Construction of a Cloud-Based Big Data Analysis Teaching Platform for Accounting in Higher Vocational Education

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Abstract. This paper begins by introducing the research hotspots and application status of accounting informatization in both domestic and international contexts. It elaborates on relevant theories and key technologies, such as systems theory, big data in accounting, accounting informatization, and cloud computing, to provide the theoretical foundation and technical support for constructing a cloud-based big data analysis platform. Furthermore, through an analysis of the current state of existing accounting information systems, it identifies their challenges in coping with multifaceted demands. Consequently, the paper proposes the utilization of technologies like cloud computing to construct an accounting information system centered around big data analysis. This paper primarily focuses on building a cloud-based big data analysis platform for accounting. Based on the principles of platform construction, it puts forth that the platform should encompass functions related to comprehensive financial analysis, financial monitoring, financial decision-making, and financial forecasting. To realize these functions, the paper designs the platform's overall framework and provides specific components for acquiring, processing, storing, analyzing, outputting accounting big data, as well as ensuring security mechanisms.

Keywords: Cloud computing, Accounting big data, Platform construction, Accounting information system

1 Introduction

With the development of Internet of Things (IoT) technology, the emergence of cloud computing offers advantages such as cost-effectiveness, vast storage capacity, and high processing speed. Researchers worldwide in fields related to informatization have begun relying on it. In China, the "13th Five-Year Plan" for national informatization includes significant support for three areas, including big data services based on cloud computing platforms. In the context of constructing accounting information systems, this article proposes the development of a cloud-based accounting big data analysis platform [1]. By leveraging cloud computing technology for accounting big data acquisition, clustering, and analysis, this platform not only overcomes the cost challenges of traditional accounting informatization models but also significantly enhances the efficiency of analyzing vast amounts of accounting big data [2]. This gradually unlocks the value of accounting big data analysis and offers new insights for further development and utilization of accounting big data, improving the

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relevance of accounting information and aiding in enhancing the teaching effectiveness of vocational accounting programs.

2 Literature Review

Xu Jinye and Li Gejin (2013) pointed out the characteristics of accounting information in the era of big data and proposed the strengthening of enterprise cloud computing construction to build an accounting big data analysis platform for uncovering the value hidden within big data [3]. Xu Jinye and Xu Lin (2013) emphasized the need for a shift in mindset when constructing a big data analysis platform: using all data, focusing on effectiveness rather than absolute precision, emphasizing correlations rather than causality, ensuring the quality of accounting big data, and developing enterprise big data center platforms [4]. Xu Jinye and Xue Yueyang (2013) specifically addressed the standardization of accounting big data. Mao Huayang and Liang Ningning (2013) elucidated the technologies and workflow employed in constructing a cloud-based accounting data center, with a focus on data warehouse and data mining process design, providing insights for cost-effective management decision-making in enterprises [5]. Cheng Ping, Zhou Huan, and Yang Zhounan (2013), building upon the recognition of cloud accounting for achieving enterprise accounting informatization, explored the relationship between accounting information security and cloud accounting. They conducted a specific study on the security issues associated with cloud computing-based accounting information systems and proposed solutions [6]. Additionally, Cheng Ping and Wang Xiaojian (2015) explained the support provided by big data technology and cloud accounting platforms for corporate financial decision-making. They established a workflow for financial decision-making in the era of big data, offering insights for cost-effective management decisions in enterprises [7]. Cheng Ping and Han Jiayi (2015) conducted a detailed analysis of the impact of technologies like big data on enterprise fixed asset investment decisions, considering factors such as decision efficiency, decision quality, and decision cost [8]. They established a framework and process for fixed asset decision-making in the era of big data, highlighting the application value of big data in these decisions. The goal of accounting informatization is to efficiently process an enterprise's accounting data to provide decision-relevant accounting information, ensuring sustainable business development. Due to the numerous advantages of cloud computing technology, its use in accounting information systems significantly enhances the utility of accounting data. China has only recently begun researching cloud-based accounting informatization models, and many scholars have provided insights for constructing such systems[9]. Therefore, this paper, in response to the changing times, builds a cloud-based accounting big data analysis platform based on the existing research achievements of scholars.

3 Construction of high -vocational accounting big data analysis platform based on cloud computing

3.1 Platform architecture design

The architecture for constructing an accounting big data analytics platform primarily consists of the following layers: the cloud service platform layer, the data acquisition layer, the data processing and storage layer, and the data output and presentation layer [10]. Furthermore, it

incorporates standardization and security mechanisms for accounting big data throughout the platform construction, as illustrated in Figure 1.

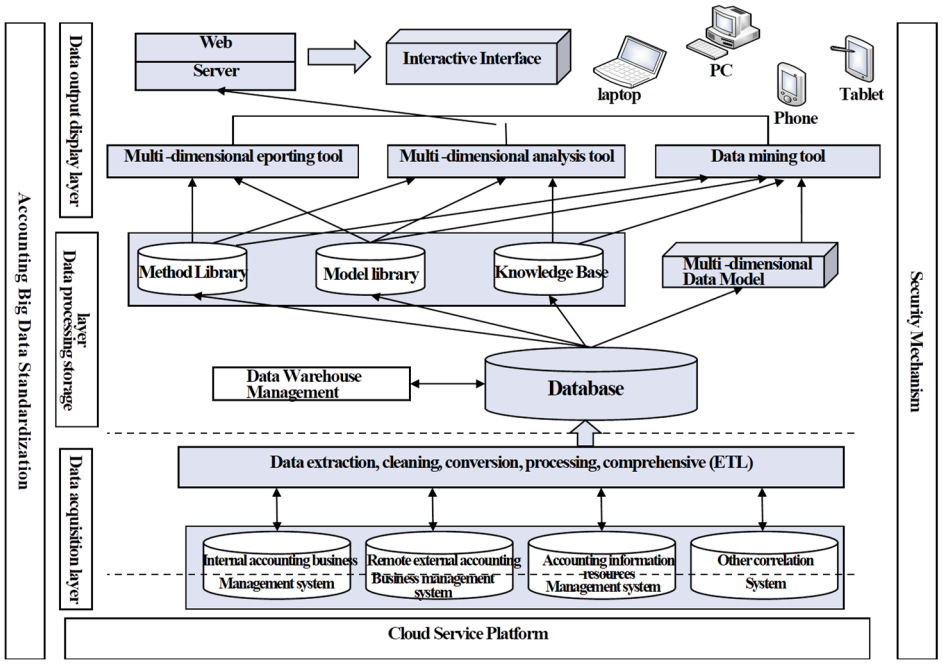

Fig. 1. The overall architecture diagram of the platform

Among them, the Cloud Service Platform Layer comprises network equipment, storage devices, operating systems, and the like, as the platform operates on a cloud computing service model, and thus, the foundational IT environment is provided by cloud service providers.

The Data Acquisition Layer encompasses accounting big data obtained from various departments within the enterprise's systems, external networks, accounting and financial management data, industry developments, and publicly disclosed accounting information from competing companies.

The Data Processing and Storage Layer involves the consolidation and processing of acquired accounting big data. Processed data is categorized and stored in different databases, including human resources accounting data, product sales accounting data, customer accounting data, all unified in the fundamental database, while methods, models, and knowledge libraries are uniformly stored in the analytical database, facilitating subsequent analysis.

The Data Output and Presentation Layer employs various data mining and analysis tools to process accounting data, and it outputs information derived from processing through different functional modules.

3.2 Basic IT environment deployment

(1) Selection of platform cloud computing service mode

There are three main delivery modes for cloud computing platform services: infrastructure, as service (IaaS), platform, service (PaaS), and software as SAAS. Each layer of service is based on the following basic services. The platform is based on infrastructure. The software service uses some software services through the network. The relationship between them is shown in Figure 2:

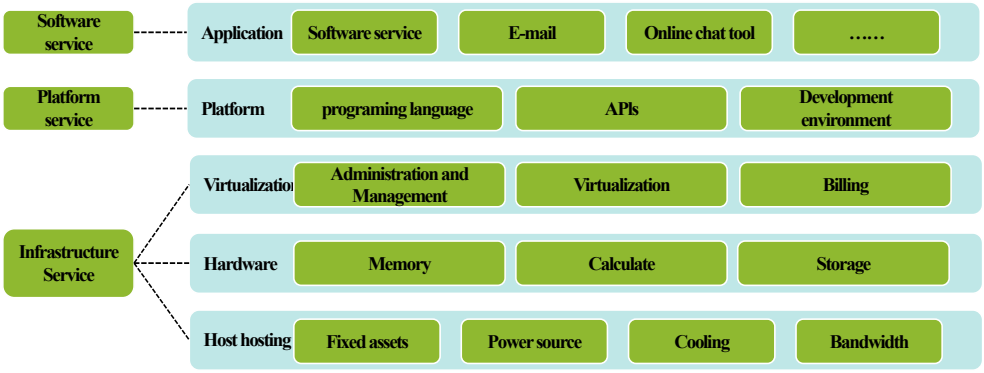

Fig. 2. Cloud computing service mode diagram

The accounting big data analysis platform constructed in this paper can be based on both the IaaS and PaaS models.

Infrastructure as a Service (IaaS): Located at the bottom layer of the cloud computing architecture, it is a pure technical component, such as the so-called "virtual machines" provided on-demand by companies like Google and Amazon. Cloud service providers virtualize hardware resources like memory, computing power, and storage, enabling enterprises to fully utilize these resources without the need for new capital investment. Almost all software applications can run on IaaS, and building an accounting big data analysis platform in this service model ensures secure and stable business operations, fast and accurate analysis of accounting data, while minimizing costs and maximizing value, achieving efficient use of capital.

Platform as a Service (PaaS): Positioned in the middle layer of the cloud computing architecture, it is an environment provided by cloud service providers for software development. Enterprises can use the programming languages and tools offered by PaaS to develop application software. Building an accounting big data analysis platform in this service model eliminates the need for defining the scalability of accounting data storage, as well as managing and controlling the cloud's infrastructure, network, servers, operating systems, or storage. However, it allows for control over application deployment and configuration within the corresponding environment. This significantly shortens the development cycle, reduces development costs, and indirectly enhances the return on investment in software for enterprises. Building software based on the PaaS model is expected to be a long-term development trend.

(2) Selection of platform cloud computing deployment mode

According to the deployment environment classification, cloud computing includes three types: public clouds, private clouds, and mixed clouds. As shown in Figure 3.

Fig. 3. Public Cloud, Private Clouds and Mixed Clouds

3.3 Accounting Big Data Acquisition

(1) Acquisition of Accounting Business Data

In the process of acquiring accounting business data, it is essential to align with the enterprise's business processing workflows. This involves not only obtaining structured data like accounting vouchers, ledgers, and reports from the existing accounting information system via the internal network but also obtaining unstructured data such as original documents (invoices from suppliers, customer orders), evidence, and experiential data through external networks, sensors, RFID radio frequencies, social network interactions, and B/S mobile inputs, among other methods. Once the data is received, it undergoes analysis, extraction, cleansing, and other operations using ETL tools before being stored in a MongoDB database (as shown in Figure 4).

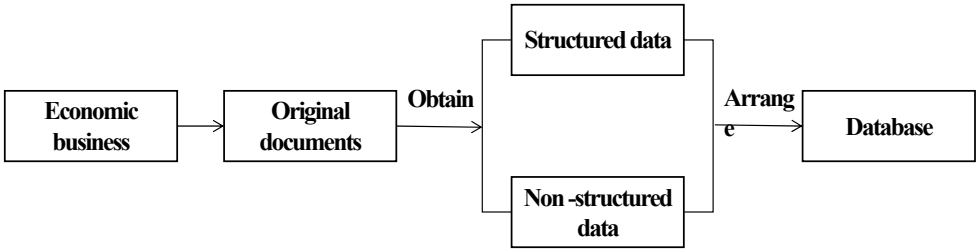

Fig. 4. The acquisition flowchart of accounting business data

Acquisition through Image Recognition: Paper-based documents can be captured through photography or scanning and then entered into the computer. Subsequently, image recognition is employed to extract relevant accounting data (e.g., for tax reporting on value-added tax invoices). Labels are added for storage. This process transforms unstructured data into structured data, making it convenient for managers to trace back to the original vouchers when reviewing accounting records and preventing redundant data entry, which could lead to data duplication.

Acquisition through B/S Mobile Input: Mobile devices such as smartphones and iPads are utilized for online headquarters to create forms for subordinate units, headquarters to review subordinate documents, headquarters to perform queries, accounting personnel to record transactions, and sales personnel to generate forms.

Acquisition through RFID Radio Frequency: RFID electronic tags are embedded in products. When the tags enter the radio signal zone of a reader, they identify the information attached to the tag on the product. The read data is then sent to the database for relevant data processing. This collection method enables data tracking, prevents data redundancy, and ensures real-time processing of accounting data.

In business accounting, due to the frequency of business transactions, the relatively low processing levels, and the need for real-time information provision, accounting data is stored in a cloud-based MongoDB database.

3.4 Accounting Big Data Analysis and Output

Accounting big data analysis and output involve the development of new data mining techniques based on the improvement of existing data mining technologies. It entails the unified application of accounting knowledge from the knowledge base, computational methods from the methods library, and financial analysis models from the model library. Various presentation tools are integrated to perform multidimensional analysis, classification, summarization, and data mining on the accounting big data stored in distributed databases. Subsequently, the results of predictive mining are dynamically presented through a client-side human-machine interaction interface to meet most common analysis requirements.

(1) Accounting Big Data Mining

This paper divides accounting big data mining into three categories: accounting business data mining, accounting knowledge mining, and other comprehensive decision analysis data mining. Accounting business data mining allows managers to independently retrieve accounting business data from the database, process and analyze it in conjunction with relevant models and algorithms to obtain desired results that meet managerial requirements.

(2) Data Output

In the data processing result output, traditional data processing outputs occur after processing accounting data using OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing). However, in cases of large accounting data volumes, this approach leads to low processing efficiency. Therefore, MapReduce technology is introduced into the platform for integrated processing of accounting big data. For example, in the output process of the analysis results of sales revenue accounting data (as shown in Figure 5), tasks related to sales revenue accounting are divided into multiple tasks based on time, which are processed separately by multiple machines. The results processed by each machine are then aggregated and outputted.

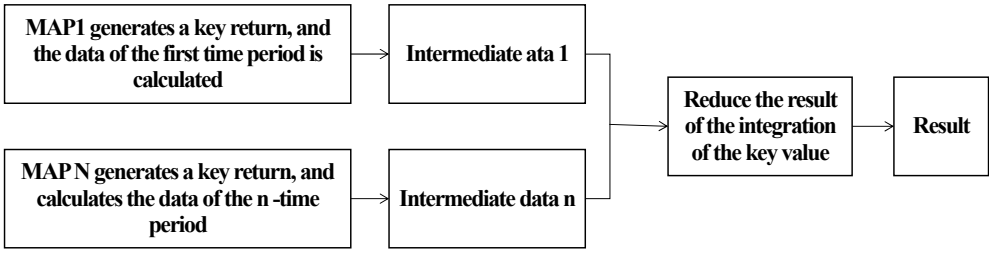

Fig. 5. Accounting accounting output flowchart

The platform uses cloud computing technology and enterprise -level search technology to process accounting big data, and the processing analysis results are dynamically displayed to information users through the B/S mode. Information users only need to pass an instant query method on the mobile terminal (SAP Business Objects Explorer), and enter the keywords that need to be queried to automatically obtain relevant accounting information, or choose to explain the model to obtain the required information information. Essence This output mode can improve the efficiency of accounting information processing and ensure the quality of accounting information while increasing the human -computer interaction of the platform.

3.5 Accounting Big Data Security Mechanism

(1) Risk Disclosure

Regarding the security of accounting big data, private cloud platforms are considered more secure than public cloud platforms. Despite many users of private clouds showing less concern in this regard, cloud computing still presents risks to the security of accounting big data. These risks manifest in various ways:

Confidentiality of Accounting Big Data Stored in the Cloud: This pertains to whether stored accounting big data can be accessed or modified by others when enterprise users are not present.

Confidentiality During the Execution of Accounting Big Data: This relates to whether accounting data can be viewed or modified when loaded into system memory.

Confidentiality of Accounting Big Data During Transmission Over Networks: This involves the security of accounting big data during transmission within the cloud computing center's internal network and over the internet, including whether it can be viewed or altered by unauthorized parties.

Integrity of Accounting Big Data: This concerns whether accounting big data can deteriorate over time.

Persistent Availability of Accounting Big Data: This refers to whether enterprises can access their accounting big data at any time, even during unforeseen events and disasters.

Access Speed for Accounting Big Data: This pertains to whether massive amounts of accounting data can still be accessed rapidly.

(2) Security

For these security risks, there are currently technical means to solve, as shown in Table 1.

Table 1 The solution table of various security risks

Safety Risk	Solution
Access permissions of accounting data	Permissions control program
Confidentiality of accounting data storage	File system encryption, storage and encryption
Confidentiality of accounting data	Operating system isolation, virtual machine isolation
Confidentiality of accounting data network transmission	Network encryption, such as HTTPS/SSL/VPN
Accounting integrity	Data validation
The lasting availability of accounting data	Accounting data mirror, accounting data backup, distributed storage
Access speed of accounting data	Data cache, high -speed network, CDN

4 Conclusion

In the process of constructing the platform, this paper has outlined the expected functionalities of the platform, designed its architectural framework, and provided detailed explanations of accounting big data acquisition, processing and storage, data mining, and security mechanisms. In the acquisition phase, we have incorporated principles from big data theory to collect accounting big data that is beneficial for enterprise decision-making. This approach ensures the relevance and quality of accounting information. In the processing and storage phase, we have advocated for the stratification and cross-storage of accounting big data. This approach enhances the utility of information resources. In the data analysis and output phase, we have employed advanced analytical techniques to integrate accounting big data, knowledge bases, method libraries, and model repositories. This integration facilitates comprehensive analysis of accounting big data. In the security module, we have introduced cloud computing security mechanisms to safeguard accounting big data. As a result, a cloud-based accounting big data analysis platform can maximize management efficiency and provide a practical platform system for vocational accounting education.

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