Scientific Research Publishing

iBusiness, 2024, 16, 216-225
https://www.scirp.org/journal/ib
ISSN Online: 2150-4083
ISSN Print: 2150-4075

Theoretical Reconstruction of Accounting Information Systems in the Big Data Era

Yueqi Huang

Nanjing Dongshan Foreign Language School, Nanjing, China
Email: huangyueqi2025@outlook.com

How to cite this paper: Huang, Y. Q. (2024). Theoretical Reconstruction of Accounting Information Systems in the Big Data Era. *iBusiness, 16,* 216-225.
https://doi.org/10.4236/ib.2024.164015

Received: October 10, 2024
Accepted: November 30, 2024
Published: December 3, 2024

Abstract

The advent of the big data era has brought unprecedented opportunities and challenges to accounting information systems. This paper explores the theoretical reconstruction of accounting information systems in the big data environment, analyzes the dilemmas faced by existing accounting information systems, and proposes the necessity and feasibility of reconstruction. The research indicates that the application of big data technology will significantly enhance the real-time nature, comprehensiveness, and predictability of accounting information, while also placing higher demands on the professional capabilities of accounting personnel. This paper constructs a theoretical framework for big data-based accounting information systems, including data collection, processing, storage, and analysis processes, and discusses the application prospects of this framework in financial reporting, management accounting, and auditing. The research results show that the reconstruction of accounting information systems driven by big data will greatly improve the quality of accounting information and decision support capabilities, providing strong support for enterprise value creation.

Keywords

Big Data, Accounting Information Systems, Theoretical Reconstruction, Data Analysis, Decision Support

1. Introduction

With the rapid development of information technology, the big data era has arrived, bringing profound changes to various industries. Against this backdrop, traditional accounting information systems face unprecedented challenges and opportunities. The characteristics of big data—huge volume, diverse types, low-value density, and fast processing speed—are reshaping the generation, processing,

and application of accounting information. In recent years, academia has extensively discussed the relationship between big data and accounting. Warren et al. (2015) point out that big data technology can significantly improve the timeliness and accuracy of accounting information. Research by Vasarhelyi et al. (2015) shows that big data analysis can enhance audit efficiency and effectiveness. However, existing accounting information systems still have many deficiencies in data integration, real-time processing, and predictive analysis. Appelbaum et al. (2017) emphasize the urgency of reconstructing the theoretical framework of accounting information systems. This study aims to explore the theoretical reconstruction of accounting information systems in the big data era, analyze the limitations of existing systems, propose a new theoretical framework based on big data, and discuss its application prospects in accounting practice. This paper will systematically re-examine the theoretical foundation of accounting information systems from the perspective of the entire process from data collection, storage, processing to analysis, providing new ideas for improving accounting information quality and decision support capabilities. By integrating big data technology with traditional accounting theory, this research will provide valuable references for the development of accounting disciplines and innovation in accounting practices.

2. Challenges Faced by Accounting Information Systems in the Big Data Era

2.1. The Contradiction between Data Volume Explosion and Processing Capacity

In the big data era, the primary challenge faced by accounting information systems is the explosive growth of data volume. Traditional accounting information systems mainly process structured financial data, while in the big data environment, systems need to simultaneously process massive amounts of structured, semi-structured, and unstructured data. These data come from a wide range of sources, including internal transaction records, production and operation data, as well as external market information and social media data. The surge in data volume has put enormous pressure on the storage and processing capabilities of accounting information systems. Traditional relational databases and batch processing modes can no longer meet the processing requirements of big data (Baruch, Gandelman, & Gandelman, 2021). The real-time requirements for data are also constantly increasing, as enterprise managers need to make decisions based on the latest data, which requires accounting information systems to achieve near real-time data processing and analysis. However, there is a significant gap between the processing capabilities of most current accounting information systems and this requirement. How to improve the data processing speed and efficiency of the system while ensuring data quality has become an urgent problem to be solved. Vasarhelyi et al. (2015) point out that accounting information systems in the big data era need to have high scalability and flexibility to adapt to the ever-growing data volume and diverse data types. Therefore, reconstructing the theoretical

framework of accounting information systems to effectively address the challenges of data volume explosion is an inevitable requirement for the development of accounting information systems in the big data era.

2.2. The Challenge of Data Diversity and Information Integration

Another significant feature of the big data era is the diversity of data types, which poses a huge challenge to the information integration of accounting information systems. Traditional accounting information systems mainly process structured financial data, while data sources in the big data environment are more diverse, including structured, semi-structured, and unstructured data (Chu & Yong, 2021). These data may come from internal ERP systems, CRM systems, supply chain management systems, or external social media, web logs, sensor data, etc. How to effectively integrate these heterogeneous data and extract valuable accounting information has become an important issue facing accounting information systems. The diversity of data not only increases the complexity of data processing but also places higher demands on the quality control of accounting information. Traditional data validation and verification methods may not be applicable to all types of data, requiring the development of new data quality management methods. The value density of different types of data varies greatly, and how to quickly identify and extract information useful for decision-making from massive data is also a key problem that accounting information systems need to solve. Arnaboldi et al. (2017) emphasize that accounting information systems in the big data environment need to have strong data integration and analysis capabilities to effectively utilize multi-source heterogeneous data. Therefore, reconstructing the theoretical framework of accounting information systems and enhancing their ability to process and integrate diverse data is key to increasing the value of accounting information systems.

2.3. The Conflict between Real-Time Requirements and Traditional Accounting Cycles

The real-time information requirements of the big data era conflict with traditional accounting cycles, which is the third major challenge facing accounting information systems. Traditional accounting practices are based on fixed accounting cycles (such as monthly, quarterly, annual) for data aggregation and report generation, a model that has become outdated in the current rapidly changing business environment (Cockcroft & Russell, 2018). Enterprise managers and investors need more timely financial and non-financial information to support decision-making, which requires accounting information systems to provide near real-time data processing and reporting capabilities. However, achieving real-time accounting information processing faces numerous technical and theoretical challenges. On one hand, it is necessary to change traditional accounting recognition, measurement, and reporting models, and establish a new real-time accounting theoretical framework; on the other hand, it also requires the development of

technical tools that can support continuous auditing and real-time reporting. Real-time requirements also involve issues of data quality and reliability, and how to improve processing speed while ensuring information accuracy is a difficult trade-off. As shown in Figure 1, real-time accounting information systems need to integrate multiple data sources to achieve real-time data collection, processing, and reporting to meet the information needs of different stakeholders.

Figure 1. Real-time accounting information system data flow.

3. Theoretical Framework Reconstruction of Accounting Information Systems Based on Big Data

This study employs a combination of literature analysis and theoretical construction. First, a systematic review and compilation of existing literature on big data-based accounting information systems were conducted to analyze the limitations of current systems and possible improvements. Second, the theoretical framework was developed by incorporating insights from case studies to propose a reconstruction framework for accounting information systems in a big data environment. The specific research methods include literature review, case analysis, and model building. The literature review helps clarify the theoretical background, the case analysis verifies the applicability of the theoretical framework through specific examples of big data applications in enterprises, and the model building approach is used to propose an improved theoretical model for accounting information systems.

3.1. Innovation in Data Collection and Storage Theory

In the big data era, the data collection and storage theory of accounting information systems needs fundamental innovation (Elsharif, 2018). Traditional accounting information systems mainly focus on the collection and storage of structured financial data, while data sources in the big data environment are more diverse and varied. The new theoretical framework needs to consider how to effectively collect and store multiple types of data, including structured, semi-structured, and unstructured data. This involves not only technological innovation but also redefining the scope and value of relevant data in accounting theory. For example, how to incorporate non-traditional accounting data such as social media data and Internet of Things data into accounting information systems requires establishing a new theoretical foundation. In terms of data storage, traditional

relational databases can no longer meet the needs of big data, and the new theoretical framework needs to integrate new technologies such as distributed storage and NoSQL databases to achieve efficient storage and management of massive heterogeneous data. Data security and privacy protection are also key issues that the new theoretical framework needs to consider. Gepp et al. (2018) point out that accounting information systems in the big data environment need to establish multi-level data governance mechanisms to ensure data integrity, security, and compliance. Therefore, reconstructing the data collection and storage theory not only needs to focus on technological innovation but also needs to consider issues related to data governance, privacy protection, and relevant legal and ethical issues to build a comprehensive, secure, and efficient big data accounting information system infrastructure.

3.2. Innovation in Data Processing and Analysis Models

The data processing and analysis models of accounting information systems in the big data era need fundamental innovation (Kang & Ampornstira, 2021). Traditional accounting data processing is mainly based on predefined rules and processes, while the big data environment requires more flexible and intelligent processing methods. The new theoretical framework should integrate advanced technologies such as machine learning and artificial intelligence to achieve intelligent processing and analysis of massive data. As shown in **Figure 2**, the data processing and analysis model of big data accounting information systems includes multiple stages such as data preprocessing, feature extraction, model training, and predictive analysis.

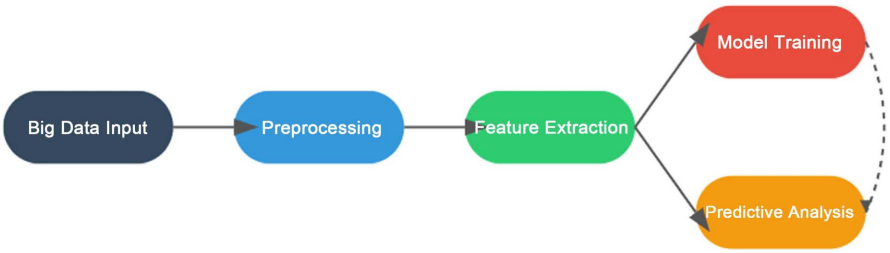

Figure 2. Big data accounting information system data processing and analysis model.

In this new theoretical framework, data mining and predictive analysis will become core components. For example, by analyzing historical financial data and related non-financial data, the system can predict future financial performance to support management decision-making. At the same time, the new theoretical framework also needs to consider how to process unstructured data and how to extract valuable accounting information from text, images, and other data. Appelbaum et al. (2017) emphasize that big data analysis technology can significantly improve audit efficiency and effectiveness, for example, by analyzing full transaction data to identify anomalous patterns. Therefore, reconstructing data processing and analysis models not only needs to focus on technological innovation

but also needs to consider how to combine these new technologies with traditional accounting theory and practice to enhance the value of accounting information and decision support capabilities.

3.3. Updating Information Output and Decision Support Theory

The information output and decision support theory of accounting information systems in the big data era also need comprehensive updating. Traditional accounting information systems mainly provide standardized financial statements and fixed-format management reports, while in the big data environment, information users' needs are more diverse and personalized. The new theoretical framework needs to consider how to utilize big data analysis results to provide richer, timelier, and more targeted information output. This includes various forms such as real-time financial reports, multi-dimensional business analysis, and risk warnings (Moffitt & Vasarhelyi, 2013). At the same time, decision support theory also needs corresponding updates to fully utilize the results of big data analysis. For example, how to integrate the results of predictive analysis into the management decision-making process, and how to use machine learning algorithms to assist decision-making. Warren et al. (2015) point out that big data analysis can help enterprises better understand customer behavior, optimize operational processes, and identify new business opportunities. Therefore, the new theoretical framework needs to explore how to effectively transform these big data analysis insights into actionable decision recommendations. Information visualization is also an aspect that the new theoretical framework needs to focus on. How to present complex data analysis results through intuitive and interactive visualization methods, making it possible for non-professionals to understand and utilize this information, is an important challenge facing accounting information systems in the big data era.

4. Application Prospects of Big Data-Driven Accounting Information Systems

4.1. Innovation in Financial Reporting

Big data-driven accounting information systems will bring revolutionary changes to financial reporting. Traditional financial reporting is mainly based on historical data, providing periodic static information. In the big data environment, financial reporting will develop towards real-time, personalized, and predictive directions. Real-time financial reporting can provide stakeholders with the latest financial status, improving the timeliness of decision-making. Personalized reports can provide customized financial information according to the needs of different users. Predictive reports use big data analysis technology to not only show past and present financial conditions but also predict future financial performance. As shown in **Figure 3**, the big data-driven financial reporting system integrates various data sources and analysis technologies, realizing full-process automation from data collection to report generation.

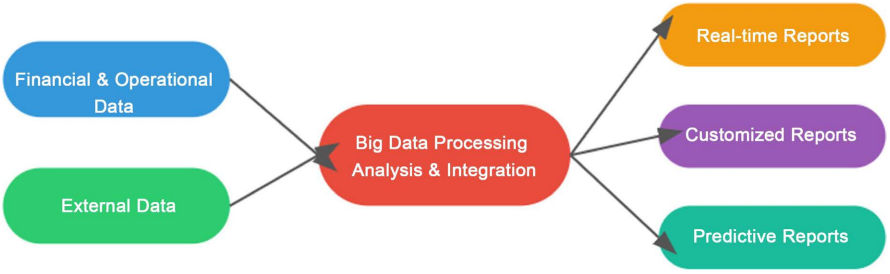

Figure 3. Big data-driven financial reporting system.

Big data technology can help enterprises better understand and report complex business transactions, improving the transparency and reliability of financial reporting (Trigo, Belfo, & Estébanez, 2014). For example, by analyzing supply chain data and market data, enterprises can more accurately estimate inventory impairment provisions; by analyzing customer behavior data, they can more precisely predict the recoverability of accounts receivable. Big data analysis can also help identify potential financial risks and fraudulent behaviors, improving the quality and credibility of financial reports. Therefore, big data-driven financial reporting can not only provide more comprehensive and timely financial information but also offer deeper insights to investors and other stakeholders, helping them make more informed decisions.

4.2. Transformation of Management Accounting

The advent of the big data era has brought unprecedented opportunities and challenges to management accounting, promoting its profound transformation. Traditional management accounting mainly focuses on cost control and performance evaluation, while big data-driven management accounting systems can provide more comprehensive, detailed, and forward-looking decision support. Firstly, big data analysis makes more precise cost allocation possible. By analyzing large amounts of operational data, enterprises can more accurately identify cost drivers and achieve more refined cost management. Secondly, big data technology provides new dimensions for performance evaluation. By integrating financial data, operational data, and external market data, enterprises can construct a more comprehensive performance evaluation indicator system that better reflects the true operating conditions of the enterprise. Predictive analysis becomes an important feature of management accounting in the big data era. By analyzing historical data and external environmental data, management accounting systems can provide enterprises with more accurate budgets and forecasts, supporting strategic decision-making. As shown in **Figure 4**, the big data-driven management accounting system integrates various data sources and analysis technologies, realizing full-process intelligence from data collection to decision support.

Big data analysis enables management accounting to better support enterprise strategic decisions (Bhimani & Willcocks, 2014). For example, by analyzing customer behavior data and market trend data, enterprises can more accurately

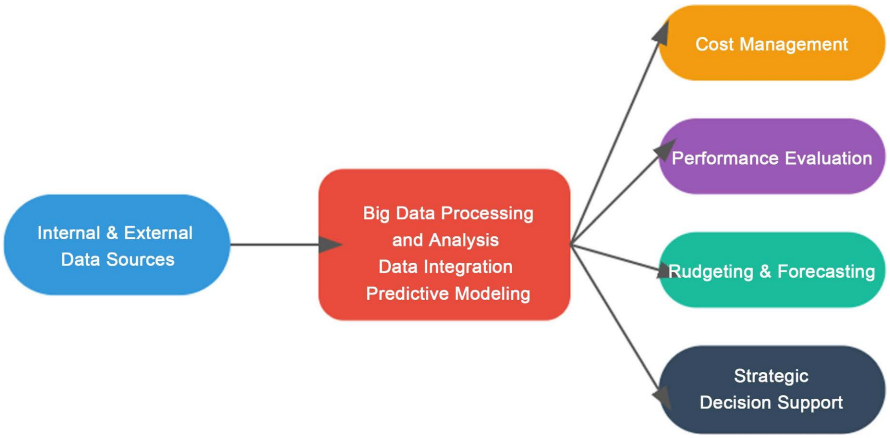

Figure 4. Big data-driven management accounting system.

predict product demand and optimize pricing strategies; by analyzing supply chain data, they can identify potential operational risks and improve supply chain efficiency. Big data technology also makes real-time monitoring and dynamic adjustment possible, allowing management accounting to respond more quickly to market changes and enhance enterprise competitiveness. Therefore, big data-driven management accounting can not only provide more precise and timely decision support information but also help enterprises discover new value creation opportunities, promoting business innovation and growth.

4.3. Innovation in the Audit Field

Big data technology is profoundly changing audit practices, driving innovation in audit methods and processes. Traditional auditing is mainly based on sampling inspection, while big data technology makes full sample auditing possible, significantly improving the accuracy and efficiency of audits. Firstly, big data analysis can help auditors more effectively identify abnormal transactions and potential risks. By analyzing full transaction data, the system can automatically identify transactions that do not conform to normal patterns, helping auditors focus on high-risk areas. Secondly, predictive analysis technology can improve the forward-looking nature of audits. By analyzing historical data and external environmental data, auditors can more accurately assess an enterprise's going concern ability and future risks. Furthermore, big data technology provides technical support for continuous auditing and real-time auditing, transforming auditing from post-event supervision to real-time monitoring. As shown in Figure 5, the big data-driven audit system integrates various data sources and analysis technologies, realizing full-process automation from data collection to audit report generation.

Big data analysis technology can significantly improve the efficiency and effectiveness of audits. For example, by analyzing an enterprise's full transaction data and external data, auditors can more accurately identify potential fraudulent behaviors; by analyzing social media data and news reports, they can more

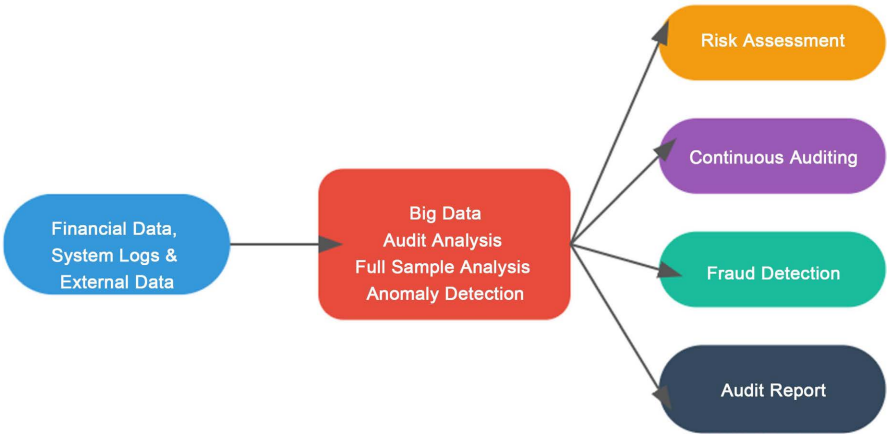

Figure 5. Big data-driven audit system.

comprehensively assess an enterprise's reputational risks. Additionally, machine learning algorithms can help auditors automatically identify abnormal patterns, reducing the risk of human error (Gepp et al., 2018). However, big data auditing also faces challenges in terms of data quality, privacy protection, and professional competence. Auditors need to possess data analysis and interpretation capabilities while maintaining professional skepticism and not overly relying on automated systems. Therefore, big data-driven auditing not only changes audit technical methods but also poses new challenges to auditors' skill requirements and professional judgment.

5. Conclusion

The advent of the big data era has brought unprecedented opportunities and challenges to the theoretical reconstruction of accounting information systems. This study analyzes the main challenges faced by accounting information systems in the big data environment, proposes a theoretical framework for big data-based accounting information systems, and discusses its application prospects in financial reporting, management accounting, and auditing. The research shows that the application of big data technology will significantly enhance the real-time nature, comprehensiveness, and predictability of accounting information, providing stronger support for enterprise decision-making. However, achieving this transformation requires theoretical and technological innovation in multiple aspects such as data collection, storage, processing, analysis, and output. The new theoretical framework needs to integrate advanced technologies, such as big data, artificial intelligence, and cloud computing, while also considering issues related to data security, privacy protection, and professional ethics. The big data-driven accounting information system also places new demands on the professional capabilities of accounting personnel, requiring the cultivation of compound talents with data analysis and interpretation abilities. Although this paper proposes a reconstruction framework for accounting information systems based on big data, there are still some limitations. First, the research mainly relies on theoretical analysis and

literature review, lacking empirical data for validation. Future studies could employ empirical research to test the effectiveness of the theoretical framework. Additionally, given the rapid advancement of big data technologies, the framework proposed in this study may need to be continually updated and optimized to keep pace with technological progress. Furthermore, the discussion on data security and privacy protection is relatively limited in this paper, which should be further explored in future research.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Appelbaum, D., Kogan, A., Vasarhelyi, M., & Yan, Z. (2017). Impact of Business Analytics and Enterprise Systems on Managerial Accounting. *International Journal of Accounting Information Systems, 25,* 29-44. https://doi.org/10.1016/j.accinf.2017.03.003

Arnaboldi, M., Busco, C., & Cuganesan, S. (2017). Accounting, Accountability, Social Media and Big Data: Revolution or Hype? *Accounting, Auditing & Accountability Journal, 30,* 762-776. https://doi.org/10.1108/aaaj-03-2017-2880

Baruch, K., Gandelman, N., & Gandelman, N. (2021). The Impact of Big Data on Accounting: A Review of the Literature. *Journal of Accounting Literature, 47,* 43-58.

Bhimani, A., & Willcocks, L. (2014). Digitisation, 'Big Data' and the Transformation of Accounting Information. *Accounting and Business Research, 44,* 469-490. https://doi.org/10.1080/00014788.2014.910051

Chu, M. K., & Yong, K. O. (2021). Big Data Analytics for Business Intelligence in Accounting and Audit. *Open Journal of Social Sciences, 9,* 42-52. https://doi.org/10.4236/jss.2021.99004

Cockcroft, S., & Russell, M. (2018). Big Data Opportunities for Accounting and Finance Practice and Research. *Australian Accounting Review, 28,* 323-333. https://doi.org/10.1111/auar.12218

Elsharif, T. A. (2018). The Impact of Accountants Participation in Development for Computerized Accounting Information Systems on the Success of These Systems' Performance. *Open Access Library Journal, 5,* 1-16. https://doi.org/10.4236/oalib.1104995

Gepp, A., Linnenluecke, M. K., O'Neill, T. J., & Smith, T. (2018). Big Data Techniques in Auditing Research and Practice: Current Trends and Future Opportunities. *Journal of Accounting Literature, 40,* 102-115. https://doi.org/10.1016/j.acclit.2017.05.003

Kang, M., & Ampornstira, F. (2021). Research on Data Analysis of Chinese Public Accounting Firms in the Big Data Era. *Open Journal of Accounting, 10,* 1-8. https://doi.org/10.4236/ojacct.2021.101001

Moffitt, K. C., & Vasarhelyi, M. A. (2013). AIS in an Age of Big Data. *Journal of Information Systems, 27,* 1-19. https://doi.org/10.2308/isys-10372

Trigo, A., Belfo, F., & Estébanez, R. P. (2014). Accounting Information Systems: The Challenge of the Real-Time Reporting. *Procedia Technology, 16,* 118-127. https://doi.org/10.1016/j.protcy.2014.10.075

Vasarhelyi, M. A., Kogan, A., & Tuttle, B. M. (2015). Big Data in Accounting: An Overview. *Accounting Horizons, 29,* 381-396. https://doi.org/10.2308/acch-51071

Warren, J. D., Moffitt, K. C., & Byrnes, P. (2015). How Big Data Will Change Accounting. *Accounting Horizons, 29,* 397-407. https://doi.org/10.2308/acch-51069