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Design of Financial Reimbursement Automatic Auditing System based on Big Data Analysis

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Abstract: In order to effectively solve the problems of large audit error and poor operation efficiency in the current enterprise financial reimbursement audit system, the automatic financial reimbursement audit system was optimized based on big data analysis. Combined with numerical probability algorithm, mass financial reimbursement data are reasonably classified, and the classified data are transmitted to the financial item configuration module for approval. The financial audit safety assessment process is optimized and the audit processing structure is checked for accuracy. The hardware configuration of the system server and processor module is optimized to achieve the design goal of optimizing the operation effect and accuracy of automatic financial reimbursement audit. Finally, the experiment proves that the financial auditing error rate of the financial reimbursement automatic auditing system based on big data analysis is obviously reduced compared with the traditional system, and the operating efficiency of the system is increased by 20 % - 50 % compared with the traditional auditing system.

Keywords: Big data; Financial reimbursement; Automatic audi

1. Introduction

With the closer integration of economic development and science and technology, the financial reimbursement management mode is also gradually improving. Enterprises not only require the reimbursement management system to have the basic function of auditing, but also to be able to accurately complete the replacement function of the reimbursement work, and more hope that the reimbursement system has a certain intelligence and efficiency[1]. Under the traditional enterprise financial reimbursement management model, the company's employees need to integrate various complex reimbursement expenses such as travel expenses, daily expenses, overtime expenses and team building expenses. by filling out various reimbursement forms manually, they will send the reimbursement forms to the department leaders at all levels for approval, and then to the financial department for approval after approval, and finally complete the reimbursement amount payment. such reimbursement is not only time-consuming and labor - intensive, but also inefficient and prone to errors in the manually filled reimbursement contents. a large number of paper reimbursement forms not only waste resources but also bring great inconvenience to preservation and collation, and the information that plays an important role in the development of the enterprise in the reimbursement forms will not be effective. The financial automatic auditing system based on big data analysis adopts the current mainstream system development technology to design and implement the enterprise financial reimbursement system. First, the financial reimbursement content items are analyzed by use cases and functional requirements, and a detailed system operation process is formulated [2]. On this basis, the overall architecture of the system is designed, and the overall architecture of the system is described and analyzed. After putting forward the framework design, the system's functional modules and database tables are designed in further detail, and the main modules of each logic flow and the relationship between each logic flow in the financial reimbursement review process are described. The main core functions are project configuration management, expense reimbursement management, travel reimbursement management, task list management, system management, etc. Through the design of reimbursement management system, the function and performance of each module are tested to improve the core functions of daily expense management and approval management in small and medium-sized enterprises. Employees and leaders can fill in expense application information according to the pre-established application form template in the system, submit the application form to the approver automatically, and the approver judges whether it passes or not, thus improving the efficiency of enterprise financial audit through information reimbursement, saving employees' reimbursement time and improving the competitiveness of enterprises.

2. Design of Financial Reimbursement Automatic Auditing System

2.1. Software design of financial audit system based on big data analysis

Financial management is the core work of the enterprise, and the audit of the enterprise's financial affairs is completed through the true, standardized, safe and transparent recording and analysis of the financial system and financial information[3]. With the gradual development of information technology, the enterprise-level financial application management system is constantly upgraded, and more and more enterprises and institutions choose to use electronic information audit system to improve work efficiency and reduce labor costs[4]. The electronic system can not only change our life and work style, but also change our thinking mode unconsciously. In order to further study the automatic financial reimbursement auditing system, the current mainstream system implementation technology is selected to develop the enterprise financial auditing system. Through strict and comprehensive testing, the research goal of perfect management of enterprise financial accounts is achieved, making financial reimbursement more convenient, financial approval processing more timely, and ensuring the enterprise financial auditing system to be more perfect[5]. In order to better conduct accurate research on the actual reimbursement business of the enterprise financial automatic audit system, the main functions of the project configuration management module, travel reimbursement module, system management module and task reimbursement module in the financial reimbursement audit management system are analyzed, and the overall functional structure of the system is shown in the following figure:

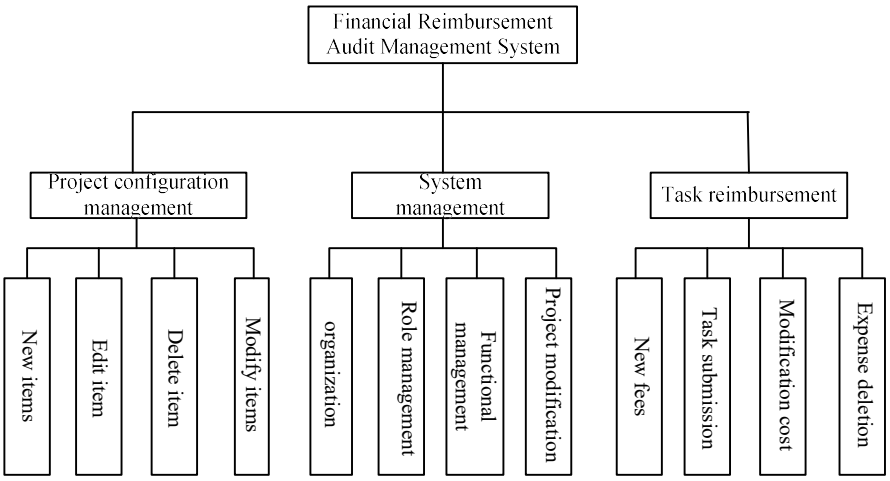

Figure 1. Overall functional structure of the system

As shown in the figure, the financial reimbursement audit management system mainly includes modules such as expense reimbursement management, business trip financial management, loan return management, return financial management, department budget management and basic data management[6]. The design of the project configuration management module is mainly used to reasonably and effectively manage and configure the project finance to which the company belongs so as to facilitate the control of the project cost in the later period. The main functions of the system management module include adding items, editing items, querying and viewing items, deleting items, etc. The Task Financial Reimbursement Module is mainly responsible for making reasonable comments on the content type, number (automatic generation), name, location, party a and party a's responsible person, implementation and sales responsible person, current project amount, start date, end date, project status and other information[7]. As shown in the figure, the design and configuration of the security protection policy should be considered comprehensively, not only considering the general computer virus, but also considering the vulnerabilities of the server and front-end code, and paying attention to the hacker behaviors such as auditing system running script attack database injection and front-end page attack. In addition, this system should have logging function, such as login time of system user, login time of IP modification creation data, and this information will be displayed the next time you log in to the system[8]. At the server side, the administrator should make regular backups of the database to restore the system's previous data state in time when the system is attacked or down. Therefore, according to the financial audit information management security situation, the security assessment process is shown in the figure.

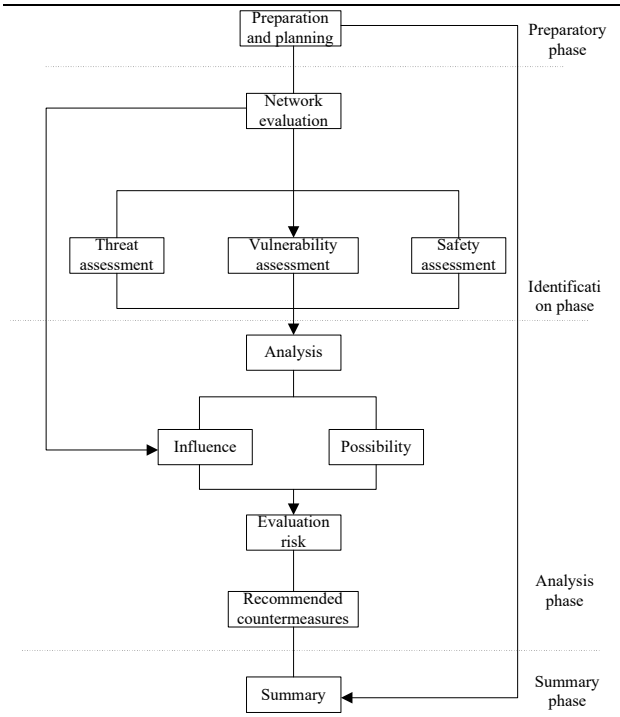

Figure 2. Financial audit safety assessment process

The system module is optimized in combination with the financial audit safety assessment process. In the financial reimbursement automatic audit system, the most important module is the project configuration module. Therefore, the operation step structure of the financial project management module is optimized separately, and the optimized structure of the project financial automatic audit configuration module is shown in the figure.

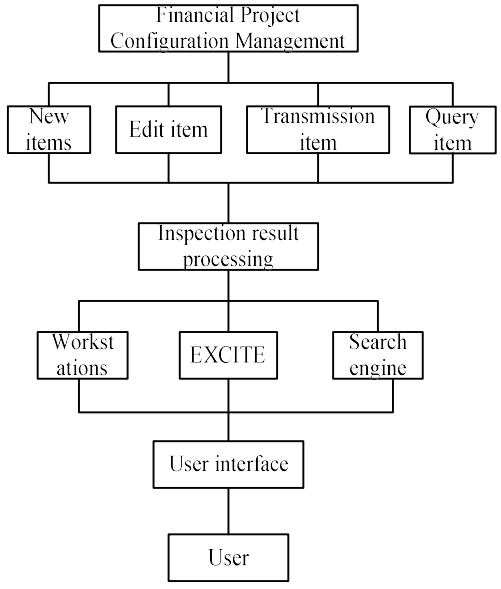

Figure 3. Project finance project configuration management module design

According to the above figure, the analysis financial reimbursement audit system is improved. When relevant enterprises carry out online new project processing, they need to add financial project information within the system so as to better control the financial audit project cost of enterprises. In the process of adding project configuration management information, if there are problems such as project financial errors, it is necessary to further review the financial reimbursement contents and accurately modify or delete the incorrect project information[9]. In the expense reimbursement module of the system, its main operation mode is different from that of the traditional reimbursement module for business trip. The main function of this module is to review the reimbursement expenses such as daily expenses, overtime expenses, team building, etc. After the approval is passed, the approval records will be given. If the reimbursement amount is too high, the information will be updated in time. If the reimbursement amount is too high, the manager's approval authority will need to be obtained for financial approval, otherwise, payment will be made directly to the cashier after the financial approval. The manager's approval authority includes submitting, querying and deleting reimbursement information. Financial approval can only be performed if more than three of them are authorized at the same time. By entering reimbursement content, submitting to the approval task workflow and being approved by the auditors of the other two parties, if the approval is passed, the status system of financial approval processing records will be automatically changed to Approved. If the leader does not pass the approval, the system will automatically return the reimbursement record to the reimbursement personnel, and the returned information reimbursement personnel can edit and submit again in the task list. So as to accurately complete the audit of financial reimbursement content.

2.2. Hardware configuration optimization of financial reimbursement automatic auditing system

In order to ensure the rapid and efficient operation of the system, how to make the system practical, open, advanced and personalized should be considered in the design. The standard specification requirements are reflected in the hardware configuration specification requirements formulated by the company for the design of the system, the hardware required in the system design process is improved to design, develop, support and maintain the system, and centralized control over system resources and authority management is achieved[10]. In the process of system operation, in order to ensure the efficiency and stability of system operation, it is necessary to optimize the hardware configuration of system server and standardize the operation parameters of hard-

ware configuration. The system server hardware configuration parameter criteria are shown in Table 1.

Table 1. System server hardware configuration

Content	Minimum configuration	Recommended configuration	Remarks
Server	1	2	-
Operating system	Windows 2007	Windows2007	-
Server software configuration	IIS 6.0	IIS 6.2	-
database server	O SCAR 5.5	O SCAR 6.0	-
CPU	2 个	4 个	-
Memory	8G	16G	-
storage device	More than 200G	redundanar ray of inexpensive disk	Other storage devices

The hardware configuration of the system server is reasonably selected and optimized according to the work content. As the audit data volume of enterprise financial management is relatively large, in order to ensure the accurate and rapid completion of the audit work of the system, the hardware of the system in the business processing module needs to be further improved. The system is directly authorized to log in to the financial reimbursement automatic approval system through the Enterprise Economic Management Budget Section to carry out financial reimbursement classification processing, and the financial reimbursement amount is configured according to the classification results and submit the data in accordance with the regulations. Due to the difference in reimbursement amount approved for different types of financial contents, the system automatically calculates the allocation data for different types of amounts. The user can review the system configured quota, and if there is something wrong, it can be manually adjusted and finally submitted to the financial department leader for review, and the formal quota will be generated after the approval is passed. In order to ensure the accurate operation of the above steps, it is necessary to automatically configure the standard quota setting for the system processor standard parameters, as shown in the following table.

Table 2. System processor configuration optimization parameters

Content	Memory	Hard disk	Operating system
Application server	2-4G	280G	Windows Server 2007
Database processor	Mysql5.1	Mysql5.1	Windows Server 2007
Document server	8G	240G	Windows Server 2007
CPU	Intel®Core(TM) i3-21503.20GHz	Intel®Core(TM) i3-21503.20GHz	Windows Server 2007

By adjusting the above parameters, the goal of optimizing the hardware configuration of the system can be effectively achieved, and finally the design goal of fast and stable operation of the system can be met.

2.3. The realization of automatic financial reimbursement audit

Combined with the above optimization method, the financial reimbursement automatic auditing system is designed completely, the database operation process in the financial information data auditing system is optimized by integrating big data analysis method, and the analysis stage, logic design stage, implementation operation and maintenance process are optimized according to the financial auditing requirements. The design of the database logical concept processing flow is the most important stage in the system design process. In this stage, the financial data entity relationship model corresponding to the user needs analysis and design is used to select the most appropriate storage structure and storage method for financial audit. The conceptual design flow of database logic is shown in the following figure.

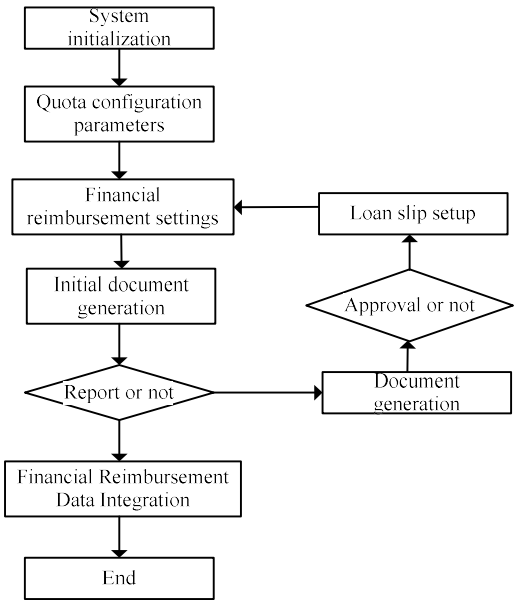

Figure 4. Financial audit database logic processing flow

Through the above process, the financial data to be audited can be more accurately screened and inspected, and the financial information can be more accurately retrieved. The accuracy of the detection data is calculated as follows:

$$R = \frac{t}{\text{tk+fp}} \quad (1)$$

In the formula, t is the parameter for detecting the accuracy of financial information, k is the parameter for error information, p is the parameter for background data screening and comparison, and f is the value for error detection. Combined with the above algorithm, the system cost audit management and reimbursement module is optimized. First, financial reimbursement content is entered, targeted screening and integration are carried out, and then submitted to the approval task work processing module and approved by the three auditors. In order to properly audit the financial audit data and effectively improve the processing efficiency of financial reimbursement, the classification features in the large-scale data parallel processing system are extracted and studied in combination with the above contents, so that the task data to be collected can be obtained in time and inserted into the collection queue accurately during the system operation, thus achieving the design effect of accurately dividing, quickly scheduling and executing data tasks. After completing the collection and integration of financial reimbursement data, the required data are transmitted and stored in the logic processing module. Due to the relatively large scale of data, it is usually necessary to process financial data in parallel in order to reasonably supervise and manage financial audit information, and finally to effectively analyze and compare the storage results of financial reimbursement data. In the process of financial reimbursement data review and processing, the system will immediately issue an alarm notification once the detection equipment fails, so as to timely detect the abnormal situation of the system and avoid data distortion and abnormality in the storage process. To sum up, design the financial reimbursement storage process for big data analysis, as shown in the following figure.

In the process of financial reimbursement data review, in order to better store and classify complex and diverse financial information data, the tasks to be reviewed in the system database need to be extracted regularly, and the abnormal data review tasks need to be judged and early-warning processed. Once there is abnormal data, it is necessary to immediately stop the review and processing of the data reimbursement task and conduct financial information screening in combination with the data task number. Accurately screen and remove abnormal task data in the collection queue, so as to effectively perform financial information auditing tasks, complete data auditing and processing work in time, and ensure the rapid and accurate auditing effect of financial reimbursement data.

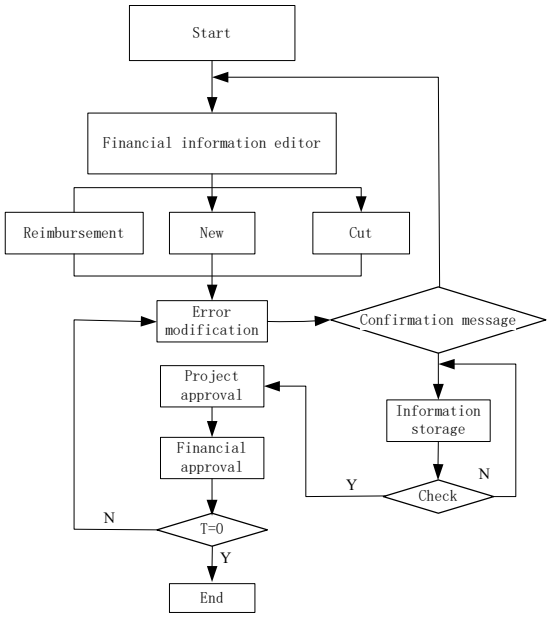

Figure 5. Financial reimbursement storage process for big data analysis

3. Analysis of Experimental Results

In order to test the performance of the financial reimbursement automatic auditing system based on big data analysis, a simulation experiment was carried out in comparison with the traditional financial reimbursement auditing system. Combined with the traditional system, software and hardware performance tests were carried out to unify the test plan and tools and other related equipment within the same time and environment. The operation efficiency and audit error rate of the system were tested experimentally.

3.1. Experimental method

The function test of reimbursement management system mainly includes project configuration management function module test, travel reimbursement management function module test, and other function tests. In the process of hardware running effect detection, there are many test indicators, including memory utilization, memory swapping, CPU utilization, network traffic and disk read-write rate, etc. The test configuration is shown in the following table.

Table 3. Test configuration parameters

Configuration	Parameter
CPU	Intel®Core(TM)i3-21503.20GHz
Memory	8GB
Storage	1TB
Database processor	CentOs6.564
application server	Mysql5.1
detecting system	win702
testing tool	Jmeter-2.12
Browser	Internet Explorer

When testing the system, the first step is to clarify the contents and conditions of the test and the environmental elements of the test, and the second step is to clarify the important indicators of the test, the average response time, and so on. The third important thing is to check the data and record many indicators and the number of concurrent users in those specific environments. Using experimental tools to capture the user's behavior, and then using a single point of control and multiple users to automatically execute corresponding scripts to test the quality of the system. A central control point can simulate the behavior of tens of millions of users so that we can generate reusable and consistent system loads that can be measured and record various simulated system performance data.

3.2. Experimental results

The black box stress test method is used to test the functionality of the network expense reimbursement audit system. First of all, the running efficiency of the system was tested and the following test results wereobtained.

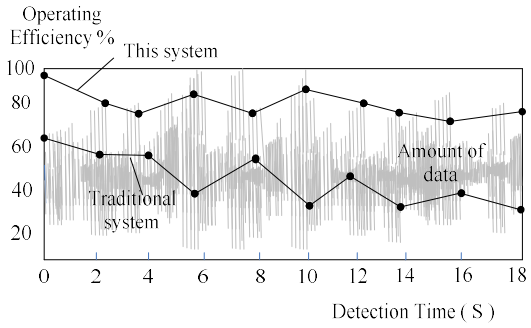

Figure 6. Comparison test results of operation efficiency of financial audit system

As can be seen from the test results, compared with the traditional financial reimbursement audit system, the financial reimbursement automatic audit system based on big data analysis proposed in this paper is obviously higher in operation efficiency than the traditional method after optimizing the configuration of hardware devices such as processors and servers. However, the test results show that the operation efficiency of the financial audit system proposed in this paper fluctuates in a small range with the surge in the amount of financial audit data detected in 4 - 10 seconds, indicating that there are still some deficiencies in the design process and needs to be improved. In order to test the performance of the big data compatibility storage system, many simulation experiments were carried out compared with the traditional methods. In order to further test the accuracy of the system audit, the error rate test of the two systems was further compared, and the test results are as follows.

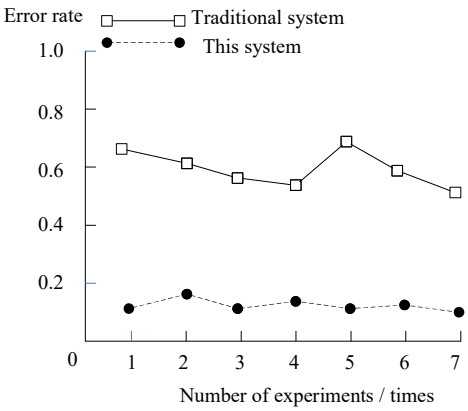

Figure 7. Comparison test results of system audit quasi-error rate

According to the above figure, it is not difficult to see that the error rate of the financial reimbursement automatic auditing system based on big data analysis designed in this paper is always lower than 0.2, compared with the error of 0.6 - 0.8 in the traditional system, the auditing accuracy of the system designed in this paper is obviously improved, thus confirming that the operating accuracy and effect of the financial reimbursement automatic auditing system based on big data analysis are obviously improved compared with the traditional system, fully meeting the design requirements.

4. Concluding Remarks

With the rapid development of modern information technology, reimbursement of financial expenses through the Internet has gradually become a trend. Generally speaking, the organizational structure of an enterprise is relatively complex, and the traditional financial reimbursement management method cannot fully meet its objective requirements for real - time, authenticity and integrity of internal financial data. To sum up, the design and devel-

opment of a network expense reimbursement system in line with the modern enterprise financial reimbursement system plays an important role and significance in improving the level of enterprise expense reimbursement information management. Through sorting out the shortcomings and defects of the existing enterprise reimbursement management system, a set of enterprise reimbursement management system based on big data with certain general value has been completed. This paper has carried on the detailed analysis modeling to the enterprise financial account reimbursement process, and has formulated the complete demand analysis document. The enterprise reimbursement system has designed five modules such as expense reimbursement and travel reimbursement. Each module is independent and interdependent, realizing an efficient financial reimbursement approval process. After strict testing, the system can complete the daily online reimbursement work of the enterprise and has high performance. It collates and analyzes the massive financial data of the company and provides decision-making basis for the future development of the company.

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