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Data Asset Auditing: Risks and Challenges

Yu Zhang[1]

1.Beijing International Studies University

Abstract

This study investigates the audit risks associated with data assets, which have become increasingly vital in the digital economy. As data assets differ significantly from traditional assets due to their intangibility, replicability, and complex valuation processes, traditional audit frameworks are inadequate for identifying and assessing the specific risks they pose. The research highlights the necessity of establishing a specialized audit framework tailored to data assets, cultivating multidisciplinary audit professionals, and adopting innovative audit technologies such as blockchain, AI, and RPA. These measures are essential for ensuring the accuracy, compliance, and security of data assets in financial statements. The study also addresses the importance of effective governance and management of data assets, emphasizing the role of internal controls and the potential risks of significant misstatements due to errors or fraud. The findings provide valuable insights for auditors and accounting firms, guiding them in adapting their practices to meet the challenges presented by data assets, thus safeguarding the integrity of financial reporting in the digital era.

Keywords: Data assets, Audit risks, Digital economy, Blockchain technology, Internal controls

I. Introduction

In today's globalized context, the digital economy has become a crucial driver of economic development. Innovations in technologies such as the internet, big data, cloud computing, and artificial intelligence have accelerated economic flows worldwide. Enabled by these technological advancements, China has achieved remarkable success in the digital economy, driving the construction of digital infrastructure and transforming traditional industries, thus becoming a significant force in global digital economic development. In 2019, the Chinese government for the first time listed data alongside land, labor, capital, and technology as a critical factor of production, significantly elevating the strategic importance of data elements in the national economy. In 2023, the Accounting Department of the Ministry of Finance of China and the China Appraisal Society issued the "Interim Regulations on Accounting Treatment Related to Corporate Data Resources" and the "Guidelines for Data Asset Valuation." These documents provide formal bases for the recognition and measurement of data assets in corporate accounting statements. With the introduction of these policies, more and more enterprises, especially listed companies, are accelerating the process of including data assets in their financial statements. However, determining the compliance and reasonableness of their accounting treatments has become an urgent issue for both academia and practice. Thus, exploring the audit risks arising from the inclusion of data assets in the financial statements of listed companies from the perspective of auditors and researching corresponding risk management measures hold significant practical value both theoretically and practically.

The main innovations of this paper are: Firstly, it keeps pace with the development of data assets, reasonably identifying potential issues in data asset auditing according to the spillover effect, ensuring the forward-looking and timeliness of the research, and contributing to theoretical enrichment. Secondly, it is based on the auditor's perspective from accounting firms, using modern risk-oriented auditing theories to conduct exploratory research on potential audit risks associated with the inclusion of data assets in financial statements, providing practical guidance for the profession.

RH Montgomery (1957), in "Montgomery's Auditing," logically linked the "audit process" with "risk." Subsequently, K. Stringer (1961) published an article on auditing, indicating a relationship between "precision and reliability" and the risk of auditors issuing inappropriate audit opinions, which marked the earliest international research on audit risk. Arens AA, et al. (1991) in "Contemporary Auditing," proposed that audit risk is the risk that, when the financial statements of an audited entity contain significant misstatements, the accounting firm fails to express a fair opinion and issues an unqualified audit report. W. Robert Knechel (2007) reviewed the origins, obstacles, and opportunities of business risk auditing, focusing on the impact of the Enron incident on audit risk. TA Seidel (2014) suggested that in addition to preventing audit risks, auditors should dynamically adjust audit procedures to respond to significant misstatement risks and use the audit risk model when dealing with specific accounts. Glazer R (1993) considered information as a carrier of value and a source of competitive advantage, proposing a methodology for measuring the value of company information. Hal R Varian (2000) argued that when opportunities for sharing information products exist, content producers often sell fewer

information products at higher prices, reducing transaction costs to achieve higher profits. Attard J & Orlandi F (2017) stated that open data is gradually penetrating all aspects of society and has become an indispensable commodity, summarizing three factors that play crucial roles in the data value network. Iansiti M (2021) found that the quality, scale, scope, and uniqueness of data will affect a company's ability to extract incremental value from data, advancing technological innovation. Moody DL & Walsh P (1999) considered information as a valuable asset, though the substantial resources consumed in acquiring, storing, and processing information are usually not reflected on the balance sheet. Wilson RM & Stenson JA (2008) first explored general methods for valuing and recognizing intangible assets, then discussed the value attributes of information assets as a special category of intangible assets. Birch K & Cochrane DT (2021) analyzed the trend of data transitioning into assets and discussed how tech companies with massive amounts of personal data should account for, manage, and evaluate personal data, and how to monetize it. Laura V (2023) argued that if businesses and investors use data to make more accurate predictions, data can not only increase profits but also solve risks, suggesting that risk resolution may be the most significant source of data value. Swash GD (1997) indicated that effectively identifying and managing corporate information is particularly important in a business environment, as good information auditing will better promote organizational change and information assetization. Buchanan S & Gibb F (2007) continued to explore the difficulties and challenges of conducting information audits within enterprises, providing a new approach to identifying and evaluating an organization's information resources and information flows to facilitate effective and efficient organization of information systems. Jones S & Ball A (2008) focused on data information, reviewed existing data audit frameworks, and analyzed the issues encountered in applying these frameworks in practice, reorganizing the development direction of data audit frameworks. Pimentel E & Boulianne E (2020) noted that accounting firms have a negative attitude towards engagements involving companies holding large amounts of encrypted data assets, primarily due to the complex and high-risk nature of the blockchain industry, which poses challenges for auditing, suggesting that academia and practice need to conduct more detailed research in this area. Zhang Yue, Yang Le, et al. (2021) found through a questionnaire survey that the era of big data presents significant challenges to social auditing, national auditing, and internal auditing, not only at the technical level of auditors but also throughout the entire audit process. Qin Rongsheng (2023) further explained the importance of data elements to economic development in the digital economy era and innovatively proposed a data-oriented audit risk model: audit risk = data error risk * detection risk, to provide practical guidance for auditing work. Zhang Junrui, Wei Yanlin, et al. (2023) found through textual analysis of listed companies' annual reports that information disclosure of corporate data resources significantly increases audit fees.

This paper first introduces the background of the data element market and the inclusion of data assets in financial statements, leading to the question, "Why and how should we analyze and respond to audit risks related to data assets?" On this basis, it further explains the theoretical and practical significance of this research and reviews the relevant literature on audit risk and data asset fields, clarifying the research methods and innovations. Subsequently, key concepts are defined, and the subsequent research is supported by the principal-agent theory, information asymmetry theory, modern risk-oriented audit theory, and externality theory. Finally, the development status of data assets is outlined, and from the perspectives of significant

misstatement risk and detection risk, the audit risks commonly associated with data assets disclosed in the financial statements of listed companies are analyzed.

II. Inclusion of Data Assets in Financial Statements of Listed Companies

Based on the review of historical literature, it is evident that the term "data assets" is not a recent concept, and there are differing views between experts in the fields of information technology and economics regarding its definition. Given that this study primarily focuses on data assets listed in financial statements, we refer to the definition of data assets provided in the "Guidelines" issued by the China Appraisal Society in September 2023. According to these guidelines, data assets refer to data resources that are legally owned or controlled by a specific entity, can be measured in monetary terms, and are capable of bringing direct or indirect economic benefits. Data resources, in turn, are defined as data that has been processed and holds economic value in the present or future. Regarding the presentation of these assets in financial statements, the "Interim Provisions" recognize data resources that meet the definition and recognition criteria for assets as either inventories or intangible assets. Therefore, the focus of this study is on assets classified under the "Data Resources" item in the balance sheet, in accordance with the "Interim Provisions."

Data Assets for Internal Use According to the "Interim Provisions," companies can recognize data resources used for internal production and management, and that meet the definition and recognition criteria under "Accounting Standard No. 6—Intangible Assets," as "Intangible Assets—Data Resources." Whether these data assets are purchased externally or developed internally, the cost recognized in the accounts should consider the purchase price, taxes, and data processing expenses. For internally developed data products that are still in the development phase and have not yet met the recognition criteria for intangible assets, companies may temporarily list them under development expenses and transfer them to the intangible assets account once recognition criteria are met.

During subsequent measurement, companies should refer to the guidelines for intangible assets to disclose changes in the book value, amortization, and impairment provisions of data resources, based on how these data resources were acquired (including external purchases or internal development). For data assets with an indeterminable useful life, companies should explain the basis for their judgment. Additionally, if a company uses data assets for business activities, it should recognize the corresponding gains and losses for the period in accordance with the relevant revenue standards.

Data Assets for External Transactions For data assets held for routine use and intended for external transactions, companies should recognize those that meet the definition and recognition criteria under "Accounting Standard No. 1—Inventories" under the "Inventories—Data Resources" item in the balance sheet. For externally purchased data inventories, companies should focus on the procurement costs incurred

during data verification, quality assessment, and registration and settlement processes to ensure proper accounting. For internally developed data inventories, in addition to considering the cost of acquiring the original data, companies should also recognize the expenses incurred in subsequent data processing stages.

When disclosing externally, companies should provide detailed disclosures about the data inventories acquired through external purchases, internal development, or other means. Additionally, companies should periodically conduct impairment tests on data inventories and accurately recognize and reverse inventory write-downs. It is important to note that data inventories have a certain timeliness, leading to strong fluctuations in market prices. When companies engage in data inventory transactions, they must strictly adhere to revenue standards to ensure accurate revenue recognition and cost transfer.

III. Audit Risks of Data Assets

This article analyzes the audit risks of data assets based on modern risk-oriented audit theory, referencing documents such as "Audit Theory and Practice" (edited by Chen Hanwen and Han Hongling), "Practical Guide to Data Asset Inclusion and Valuation" (Shanghai Data Exchange), and the "Data Compliance Audit Guide" (China Electronics Information Industry Association). The analysis is focused on two major directions: significant misstatement risk and detection risk. According to the "Chinese Auditing Standards No. 1211—Identification and Assessment of the Risks of Material Misstatement" (revised on December 22, 2022), significant misstatement risk may be caused by errors or fraud, which is further analyzed in detail.

Significant Misstatement Risk Caused by Errors (1) Compliance and Rights Recognition Based on the widespread application of data asset inclusion in various industries mentioned above, companies that have completed the inclusion of data assets are often subject to two aspects of legal and policy regulation. The first is the legal regulation inherent to the industry, which undoubtedly restricts every move of the company. For example, the information technology industry, which is data-intensive, is not only supported by the state in emerging industries and high-tech industries but also subject to legal regulations such as cybersecurity and patent protection. If a company incorrectly uses illegal technologies or unauthorized patents to seek high profits, it will face significant operational and material misstatement risks. The second aspect is the additional regulation brought by the inclusion of data assets, such as strict adherence to national laws and regulations like the "Data Security Law" and the "Measures for Security Assessment of Data Exports," as well as local data regulations and management measures at the provincial and municipal levels, as shown in Table 3-1. If a company does not clearly define the ownership of data assets at the initial inclusion stage, significant disputes that arise later may overturn the previous asset recognition, posing a challenge to the audit work. Additionally, China is accelerating the advancement of tax reforms in the digital economy, and future more explicit data asset tax policies will reverse-push corporate tax planning, further challenging auditors' compliance efforts.

Table 3-1: Relevant Laws and Regulations for Data Assets

Time	Law/Regulation	Main Content
2016	Cybersecurity Law	Protects sovereignty and national security in cyberspace, social public interests, and the legal rights of citizens, legal persons, and other organizations.
2021	Data Security Law	Establishes a data classification and management system, data security review, data security risk assessment, monitoring and early warning, and emergency response systems.
2021	Shanghai Data Regulations	Regulates data processing activities, promotes the orderly flow of data, ensures data security, and enhances the marketization of data elements.
2021	Shenzhen Special Economic Zone Data Regulations	Promotes data as a production factor for open circulation and development, accelerates the construction of a digital economy, digital society, and digital government.
2022	Guizhou Province Big Data Development and Application Promotion Regulations	Promotes the development of big data, applies big data to economic development, improves social governance, and enhances government service management capabilities.
2022	Measures for the Evaluation of Data Outbound Security	Specifies the scope, conditions, and procedures for the evaluation of data outbound security, providing specific guidance for data outbound security evaluation work.
2023	Shanghai Data Exchange Administration Measures	Regulates the Shanghai Data Exchange, creates a healthy, high-quality, and active data element market.

Source: Public data collation

(2) Effective Governance and Management At the current stage, the governance and management of data assets in companies are largely based on the effectiveness of internal controls. The fundamental reason for establishing internal controls is to strengthen internal management, ensure the legality, rationality, and decentralization of operational management. After implementing the inclusion of data assets in financial statements, companies will face higher requirements for internal controls, including the standardization of processes related to the acquisition, processing, storage, and disclosure of data assets. Many companies are still in the exploratory phase of including data assets in their financial statements, and their internal control systems are not yet fully developed. However, due to the relatively small scale of these assets and the high level of attention from senior management, many issues may not yet have surfaced. According to modern risk-oriented audit theory, auditors should not rely solely on internal control testing during audits but should implement comprehensive substantive procedures. However, for auditing data assets, many significant misstatement risks stem from the processes of data asset acquisition, processing, storage, and disclosure. Therefore, auditors must pay particular attention to the impact of internal controls on the accuracy and reliability of accounting information disclosure. Additionally, auditors should reasonably assess the potential impact of senior management's subjective intentions on internal controls, avoiding situations where management overrides the internal control system and designing appropriate further audit procedures.

Moreover, auditors should conduct thorough assessments of the information technology used by the audited entity. In traditional industries, where companies primarily engage in the trade of physical assets and have not undergone digital transformation, auditors need to be vigilant about technical issues related to the inclusion of data assets in financial statements, identifying hidden risks. Generally, the information technology used by the audited entity can pose two types of risks related to the inclusion of data assets in financial statements. One is the credibility of the company's data environment. If the company's information security management framework is immature and lacks professional information systems and technical personnel, the credibility of its data environment is low, posing a risk of significant impairment of data assets in the future. The other risk is that management may pressure technical staff to inaccurately estimate data volume and quality during the process of acquiring and processing raw data into data assets, leading to inflated valuations and, objectively, to asset overstatement. Both technical deficiencies and human errors can impact the risk of significant misstatements at the financial statement level, increasing the likelihood of audit failures.

(3) Economic Benefit Analysis According to the definition of data assets provided earlier, data assets disclosed in financial statements should originate from routine economic activities, and the resulting economic benefits are likely (with a probability greater than 50%) to flow into the enterprise. For data assets that have already generated economic benefits, auditors should focus on the correlation between the corresponding revenue and the reported item. For data assets that have been recorded but have not yet generated revenue, auditors should carefully assess the likelihood of these assets generating economic benefits, reasonably estimate the various economic factors that may exist within their useful life, and, if necessary, compare them with competing products in the market to prevent the audited entity from overestimating the feasibility of the expected economic benefits of the data assets.

(4) Reasonable Cost Allocation and Amortization When including data assets in financial statements, companies must consider two main issues. The first is the basis for recognizing the data assets in the financial statements. Whether the company recognizes them as intangible assets or inventories, it must adhere to the corresponding recognition standards. The second issue is the specific processing costs associated with data assets, which may include data compliance costs, governance costs, ownership identification, registration costs, and indirect costs that need to be allocated. If the audited entity fails to reasonably allocate and amortize these costs, the fairness of the financial statements could be compromised. Auditors should be particularly vigilant when dealing with listed companies that recognize data assets as inventories, ensuring that the risk of misstatements is controlled within an acceptable range.

(5) Reporting and Disclosure According to the "Interim Provisions," companies are required to disclose the newly added "Data Resources" sub-item in their annual reports in a detailed manner using tables. Although some listed companies have provided textual descriptions of data assets in their Q1 2024 reports, they have not yet met the standards required by the "Interim Provisions." Given the continuity of financial statements, auditors should also consider the accuracy of previous quarterly reports during the annual audit. The selection of items to be included in the financial statements by the audited entity is another important area for auditors to assess audit risk. For example, among the first batch of listed companies to attempt the inclusion

of data assets in financial statements, four companies later reclassified the amounts under "Inventories—Data Resources" to "Contract Assets" in subsequent correction announcements. The reasonableness of this reclassification will need to be verified during the annual audit. Additionally, Nanjing Iron & Steel Co., Ltd. and Capinfo Company Limited both recognized "Intangible Assets—Data Resources" and "Development Expenses—Data Resources" in their Q1 2024 reports, which poses a risk of misstatements regarding the timing of data capitalization and intangible asset recognition. Therefore, when assessing the risk of misstatements caused by errors, auditors should trace the entire process of data asset inclusion and subsequent treatment.

2. Significant Misstatement Risk Due to Fraud

(1) Existence Given that significant misstatements caused by fraud are often related to management assertions, this section provides a detailed analysis of asset and liability assertions. For asset items, auditors should first test their existence. The main motivations for including data assets in financial statements for listed companies include expanding the scale of assets, optimizing the asset-liability structure, capitalizing expenses, and innovating financing channels. Driven by these motivations, many listed companies, especially those under operational pressure, may face greater temptation to manipulate financial information to cover up actual operational issues or pursue short-term interests. Legalizing the inclusion of data assets in financial statements provides a favorable tool for financial fraudsters. On the one hand, inflating data assets can increase total assets, lower the debt-to-equity ratio, beautify the balance sheet, and reduce attention from stakeholders and regulatory authorities. On the other hand, management can use the inclusion of data assets to balance artificially inflated revenue and profits, and then "reasonably" absorb the inflated profits through impairment. Additionally, when a company faces a fatal cash flow shortage, management may overstate data assets to seek cash through pledging or issuing special bonds. Therefore, when assessing the existence of data assets, auditors should fully consider their objective, real existence, and ensure that the quantities are not fabricated.

(2) Rights and Obligations According to the "Interim Provisions," data assets that meet the relevant recognition criteria can be disclosed as assets in financial statements, but clear ownership of data assets is a critical prerequisite for any subsequent operations. Currently, there is no unified national standard for the ownership confirmation of data assets, and companies have only conducted data asset confirmation and registration according to local management measures, as shown in **Figure 3-1**. Therefore, company managers may obscure the concept of the entity when including data assets in financial statements, expand their scope of rights, and recognize data assets that they do not control to inflate assets. Moreover, the authenticity and legality of accounting vouchers related to the inclusion of data assets in financial statements will also challenge auditors. When verifying the ownership of data assets of different companies, auditors may find it challenging to accurately identify significant misstatement risks due to a lack of authoritative reference standards.

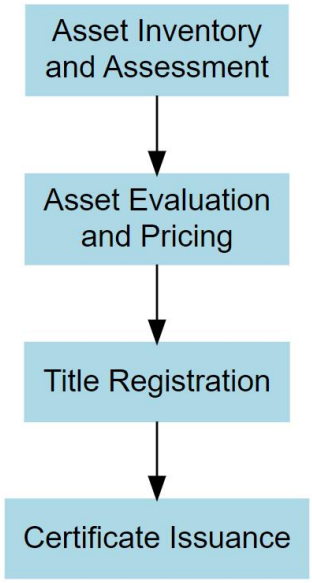

Figure 3-1 Data asset validation registration process

(3) Completeness In the process of verifying the completeness of balance sheet items for the audited entity, auditors often focus more on the completeness of liabilities and may overlook the completeness of assets. Since data assets are a new type of asset, many companies may be cautious in their accounting treatment or may conceal assets for certain reasons. For example, some listed companies that have recognized data assets as intangible assets may emphasize that these intangible assets have no definite useful life and therefore do not require amortization. However, under tax law, corporate income tax may require amortization over a minimum period of 10 years, which could affect the value of data assets. Additionally, most of the listed companies that advocate the inclusion of data assets in financial statements are in the information technology industry. If management falsifies the purchase of data assets as R&D expenses to meet the requirements of high-tech enterprise recognition for the year, it would harm national interests. Therefore, auditors must maintain reasonable professional skepticism about the completeness of data assets in the audited entity to ensure audit quality.

(4) Accuracy, Valuation, and Allocation After determining the corresponding item for the inclusion of data assets in financial statements, the method of valuation and the accuracy of the valuation will also affect the risk of significant misstatements at the assertion level. Whether the company recognizes data assets as intangible assets or inventories, it must consider their use value, exchange value, and economic value. Many experts currently believe that the valuation of data assets should be based on traditional appraisal methods, using the cost approach, income approach, and market approach for estimation. Given the differences between these methods, company management may exploit this to overestimate the value of assets, leading to significant misstatement risks due to fraud. During subsequent measurement, if the company deliberately alters the method of amortization or impairment of data assets, it could distort the financial statements. Furthermore, because data assets are replicable and non-exclusive, when the company sells or uses data assets to provide services to customers, there may be situations where data assets are repeatedly utilized. Therefore, when calculating the costs of different types of

business data assets, the company may obscure the handling of sales costs, leading to a mismatch between revenue and costs and resulting in significant misstatement risks.

(5) Classification

There is also a risk that data assets may not be recorded in the appropriate accounts during the process of recognizing specific items. Due to the spillover effect of the inclusion of data assets in financial statements, more and more listed companies may seek to reclassify their operational data as intangible assets after further development. However, during the recognition of intangible assets, companies must distinguish between the research phase and the development phase, involving the capitalization or expensing of research and development (R&D) expenditures. This provides management with the opportunity to manipulate profits. If management subjectively allocates a significant amount of expenses to the development phase for capitalization, they can reduce the impact on profits for the current year through amortization.

(6) Presentation According to the emphasis in the "Interim Provisions," companies should provide detailed disclosures in their annual reports through tables for the newly added "Data Resources" sub-item. If a listed company fails to provide detailed disclosures regarding data assets in its annual report, it could affect the accuracy of auditors' verification of data assets. When similar issues arise in the inclusion of data assets in financial statements, the company may conceal or ambiguously present the information in its external disclosures, potentially misleading auditors. Therefore, auditors should fully penetrate the assessment of significant misstatement risks based on the modern risk-oriented audit model, design reasonable audit procedures, and issue a fair opinion.

3. Detection Risk

According to modern risk-oriented audit theory, audit risk is the level of security preset by the auditing firm, and significant misstatement risk is the inherent risk present in the audited entity. Therefore, detection risk is the only controllable variable for auditors and is the ratio of audit risk to significant misstatement risk. When the audited entity is at a high level of significant misstatement risk, auditors should design more detailed and comprehensive audit procedures to reduce detection risk to an acceptable level, thereby controlling overall audit risk.

(1) Professional Ethics The professional ethics of auditors have a profound impact on audit detection risk. Auditors who adhere to ethical principles such as independence, objectivity, and integrity can effectively reduce audit risk, ensuring the truthfulness and reliability of the audit report. However, auditors who fail to meet professional ethical standards may be influenced by conflicts of interest, moral hazards, or pressure, leading to negligence in the audit process, resulting in a lack of sufficient audit evidence, reduced audit quality, increased risk, and ultimately affecting the governance structure of the company and market stability, thereby undermining investor confidence.

(2) Professional Competence Professional competence is the foundation for auditors to effectively conduct audit work. This includes not only auditors' mastery of accounting and

auditing knowledge but also their understanding of the industry and matters being audited. Competent auditors can accurately identify and correct potential audit deviations and errors during their work, effectively implementing audit procedures and ensuring audit quality. Conversely, lack of professional competence can lead to unexpected detection risks. Additionally, auditors' familiarity with the industry and audit matters is a critical aspect of their professional skills. Different industries often have varying points of significant misstatement risk. If auditors lack relevant industry experience, they may be unable to accurately assess significant misstatement risks. For the audit of data assets, auditors should make reasonable judgments about the compliance issues related to the inclusion of data assets in financial statements and the safety and credibility of the data environment. However, many auditors may lack the necessary legal and technical knowledge, which undoubtedly increases audit risk. Therefore, whether auditors can adopt targeted audit methods and appropriately execute further audit procedures based on different audit environments is crucial to ensuring audit quality.

(3) Audit Procedures Audit procedures are the methods employed by certified public accountants to obtain sufficient audit evidence and span the entire audit period. Reasonable audit procedures can help auditors adequately address significant misstatement risks and control detection risk within acceptable limits. Audit procedures also test auditors' audit capabilities. For data assets, auditors should analyze the company's specific valuation methods, combined with accounting attributes, and reasonably design audit procedures to obtain sufficient and effective audit evidence, thereby reducing detection risk. Furthermore, due to the unique nature of data assets, auditors should be vigilant about the audited entity's level of information technology. Referencing IT governance audit frameworks, factors such as IT risk impact, system dependency, and IT governance environment are key focus areas in audit practice. Therefore, auditors should specifically analyze the accounting attributes and corresponding technical levels of the audited entity's data assets to ensure the reasonableness of audit procedures and the adequacy of their execution, thus tightly controlling audit risk.

(4) Audit Evidence Gathering audit evidence is a critical step in the audit process, and the quality and effectiveness of this evidence directly determine the reliability of audit conclusions. If the audit evidence is sufficient and reliable, auditors can more confidently support their audit opinions. Conversely, if audit evidence is insufficient or of poor quality, auditors may face challenges in identifying significant issues or errors and may be unable to provide adequate assurance. Traditional audit evidence includes written documents, records, reports, receipts, contracts, and other tangible forms of documents or records. Unlike traditional assets, data assets exist in a virtual and intangible form, making the audit evidence-gathering process more complex. Additionally, data assets are often closely linked to the company's production and operations, with many data assets being derived from raw data summarized and reported by business departments, involving multiple departments and systems throughout the process. This complexity provides opportunities for companies to fabricate data and embellish financial statements. Therefore, auditors must ensure that the audit evidence is sufficiently accurate and comprehensive.

IV. Responding to Data Asset Audit Risks

Establishing a Comprehensive Audit Framework Due to the non-physical and replicable nature of data assets, which differ from traditional assets, the existing audit models are inadequate for fully identifying and assessing specific audit risks. Furthermore, digital technology and the digital economy are increasingly becoming focal points of international competition, and the importance and prospects of data assets in capital markets are self-evident. In light of these circumstances, accounting firms and auditors should establish a targeted audit framework for data assets, aimed at ensuring the compliance and accuracy of corporate data asset accounting. The framework should clearly define data assets, including their sources, types, and value, to ensure they are recorded in the correct accounts. Additionally, it should establish a data classification system, assess the audited entity's information environment, conduct risk assessments for different types of data, and identify potential security threats and compliance risks.

Cultivating Multidisciplinary Audit Talent A competent data asset audit team should consist of two types of multidisciplinary audit professionals. The first type is auditors proficient in digital technology. Accounting firms should actively collaborate with universities and training institutions to develop auditors' skills in data analysis, programming, cybersecurity, and data privacy regulations. The second type of professional is those with strong knowledge in asset valuation, as valuation plays a decisive role in the pricing of data assets, and its accuracy and reasonableness should be key considerations for auditors. Therefore, accounting firms should actively promote professional seminars and online courses on asset valuation to foster collaboration and integration between asset valuation and auditing.

Innovating Audit Techniques By leveraging automation tools and intelligent analysis platforms, auditors can efficiently process large volumes of data, promptly identify risks, and provide recommendations for improvement. The decentralized, tamper-resistant, and traceable characteristics of blockchain technology can help confirm data asset ownership and resolve disputes. Meanwhile, Robotic Process Automation (RPA) technology, which simulates human-computer interaction, is suitable for handling repetitive tasks that involve large amounts of data and require human support. When combined with artificial intelligence (AI) and machine learning (ML) algorithms, RPA can also analyze unstructured data and identify complex patterns, allowing auditors to focus on higher-value analysis and decision-making. By integrating blockchain and RPA, the audit of corporate data assets can undergo intelligent and automated transformation, enhancing audit accuracy, and improving data security and efficiency.

V. Conclusion

As the digital economy continues to expand, data assets have emerged as a critical component of corporate value and an increasingly significant element in financial statements. The unique characteristics of data assets, such as their intangibility, replicability, and the complexity involved in their valuation and management, pose substantial challenges for auditors. These challenges

necessitate the development of specialized audit frameworks, the cultivation of multidisciplinary audit talent, and the adoption of innovative audit technologies.

This study has explored the audit risks associated with data assets, including the risks stemming from errors and fraud, as well as those related to compliance and internal control weaknesses. The findings suggest that traditional audit approaches are insufficient for addressing the complexities of data assets, thus highlighting the need for auditors to adapt their methodologies. By establishing a comprehensive audit framework specifically designed for data assets, auditors can better assess and mitigate the risks associated with these intangible assets.

Furthermore, the integration of advanced technologies such as blockchain, AI, and RPA into the audit process offers promising solutions for enhancing audit accuracy, efficiency, and data security. These technologies not only facilitate the management and verification of data assets but also enable auditors to focus on high-value tasks, thereby improving overall audit quality.

As data assets become increasingly integral to corporate strategy and operations, their audit will continue to evolve. The insights provided in this study contribute to the ongoing discourse on how best to audit data assets, ensuring that they are accounted for accurately and securely. Future research should continue to explore the intersection of technology, data management, and auditing, ensuring that audit practices remain relevant and robust in the face of rapid technological advancements. This will ultimately help to safeguard the integrity of financial reporting in the digital age.

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