Design and Implementation of Accounting Informatization Platform Based on Big Data Processing

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Abstract
This paper analyzes the researches in accounting informatization and current application from global perspective and elaborates on relevant theories and key technologies. These theories and technologies support the construction of cloud computing big data analysis platform. On this basis, this paper also analyzes the construction of accounting big data analysis platform and proposes the corresponding function of this platform based on the basic principle of platform construction, including the comprehensive analysis, decision, forecasting and monitoring of finance. Through the framework design of accounting platform, this paper realizes the collection of accounting big data, logical processing, storage and output and establishment of security mechanism. Finally, this paper takes a group as an example and points out the problems existing in current accounting information system. On this basis, computing big data analysis platform is reasonably applied in this paper and then the application effect is evaluated, which fully reflects the advantage of this platform.

Keywords: big data processing, accounting informatization platform, logical processing.

1. INTRODUCTION

In the age of big data, knowledge, information and data have become the important property of enterprises. Currently, in many developed countries, enterprises are actively engaged in the transformation to become knowledge-based enterprises, the introduction of big data technology and mining of important information from accounting data, thus effectively enhance enterprise competitive edge. In the 18th National Congress of the Communist Party of China, the improvement of informatization level has become an important indicator of the construction of well-off society, which will further stimulate the sustainable development of economy and the enhancement of comprehensive national power(Duffie and Lando, 2001). At present, the economic environment is relatively complex. In this environment, to achieve growth in this environment, enterprises need the continuous innovation of informatization construction. In traditional accounting informatization construction, these information systems cannot provide decision support for enterprises and enterprises find it difficult to mine useful data because of long implementation cycle, low efficiency, high cost and bottlenecks existing in technology(Indjejikian, 2007). Therefore, it is the common challenge for enterprises and academic circles to mine potential highly valuable knowledge from accounting big data and constantly promote enterprise development.

In recent years, the Internet of Things technology has developed rapidly and cloud computing technology started to come into use, which possesses advantages like large memory, low cost and fast speed(Chaney et al., 2011). At the moment, any research involving informatization technology will be included in cloud computing technology. In the 13th Five Year Plan, the government also gives priority to the development of cloud computing technology, especially the development of big data service technology based on cloud computing platform (Chen et al., 2001). In the construction of new type of
accounting information system, the construction of big data information system based on cloud computing platform can effectively utilize this technology to achieve the clustering and mining of data, thus effectively reducing the construction cost of information system, significantly lifting the efficiency of data mining and improving the potential knowledge value of data mining (Ball et al., 2008). After the mining of potential knowledge with high value, it can benefit the enterprise management layer for making decisions, thus achieving the low-cost accounting control mode.

2. EXISTING PRESENT SITUATION AND CHALLENGE OF ACCOUNTING INFORMATION SYSTEM

The current operation model of accounting information system is to transform the actual economic transactions of enterprises into accounting elements that can be identified by the system (Dilla et al., 2010). Then, these elements will be included into different accounting titles and index processing will be conducted based on enterprise assets, ownership interests and liabilities, forming corresponding financial statements like profit statement, balance sheet and cash flow statement under certain accounting cycle. If some important business matters cannot be demonstrated in the relevant reports, then it needs to be disclosed to the outside world in the form of annotation (Hirshleifer et al., 2005). The overall effect of current accounting decision making system and the main operation thinking is that: apply the accounting equation and cycle and then integrate the data in the enterprise information system to conduct budget work and decision work (Zhang, 1999). In figure 1, in terms of the whole situation of current accounting information system, the accounting cycle characteristics are significant.

![Figure 1. A profile of the existing accounting information system](image)

The deficiencies of current accounting information system are:

(1) Singleness of the collected and analyzed accounting data

Before the recording of accounting information system, the data needs to be screened combined the principle of reliability, correlation, accountability and definability and only those data meeting the requirements can be inputted into the system (Cartigny, 2010). Through this whole set of data screening (Nicolaou, 2000), it is apparent that the data entering into the accounting information system will present typical singleness. Some non-financial data will be excluded, which will lead to the incompleteness of data.

(2) Hysteretic nature of accounting information processing
At present, accounting information system conducts logical processing based on traditional accounting mode (Kurunmaki et al., 2003). After the appearance of business activities, the accounting information system starts the collection of relevant data and then carries out voucher preparation, entry account and financial report generation. Under this operation mode, the business flow is parallel with data flow, and thus it is very difficult to obtain immediate feedback during business activities and achieve real-time financial monitoring (Maines and Wahlen, 2006).

(3) Low integration level of relevant accounting and business

At present, the accounting information system collects the data based on accounting titles and these data can only satisfy the requirement of monetary measurement. Some other business-related data are not collected (Sami and Zhou, 2004). For example, the supplier information is not included in the purchase invoice in the system and data related to product quality are also not included in the warehousing receipts. It is obvious that the financial report based on monetary measurement type data cannot satisfy the decision-making demand of management layer.

(4) Poor correlation of accounting information

The information processing technology in current accounting information system is relatively weak (Manigart et al., 2000). In these simple data, this system can only conduct processing of structured data and it is difficult for the system to conduct logical operation of non-structured data. Moreover, singleness can also be found in the displayed financial report and the summarized financial indexes cannot satisfy the demand of managers. These indexes cannot analyze some important economic and business transactions and the correlation of accounting information is poor, which means the management layer.

3. CONSTRUCTION OF ACCOUNTING BIG DATA ANALYSIS PLATFORM BASED ON CLOUD COMPUTING

3.1 Construction of platform function

(1) Comprehensive financial decision-making

In the age of big data, the larger the data scale involved in financial decision-making, the more it adopts data to conduct in-depth mining, providing important reference for financial decision-making (Pierce and O’Dea, 2003). This is significantly different from traditional decision making which only relies on accounting data and experience. The detailed process of comprehensive financial decision-making can be seen in Figure 2. The data sources involved in this type of decision making are diversified and the data channels of data collection are diversified, too. The Internet, social network and the Internet of Things can all be used to collect information and the specific data sources include the data related to financial decision-making from inner-enterprise, taxation, industrial and commercial, all types of accounting firms and banks (Riley et al., 2003). In addition, in-depth analysis is conducted on the data obtained through the utilization of big data mining technology. Meanwhile, the information of accounting, tax paying and monitoring policies that is closely related to comprehensive financial decision-making information is extracted. Finally, various technologies like visualized discovery, text analysis, business intelligence and advanced analysis are utilized to provide important technological support for comprehensive financial decision-making.
(2) Comprehensive financial forecasting

For the forecasting of enterprise financial crisis, we can adopt the F scoring model proposed by Zhou Shouhua, the BP neural network model and the Kalman filter to conduct dynamic analysis on the financial crisis. In addition, we can use diversified data to construct dynamic financial warning model. The primary cause of the emergence of the financial crisis is the deterioration of financial situation. The basis of financial crisis is the problems existing in the operation; the catalyst of financial crisis is the internal and external environment of the enterprise; the internal impetus of financial crisis is the poor governance of the enterprise (Spathis and Ananiadis, 2005). Therefore, we need to collect information from various layers and conduct real-time analysis of the environment confronted by the enterprise based on these data. Therefore, we can obtain relevant characteristic indexes that can precisely reflect the financial crisis, as in shown in Figure 3. After that, we can conduct quantification processing on these indexes and then build the comprehensive index monitoring system (Wilkinson, 2003). Finally, we can adopt scientific methods to construct the financial crisis warning monitoring model and then conduct comprehensive evaluation on enterprise financial risk and crisis through this model. For the risk that has already been identified or confirmed, we need to disclose it timely and warn relevant departments.

Figure 2. Financial comprehensive decision analysis process

Figure 3. Financial dynamic early warning analysis system
3.2 Architectural design of platform system

The accounting big data analysis platform mainly includes the following modules: data processing and storage, cloud service, data collection and data output. In addition, under this platform, the standardization and security mechanism of the data runs through the whole process and the concrete frame diagram can be seen in Figure 4.

Cloud service platform: this module mainly involves OS operating system, storage device and network equipment. This platform is the service based on cloud computing, so the basic IT environment is provided by cloud service enterprises. Data collection: this module can obtain relevant data of accounting transactions, public information of competitive enterprises and industrial development information from various department of enterprises and external network. Data processing and storage: conduct unified processing on the collected data and then store these data into different classifications. The relevant data concerning product sales, human resources accounting and customer accounting can be stored into basic database while model base, knowledge base and method base can be stored into analysis database. In this way, it is very convenient to call relevant data. Data output: this module can conduct data processing through data mining analysis tools and then output the processed results from corresponding function modules.

![Figure 4](image-url)

**Figure 4.** The overall architecture diagram of platform

3.3 Basic IT environment deployment

There are three types of cloud computing platform service model: infrastructure IaaS service and corresponding service of software and platform, which are SaaS and PaaS. Basic service is the core foundation to realize different layers of service. In other words, infrastructure is the core of platform construction while software service can provide users with relevant service thought the Internet. The corresponding relationship of these services are shown in Figure 5.
4. CASE APPLICATION OF ACCOUNTING BIG DATA ANALYSIS PLATFORM BASED ON CLOUD COMPUTING

4.1 Background Information of the Group

This group is a large pharmaceutical enterprise, whose core business includes pharmaceutical production, retail and distribution. The enterprise scale is large and this group is now in high-speed development period, which has multiple levels. Especially with the constant expansion of enterprise scale, problems in management mode become more and more severe. This group mainly uses centralized management mode, which means that the group is in control of each subsidiary and controls the budget and financial decision-making of these subsidiaries. At present, information system is constructed in the headquarter and subsidiaries, so the headquarter can conduct the financial report analysis, accounting calculation, fund and budget management. However, there exists difference between the systems in the subsidiaries and the headquarter, which leads to the hysteretic nature of information transfer. Under the environment of expanding sale scale and increasing retail and distribution outlets, this group expects to have a unified accounting information system to integrate relevant accounting data. In this way, it will provide accurate data support to leaders to make decisions based on financial intelligent analysis and thus enhance the real-time of financial monitoring and reasonability of budget system in this group.

4.2 Functional test of accounting big data analysis platform application based on cloud computing of the group

This chapter is mainly about the test analysis of partial function of accounting big data platform, which includes the intelligence, dynamic and precision of this platform.

(1) Test of financial analysis management function

Figure 6 illustrates the frame diagram of this financial analysis center and the contents involved are: analysis subject, method and dimension. This group can select the corresponding index through the analysis subject and select corresponding dimension range from the analysis dimension. After that, this group can realize the analysis function of 3-D accounting big data using specific analysis methods. It is sure that corresponding financial subject can be selected independently to view the financial index of the group.
The indexes of the enterprise include financial ratio analysis, debt-paying ability analysis, development ability analysis, profitability analysis, asset quality analysis and risk resistance analysis. Managers in the enterprise can conduct financial analysis based on corresponding time dimension. The interface can not only present all types of analysis ratios, but also can display the correlation trend, which can be seen in Figure 7.

(2) Test of financial forecasting function

To analyze the predictability of this platform, transfer the financial data of this group from 2000 to 2009 into this platform and then conduct forecasting analysis of the operating income, cost and the financial condition of three expenses from 2010 to 2018. The financial information from 2010 to 2013 has already been given, so we can analyze the accuracy of platform forecasting through the comparison of data in these years.

Firstly, forecast the operating income and cost. Combined with the imported data, draw the corresponding trend line through this platform software, so users can forecast the
operating income and cost in the next few years combined with this trend line. Figure 8 is the extension of the forecasting line.

![Figure 8](image)

**Figure 8.** Platform operating revenue and operating cost prediction

We can see from the forecasting line that the forecasting income is ¥41.8 billion while the real income is ¥38.7 billion. The error is 8%. In 2011, it was expected that the income would reach ¥54.6 billion and the real income was only ¥200 million more than the forecasting income. The error is only 0.05%. In 2012, the income was expected to reach ¥67.3 billion and the real income was only ¥700 million more than the forecasting income. The error is only 1%. In 2013, the forecasting income and real income were ¥78.1 billion and ¥78.2 billion respectively. The error is only 0.1%. From the analysis results, there only exists large error in 2010, while other forecasting errors all meet the criteria. The forecasting of operating cost is closely related to operating income. In 2010, the error of operating income was large, which leads to large error of operating cost in 2010. In 2010, the forecasting income of this group was larger than the real income. The reason was the introduction of new medical reform policy, which led to the structural adjustment inside the industry. Moreover, in 2010, the uncertainty of macro policies and economic environment exerted negative impact on the income of this group. After that, this group adjusted its policies and then quickly moved towards the right direction.

![Figure 9](image)

**Figure 9.** Three cost prediction of the platform

Secondly, the forecasting of three expenses. In 2010, the expense was ¥2.84 billion while the actual expense was ¥3.07 billion. The error is about 3%. In 2011, 2012 and 2013, the corresponding selling expense forecasting was ¥3.27 billion, ¥3.84 billion and ¥4.4 billion while the actual expense was ¥3.28 billion, ¥4.41 billion and ¥4.42 billion. The error rate was large in 2012 and the number was 3%. The error rate was 0.5% and 0.3% in 2011 and 2013. The management expense and financial expense are not described in detail here, which can be seen in Figure 9.
The third is the test of financial forecasting warning analysis. Z value model is adopted to forecast the financial crisis of this group on this platform.

\[ Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + X_5 \]  \hspace{1cm} (1)

If Z value is lower than 1.81, then it shows that the finance is in extreme crisis and the group may face bankruptcy within one year. When Z value is between 1.81 and 2.675, it shows that the finance is facing adverse conditions. If Z value is higher than 2.675, it indicates that the finance of this group is secure. This system can achieve real-time monitoring and it will automatically send warning once exceeding the criteria. Figure 10 illustrates the influence factors concerned by this warning function.

![Figure 10. Financial early warning](image)

Based on the forecasting results and the practical situation of the enterprise, we discovery that this group often meets financial distress at the beginning of the year because the sales plans at the beginning of the month can only be implemented after adjustment. This hysteric nature may give rise to financial crisis. Especially in May 2015, fraud was found in the financial report of this group. Combined with the situation of the group in March and April, the platform forecasted that the group might face financial crisis. This forecasting was quite accurate. However, in March 2104, the platform made a mistake in forecasting but the forecasting was overall accurate.

5. CONCLUSION

This paper first analyzes the current situation of accounting information system and points out the deficiencies in current system, which makes it difficult to provide valuable decision-making data for managers. Therefore, we need to improve from technical aspect. At present, cloud computing technology platform holds obvious advantages in terms of the data processing efficiency and construction cost, so this paper constructs the accounting big data analysis platform based on cloud computing. This platform includes various function modules like comprehensive financial analysis, forecasting, decision-making and real-time monitoring. This platform also optimizes the security mechanism of this system to enable this system platform to satisfy all types of data mining analysis, thus providing more intelligent support for enterprise leaders when making decisions.

The construction and implementation of the accounting big data platform based on cloud computing need some time. This paper conducts beneficial exploration and analysis on the construction of this platform and this platform needs to be improved in future development combined with physical situation and accounting theory. And then the function of this platform can be more perfect and the intelligent level can be higher, thus better satisfying the demand of the managers.
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7. REFERENCES


