Exploring the Enhancement of Financial Audit Efficiency in Universities through Big Data Technology

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Abstract: Financial audit is a crucial means to ensure the authenticity and reliability of financial information in universities, optimize resource allocation, improve the efficiency of fund utilization, and enhance internal control and management. Every expenditure is closely related to teaching quality, scientific research innovation, and the well-being of faculty and students. With the continuous expansion of university scale and the increasing diversification of funding sources, traditional auditing methods can no longer meet the needs of the work. In recent years, with the rapid development of big data technology, new revolutionary tools have been provided for financial audits in universities. Relying on the powerful data processing, analysis, and mining capabilities of big data, audit efficiency and quality can be significantly improved. This paper outlines the current situation and existing problems in university audit work, analyzes the characteristics of big data technology and its significance in enhancing audit effectiveness, and discusses the challenges and solutions of applying big data in auditing. This study aims to assist universities in advancing the informatization of audit work, enhancing internal management, and achieving high-quality development.

***Keywords*:** financial audit; big data technology; universities; challenges; countermeasures

1. Introduction

In recent years, supported by the strategy of building a strong nation through education, China's higher education has developed rapidly, with universities expanding in scale and funding sources becoming more diversified. As financial and internal management risks continue to increase, financial auditing has become an increasingly vital tool for supervising and ensuring the healthy, transparent, and efficient operation of university finances, as well as the completeness and accuracy of financial information. However, as universities' economic activities and transaction volumes grow, a massive amount of financial data is generated, and traditional methods such as manual sampling and experiential judgment are prone to blind spots and efficiency issues, which can no longer meet the demands of auditing tasks.

In recent years, information technologies represented by big data, blockchain, and artificial intelligence have developed rapidly, empowering various industries and significantly improving work efficiency. These technologies have also brought revolutionary tools to traditional auditing. Using big data technology enables the extensive collection of university data, analysis of data, problem identification, and rapid discovery of high-quality clues, thereby achieving more with less effort, significantly improving audit speed and efficiency, and supporting high-quality development of audit work. In this regard, at the first meeting of the 20th Central Audit Committee, General Secretary Xi Jinping emphasized the need to "adhere to strengthening auditing through technology and enhance the informatization of audit work." Further promoting big data auditing in universities is not only an important practice in implementing General Secretary Xi Jinping's important directives but also a key measure to improve audit efficiency. Studying financial auditing in universities under big data technology has become a key topic in the field.

2. Current Situation and Dilemmas of Financial Audit Work in Universities

2.1 Significant Increase in Workload and Massive, Complex Financial Data

In recent years, with the in-depth implementation of the strategy of building a strong country through education, the country has paid increasing attention to higher education. Universities have developed rapidly, and the sources of funds have become more diversified. These include not only government appropriations such as fiscal funding and research grants, but also internal revenues such as income from university-owned enterprises, tuition fees, and social donations. Expenditures are extensive, covering but not limited to campus infrastructure projects, procurement of teaching and research equipment, construction of on- and off-campus training bases, discipline development, university-owned enterprises, and personnel expenditures. The increasing volume of economic and social activities in universities has generated massive financial data

with diverse structures, including financial statements, invoice images, contract documents, and meeting minutes. Traditional audit methods can hardly achieve comprehensive supervision or conduct in-depth analysis, making it easy to overlook key information and fail to detect problems effectively.

2.2 Efficiency Bottlenecks in Traditional Audit Methods

In the past, most university audit work relied on manual auditing, requiring auditors to review a large number of account books and accounting vouchers. Some even needed to manually verify accounts and flip through documents, which was time-consuming, labor-intensive, and highly inefficient. For example, during the annual internal audit of a university, auditors spent three to six months reviewing account books and materials every day, only completing basic compliance reviews, with no time for deeper financial analysis or performance auditing. The audit process was not only inefficient and lengthy but also hindered the university's normal operations, failing to effectively support university decision-making and unable to meet the needs of dynamic university management.

2.3 Difficulty in Identifying Potential Economic Risks and Hidden Problems

In recent years, especially after the release of the Ministry of Finance's Guiding Opinions on Further Strengthening the Internal Control System Construction of Universities in 2024, universities have continuously improved their internal control systems, and management levels have significantly improved. However, risks and hidden dangers in business and financial activities still exist, exposing many problems. For example, a university in Beijing violated regulations by charging a canteen management fee of 2.2297 million yuan from a designated canteen contractor; another college failed to stop a trustee operator from subleasing a property in violation of the contract and profiting from it, involving 4.944 million yuan in rent; a university in Xiamen included treadmills and barbells worth 1.6961 million yuan in the application list for "advanced teaching and scientific equipment" and was approved. In addition, there are issues such as irregular project bidding and arbitrary project changes. Some cases have even given rise to corruption. In these exposed problems, traditional audit methods are limited by sampling constraints, making it difficult to effectively identify risks, while full-coverage audits take a long time and are inefficient, failing to achieve comprehensive oversight.

2.4 Insufficient Audit Depth and Inadequate Use of Results

In past internal audits of universities, some economic responsibility audits have tended to be stereotypical and superficial, only skimming the surface of key issues, with auditors either unwilling or afraid to dig deeper, resulting in generally low audit quality and failure to effectively serve the function of preventing occupational crimes and curbing corruption. Moreover, the use of audit results has not been adequate. Rectification of identified problems has lacked effective follow-up, with incomplete or superficial corrections, failing to achieve the expected outcomes. Audit results have not been closely linked to year-end evaluations, performance management, rank promotion, or personnel appointments. There is a lack of effective coordination with departments such as organization and personnel, and discipline inspection and supervision, resulting in audit outcomes being underutilized or circulating ineffectively.

3. Big Data Technology and Financial Auditing

Big data technology refers to the techniques used to extensively collect massive data from various sources and analyze, extract, and mine useful information from it. The characteristics of big data technology are summarized as "4Vs":

Volume: With distributed storage architecture, it can store massive amounts of financial information and easily accommodate PB-level financial data.

Variety: It includes structured, semi-structured, and unstructured data. Through technologies such as text mining and image recognition, key information from invoices and contracts can be extracted, thus expanding the scope of audit work.

Velocity: It can perform large-scale data computations in a short time, such as calculating complex financial indicators and performing multi-dimensional data correlation and matching, significantly shortening the time required for processing audit data.

Value (low density): While the data volume is large, its value density is low, requiring deep mining through big data models and algorithm learning. For example, clustering analysis can be used to identify abnormal fund expenditures, and decision trees can be used to predict the risk level of infrastructure projects.

The inherent characteristics and functions of big data technology align closely with the needs of financial audit work. When applied to university financial auditing, it can produce twice the result with half the effort. It helps address issues such as the large volume of financial data, insufficient manual auditing capacity, limited audit coverage, and lack of audit depth. Moreover, it supports the advancement of comprehensive audit coverage in universities and helps reshape the financial

auditing ecosystem in higher education institutions.

4. Effectiveness and Significance of Applying Big Data Technology in Audit Work

4.1 Supporting Manual Verification and Improving Audit Efficiency

By relying on technologies such as big data and blockchain, financial data can be collected, verified, and analyzed through digital and information-based methods. Compared with traditional manual review methods, automated data collection and processing can significantly improve audit efficiency. For example, with the support of big data technology, a big data platform for university audit work can be established, integrating systems such as finance, operations, research, and human resources. This enables automatic extraction, rapid collection, cleaning, transformation, and integration of relevant system data, thereby multiplying efficiency. Through natural language processing and machine learning, simple audit procedures such as voucher verification and cross-checking of accounting relationships can be automatically reviewed, reducing the manual workload and allowing auditors to focus on more critical tasks.

4.2 Expanding Audit Scope and Extracting More Valuable Information

The application of big data technology in the field of auditing breaks through the data boundaries of traditional audits. In traditional audit models, the focus is primarily on financial data provided by the audited entity or sampled data, which is relatively limited in content and difficult to present a comprehensive picture, making problem identification challenging. By utilizing technologies such as big data and blockchain, various types of data can be effectively collected, significantly expanding the audit scope. Auditors can quickly collect and mine both structured and unstructured data, achieving even 100% full coverage and avoiding the limitations of partial or case-specific audits. Preprocessing through model algorithms helps auditors dig deeper into valuable information and identify audit breakthroughs. Furthermore, big data technology enables integrated analysis of operational and financial data in universities, helping to uncover complex problems hidden within individual systems.

4.3 Enhancing Risk Identification and Promoting the Transformation and Upgrading of Audit Models

With cutting-edge technologies such as big data, blockchain, and artificial intelligence, a university financial risk early warning system based on audit rules and machine learning models can be established. By integrating this into the university audit information platform, real-time 24-hour monitoring of financial activities can be achieved. Comprehensive supervision of economic and financial activities enables alerts for abnormal transactions, unusual transfers, budget overruns, and other issues, facilitating early risk detection and intervention. This shifts the audit function from post-event auditing to preventive measures taken before and during events. In addition, technologies such as cluster analysis, association rule mining, and anomaly detection assist in identifying clues that traditional methods may overlook, such as fund misappropriation or bid rigging. The application of big data in university auditing promotes the shift from compliance-focused auditing to comprehensive and investigative auditing, enhances internal control and risk prevention capabilities, and fosters high-quality development in universities.

5. Challenges and Countermeasures in Enhancing the Efficiency of University Financial Audits with Big Data Technology

5.1 Fixed Mindsets and Concepts Require Further Alignment of Understanding

Audit work under big data technology represents a transformation driven by technological advancement. Promoting big data-driven audit work first requires an upgrade in mindset and concepts. Traditional audit thinking and workflows can no longer meet the needs of big data environments and must be transformed and upgraded in line with audit informatization. Universities should widely promote and mobilize through meetings and campaigns to unify thinking and incorporate big data auditing into the institution’s informatization and audit development plans, clarifying goals, responsibilities, and resource guarantees. They should also improve and refine audit regulations and workflows to match the demands of big data auditing based on their own circumstances, laying the groundwork for future audit work.

5.2 Technical and Talent Constraints Require Strengthened Comprehensive Support

Big data auditing imposes higher demands on both hardware and software infrastructure. The costs of servers, storage facilities, and software platforms are high, placing pressure on university budgets and potentially limiting the implementation and promotion of big data auditing. It is recommended that universities actively explore diversified funding

channels, seek maximum support from government funds and research grants, and adopt phased construction and multiple investment strategies to reduce upfront costs. Strengthening university-enterprise cooperation and introducing corporate resources can also help ease financial burdens. Big data auditing also places higher demands on auditing personnel, requiring interdisciplinary talent proficient in both information technology and auditing. Currently, most university auditors have backgrounds primarily in finance or auditing. It is necessary to provide specialized training and education, and explore the introduction of professionals from disciplines such as computer science and mathematics to strengthen audit teams and build a scientifically structured talent pipeline.

5.3 Information Silos Persist and Require Further Data Integration

Effective financial auditing under big data requires massive data support to fully leverage the technology's potential. Currently, many universities' operations, logistics, and financial departments operate on systems that are not interconnected and cannot share data in real time, resulting in data silos that hinder audit effectiveness. Universities should address this based on their specific conditions, either by building new platforms or upgrading and expanding existing audit platforms incrementally. By establishing standardized data formats and unified collection protocols, they can address the issues of diverse data sources and inconsistent formats. Connecting to education department data interfaces will help eliminate information silos. All audit data must be verified and cleaned before submission, with logical checks in place. Anomalies should trigger alerts and be returned for correction to ensure authenticity and accuracy, paving the way for comprehensive audit coverage.

5.4 Privacy, Security, and Model Risks Require Strengthened Comprehensive Management

In the context of big data auditing, platforms collaboratively collect various types of internal data from universities, which may involve state secrets, trade secrets, and personal privacy of faculty and students. There are risks of data leakage during storage and transmission, which, if realized, could lead to severe consequences and damage national, societal, and individual interests. Universities are advised to build a comprehensive data protection system from both technical and managerial perspectives. They should strengthen the application of encryption technologies such as AES and RSA to ensure secure data transmission. Strict access controls should be enforced based on the principle of least privilege, with operational and management permissions defined strictly according to job roles, prohibiting any unauthorized operations. Universities must also enhance firewall construction for system platforms, regularly upgrade and maintain systems, conduct virus scans, and defend against external intrusions to ensure data security. As big data models play a critical role in auditing, their accuracy and stability are of great importance, and the "black box" problem must be avoided. Universities should adopt a cautious attitude toward model usage, limit their application scope, and establish rigorous mechanisms for model development, validation, and updating to enhance transparency.

6. Conclusion

The maturity and practical application of big data technology have provided efficient tools and broad development prospects for financial auditing in universities. Although it faces multiple challenges such as technology, talent, data governance, and cybersecurity, the benefits it brings—including improved efficiency, expanded scope, enhanced risk identification, and added audit value—are substantial. Universities should seize the opportunities of the digital era, improve mechanisms, cultivate talent, and strengthen safeguards to promote the deep integration of big data technology with financial auditing. By using big data to drive the transformation and strengthening of audit work, they can effectively prevent and resolve financial risks, ensure the security of funds, enhance internal control and management efficiency, and provide strong support for the sustainable and high-quality development of universities.

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