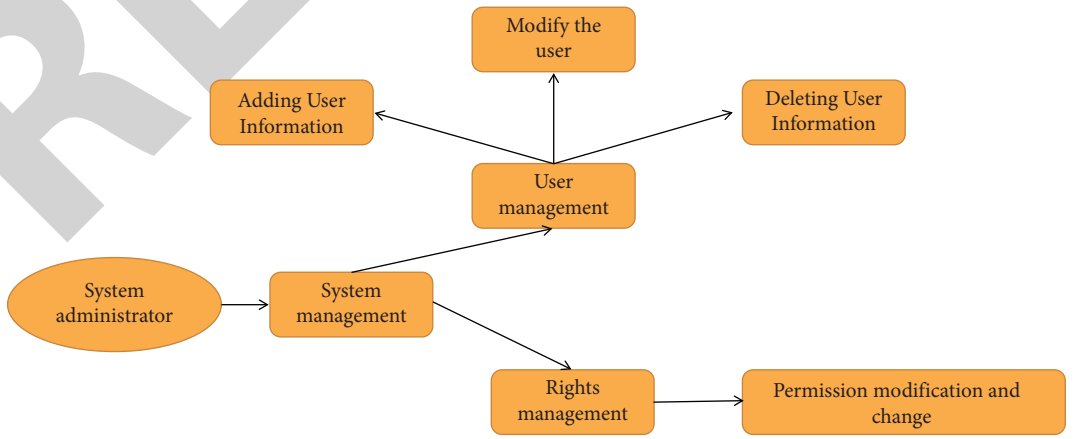

Figure 7: System management use case diagram.

encryption is very important for the enterprise salary management integration system.

(4) The specificity of the system. For the highly professional fields of salary management in similar science and technology start-up enterprises, the workflow of the system should comply with the daily manual operation process, have a friendly interface and be easy for users to understand and learn.

4. System Analysis

Based on the preliminary design of the blockchain software, the entire system is analyzed, and various forms of design are carried out to ensure the technical capability and security of the entire salary management system. However, this is only a series of predevelopment treatments [22]. After the application development is completed, the application system needs to be tested in the actual development. The role of software testing is to obtain the internal structure and rules of actual system development by designing experimental tools, such as inputting data into a real process. These developed test cases are included in the development system, and the results are obtained by running the entire system. By filtering out the results, you can see if the system can be developed. If this is incorrect, we need to carefully find the wrong point. During software testing, developers have a better understanding of the overall development of the system, making it more reliable and stable.

4.1. Test Method. System software testing mainly embeds test cases into the whole system and runs through different test cases.

4.1.1. Unit Test. Unit testing is the first step of software testing. Unit testing is also divided into four stages:

4.1.2. Integration Test. The integration test is similar to the unit test, and the step test is similar, but the function of the integration test and the unit test use is different. The use case of a unit test is used to test the functionality of a component, and an integrated test case is used to implement interactive functions for classes and objects.

After the unit test is completed, each system function module must be integrated to test the system as a whole. The tests executed during integration testing are as follows:

(1) Check whether the data transmission and communication between modules are complete and there is no data loss.

(2) After the system combinatorial test, check if the functional binding between modules and modules affects each other; a common method of designing an integrated test case first acquires the interaction diagram of the use case and designs a scenario that contains the input, output, initial state, and various classes of multiple participants by the tester, and ultimately performs an integrated test. The result is to compare the interaction diagram of the actual test of the object to the interaction diagram of the initial use case and the details. If it is consistent, it indicates that there is no problem. On the other hand, a loophole exists in the system.

4.1.3. Functional Testing. Functional testing is a process of checking whether the completeness and accuracy of various functions such as design requirements and system configuration meet the requirements. In this part, two test tasks were mainly completed.

(1) Effectiveness test: In the actual function testing process, the commonly used function testing method is black box testing, that is, it no longer looks at the code of the design process, but only focuses on the functions realized by the system, tests these functions, and detects whether they meet the design requirements. According to the test results, the system functions are modified.

(2) System configuration review: The system configuration review ensures that all components of the software configuration are complete, all aspects of quality meet the requirements, and have the details necessary for the maintenance stage and tailored the classified directory.

5. System Test

Two test methods for testing system components or parts are one of the above methods. System testing must be used to test the entire system. System testing is used to determine whether the entire system can operate stably under different configuration information by changing various settings, such as the number of personnel and system load [24]. The requirements for system testing are to perform a complete test of the system. That is, testing the whole system combination of systems in different environments, including systems, applications, hardware, software, external environments, and operators. Simulate system online and final system validation tests. The definition of software and system is inconsistent or contradictory.

5.1. Test Scheme. During the test, the system mainly tests the functional modules of the salary management system of science and technology enterprises. During the operation, observe the loopholes and errors of the system, and see whether the system has achieved the expected results from the results, as shown in Figure 8.

As can be seen from Figure 8, black box testing belongs to dynamic testing, mainly including function testing, attack testing, and performance testing. To understand the black box test literally means that the internal structure of the test is invisible, and only the input and expected results are known. Black box test is mainly to preliminarily verify the function of the system. The test data should be as much as possible, and the test results are only for the visual display of the functional interface of the software system.

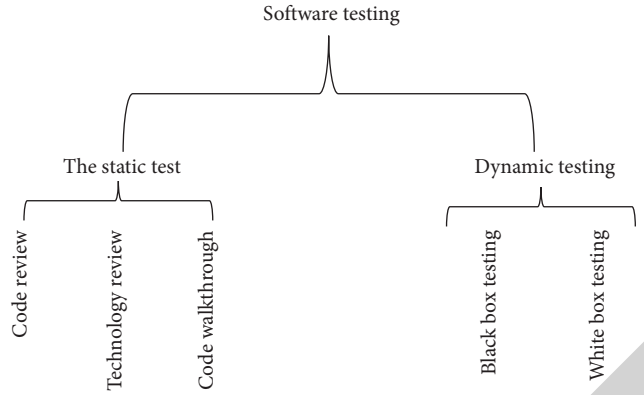

Figure 8: Software test classification diagram.

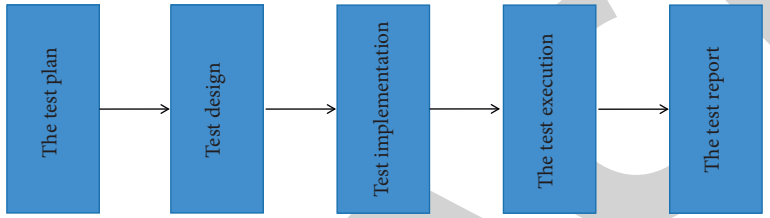

Figure 9: Flow chart of software testing process.

Table 2: System performance test cases.

Test items	Test time (s)	Frequency	Average response time (s)
Save time after data entry	3.0		1.02
Response time of data confirmation button	3.0		≤1.5
Query response time of single information query or multiple records	3.0		≤2.7
Exception handling time	3.0		≤4.02
System login time	3.0		≤2.9
Average online operation time of the normal number of users	3.0		2.79
Normal operation time of database server and web server	3.0	Once/hour	≥10s

The testing process flow of salary management software is shown in Figure 9.

5.2. Test Results. The performance of the system was tested according to the performance requirements in the system requirements analysis. A particular test process is described, using multithreading technology to access multiple browsers simultaneously, record a series of information related to the system, and calculate the maximum number of concurrent users supported by the system to investigate the performance of the system. Detailed test cases are shown in Table 2 and Figure 10.

Through the system performance test, the saving time after data entry is less than 3 seconds; the response time of the data confirmation button is less than 3 seconds; the query response time for a single information query or multiple records is less than 3 seconds; the exception handling time is less than 3 seconds; the system login time is less than 3 seconds; and the average online operation time of a normal number of users is 2.78 seconds, which meets the requirements of performance demand analysis.

(1) User login test: Because different users have different permissions, which have been defined in the system, users with different permissions will see different interfaces after logging in. User login test is to log in as different users and enter the system. All users can install the permissions specified by the system and enter different pages.

(2) Data query testing: Query functions are the necessary functions of each system and have many query requirements. In this data query test, you enter different query conditions to display all the data that meets this query condition.

(3) Data batch and single quantity input test: Data batch input is an important function of the system. Many operators are used to the traditional excel form for various operations. In this case, the function of batch import of data from excel form into database is particularly important. After testing, the batch import function can realize complete seamless import.

After the above test is applied to the system, the test results show that the salary payment management system

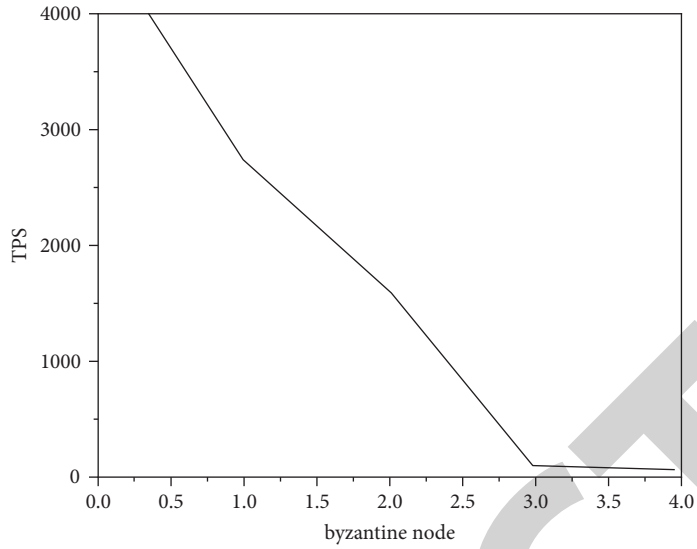

Figure 10: System function salary pre- and postmanagement test.

meets the requirements of the demand report, performs various basic functions, and the overall stability of the system is good. Operation proceeds normally.

6. Conclusion

Specific applications of wage management activities based on blockchain technology are recorded in chains depending on each node, from employee performance declarations to salary payments. Administrators can monitor the entire payroll management activity in the whole process and ensure that the post accounting of pay management can be traced back to the process in advance, and can effectively prevent all kinds of fraud and fake performance reports, ensure the openness and transparency of wage management, and ensure the human capital of the firm and the management efficiency of the employee. You can fully monitor the employee payload budget implementation and predict the risk of salary management activities.

For example, the seller's performance evaluation can be done through a blockchain commodity trading platform. Because the signature, delivery, transport process, and receivables can be monitored in real-time, the help manager finds the problem to accurately calculate the performance of the salesperson for a given period of time, and develop a more rational performance evaluation criterion. At the same time, this process is fully monitored and improves the security of corporate capital flows. Through the monitoring and reviewing of employee performance assessments through private enterprise financial management platforms, we analyze the various financial data, as well as save troublesome manual auditing and accounting processes; you can also provide reliable financial decision support for managers. And, it effectively realizes the function of financial supervision. In short, with the continued development of high technology and new technology, the application of blockchain management in corporate salary management activities can optimize the traditional payroll management links and reduce transaction processing time and improve the working efficiency of the various departments. Then, the defect and the defect of the pay management activity are solved. Designing an enterprise management system framework based on blockchain promotes the good integration of blockchain and ERP system, promotes enterprises to improve their own work efficiency, and enhances comprehensive benefits, which is of great significance for enhancing their core competitiveness. In this regard, it is necessary to continue to explore the good combination of blockchain and ERP system to provide assistance for enterprise management. This not only facilitates the auditors to verify the project funds but also inhibits the occurrence of unreasonable use of scientific research funds to a certain extent.

The database of the system also needs to provide an automatic backup function and graphical interface for actual operators, rather than the actual operation of the database client, which can greatly reduce the difficulty for users. Due to the lack of user testing many times, the missing functions and imperfect user experience in the system design need to be further solved in the later user testing.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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