Advances in Computer, Signals and Systems (2026)
Clausius Scientific Press, Canada

DOI: 10.23977/acss.2026.100108
ISSN 2371-8838 Vol. 10 Num. 1

The Dilemmas of Data Quality Governance Based on Data Asset Incorporation and Technological Solutions

Xiaobin Zhang

Jiangxi Juxing Digital Technology Co., Ltd, Nanchang, 330096, China

Keywords: Data Quality Governance; Artificial Intelligence; Blockchain Technology; Data Assets

Abstract: With the advent of the big data era, data quality governance has become a key issue in organizational management. Data quality is directly related to decision-making accuracy and operational efficiency. This paper focuses on the core challenges faced in data quality governance during the process of recognizing data assets on the balance sheet. It systematically analyzes issues such as the lack of unified data quality evaluation standards, insufficient full lifecycle management mechanisms, and lagging technical means, and on this basis proposes corresponding technical solutions to address these challenges. Moreover, establishment of unified data quality evaluation system, intelligent quality management solutions and cross-departmental collaboration mechanisms demonstrate innovation and efficient implementation of data governance, thereby solving bottlenecks in current data quality governance. At same time, research results enhance effectiveness of data asset management and support decision-making capabilities.

1. Introduction

The significant advancement of information technology and the onset of the big data era could indicate that data has progressively become a crucial asset for both enterprises and governments. In addition, the assetization of data may not only be limited to simple accumulation, but it seems to involve effective management and utilization of data throughout the entire life cycle, with the quality of data directly affecting the accuracy and efficiency of decision-making, thereby making it a key factor in organizational operations[1]. However, the volume of data continues to expand, and given that accuracy, completeness and timeliness of data are crucial, ensuring these aspects has become an urgent challenge in data governance.

Governance of data quality faces difficulties, including lack of standardized evaluation indicators, insufficient management mechanisms and lagging technical methods. Therefore, establishing a scientific, reasonable and effective data quality evaluation standard system may become crucial, while important research may utilize emerging technologies such as artificial intelligence and blockchain to improve governance efficiency. However, optimizing data management and application has become focus of research and technological breakthroughs in data governance field. Given these key challenges, this paper conducts an in-depth investigation into the core issue of data quality governance and proposes corresponding technical solution pathways, with the aim of providing theoretical support and practical guidance for the efficient management and utilization of

data assets.

2. The Background and Importance of Data Asset Incorporation

2.1 The Concept and Development Trends of Data Assetization

Data assetization may suggest that the transformation of data from a mere informational resource into a valuable asset, one that can generate economic benefits for an organization through the clear identification of its value, purpose, and management methods[2]. Additionally, with unfolding of big data era, enterprises and government institutions may increasingly recognize potential of data, thereby regarding it as new production factor and asset. In recent years, application of data assetization may have gained attention in different fields such as finance, healthcare and manufacturing industry, and with advancement of technology, especially breakthroughs in artificial intelligence and big data analysis, value of data may gradually be explored and transformed into source of competitive advantage for enterprises. However, data assetization may continue to develop, thus forming comprehensive mechanism of data asset management, circulation and monetization.

2.2 The Significance and Challenges of Data Asset Incorporation

Data asset incorporation seems to indicate that, under guidance of recognized norms and standards, formally integrating data assets into established management systems can meaningfully realize their quantification and reflection in important areas such as financial and economic fields, which may indicate that practice of data management has been enhanced, while also promoting realization of data value in key areas such as decision-making, resource allocation and risk control[3]. However, data asset incorporation may indicate existence of many challenges, including how to accurately assess value, and how to handle diversity and dynamics, with current management systems and technical frameworks showing limitations that complicate these efforts. In addition, issues surrounding data security and privacy protection may indicate existence of additional difficulties in implementing data asset incorporation, thereby requiring adequate preparation both technically and institutionally.

2.3 The Close Relationship between Data Quality and Data Governance

Data quality may serve as important foundational element of data assetization, which indicates that data can provide effective support for important decision-making processes, while additionally, high-quality data may provide accurate foundation for decision-making, with data improving operational efficiency, thereby reducing decision-making risks. Given that systematized management occurs, data governance may refer to managing data through rules and processes to ensure integrity and accuracy[4], and data governance may address problems in data collection process, which can include important data quality management activities that are critical to organizational success. Given existing robust framework, data governance framework may continuously guarantee data quality, and this framework may optimize data flow, with governance driving transformation of data assets, thereby making data quality and governance seem to be interdependent, which indicates that any one element cannot operate independently without other element. Additionally, these elements may constitute key components for achieving data assetization.

3. Core Dilemmas in Data Quality Governance

3.1 The Lack of Uniformity in Data Quality Evaluation Standards

One of main challenges that today's data quality governance faces is lack of standardized assessment standards, where different organizations and departments define and require data quality in different ways, thereby making it difficult to implement consistent standards throughout entire data lifecycle - from collection, processing to storage and utilization[5]. Data quality assessment involves range of indicators, including accuracy, completeness, consistency and timeliness, and lack of universally applicable framework makes measurement and comparison of data quality complicated, while industry standards and academic research have provided various methods for assessing data quality, but lack of cross-industry and cross-platform specifications means that organizations have difficulty applying unified standards in governance process. This not only increases difficulty of data governance, but also has risks of low efficiency and limitations in data quality management, thus making developing standardized data quality assessment system an urgent problem that needs to be solved within data governance field.

3.2 The Absence of a Full Lifecycle Data Quality Management System

Data quality management may indicate that early stages of data—such as collection and storage—may receive large amount of attention, while entire life cycle of data, from initial generation and circulation to final use, may be overlooked, as data quality problems may appear at any point in life cycle. Additionally, most existing data quality management systems may not cover each stage, thereby making real-time identification of quality problems challenging, and this limitation causes data quality problems to accumulate over time. Given that accumulated problems affect results, accuracy of decision-making may decline, while data volume continues to grow, with speed of its flow accelerating. Furthermore, delay in data quality management becomes apparent, which makes establishing data quality management system that may cover entire life cycle crucial—from collection and storage to processing and application. However, system can allow monitoring at each stage, thereby guaranteeing data reliability at every step.

3.3 The Complexity of Multi-Stakeholder Interests in Data Governance

Data governance may involve complex network of important stakeholder interests, including providers, users and regulators of data, which may indicate that implementation seems challenging and often controversial, with different departments within organization having different data needs. Therefore, different objectives and interests may emerge, given that collection and utilization of data usually span multiple departments, and coordination may bring challenges, with data involving external suppliers and partners. Furthermore, security and privacy issues of data may require cooperation between legal department and technical department, while flow and use of data may require collaboration between business department and data management team, where poor communication between these departments may lead to ineffective implementation of data governance measures. In addition, conflicts of interests may lead to implementation failure, given legal regulations, and compliance with GDPR and privacy protection laws may increase complexity, although there are these important regulatory frameworks, with cross-border data governance bringing significant additional challenges, while transnational data governance may exhibit similar patterns. Therefore, establishing efficient cross-departmental collaboration mechanism may indicate that coordinating different interests of stakeholders seems crucial, thus, such coordination may represent significant challenge in data governance.

3.4 The Obsolescence of Traditional Tools and Methods, Struggling to Meet Big Data Demands

Era of big data has emerged, which may indicate that traditional data governance tools may no longer be able to meet significant demands brought by massive volume, diversification and rapid changes of modern data, however, traditional methods seem to rely on static rules and manual intervention, thus lacking flexibility required to manage high-dimensional data. In addition, existing technical tools may focus on isolated functions, such as data cleaning, and fail to provide intelligent management in data lifecycle, nevertheless, data quality problems in context of big data seem to be multi-level and multi-dimensional, with existence of advanced technologies such as artificial intelligence, these technologies can realize intelligent management methods, therefore, technological progress may improve efficiency of data governance, thereby promoting innovation of data governance methods. In addition, it is necessary to introduce technologies such as blockchain to enhance the credibility and traceability of data processes, thereby effectively improving the efficiency and quality of data governance.

4. Technological Solutions for Data Quality Governance

4.1 The Construction and Improvement of a Data Quality Evaluation Standard System

In context of recognizing data assets in balance sheet, establishing scientific and operable data quality assessment standard system constitutes basic technical path for solving data quality governance challenges, which should center on requirements of value confirmation and management of data assets, and systematically characterize quality of data from multiple dimensions. Evaluation standards of data quality can be divided into five core dimensions. First, accuracy standard focuses on measuring consistency between data content and real business objects, which can be evaluated through rule verification, anomaly detection and manual sampling review methods. Second, completeness standard emphasizes indicators such as missing rate of key fields and data coverage, and ensures data meets basic requirements of asset identification and business analysis. Third, consistency standard is used to evaluate uniformity of data definitions and formats across systems and departments, thereby avoiding conflicts of same indicator in different systems. Fourth, timeliness standard reflects degree of data support for business decisions through indicators such as update frequency and delay time, with fifth, usability and compliance standards comprehensively examining whether data has legal sources, clear ownership and conditions for sustainable utilization.

Combination of these standards can form a universal data quality assessment framework, while also allowing differentiated refinement according to specific industries and application scenarios. For example, financial industry may place more emphasis on consistency and compliance requirements, whereas healthcare industry tends to prioritize accuracy and completeness, with practice integrating DAMA data management framework and international standards such as ISO 8000, thereby transforming above-mentioned indicators into quantifiable and auditable assessment rules, which provides unified foundation for data quality governance and data asset confirmation on balance sheet.

4.2 Artificial Intelligence-Based Data Quality Management Solutions

An artificial intelligence-based data quality management solution should take the entire data lifecycle as its governance object, and establish an intelligent quality management mechanism, covering all stages of data generation, collection, storage, processing, sharing and application. In

data generation and collection stage, machine learning models can be used to perform real-time validation of data input, which through anomaly detection and pattern matching technology automatically identify logical errors, format deviations and outliers, thereby reducing data quality risks at source. In data storage and integration stage, artificial intelligence can combine rule learning and semantic analysis technology to automatically compare and map data across systems, and identify inconsistent definitions, duplicate data and structural conflicts and other problems, thus ensuring data consistency and integrity. In data processing and analysis stage, AI models can use historical data features and business rules to intelligently fill missing data, while dynamically correcting abnormal results, thereby improving data usability.

In stage of data sharing and application, intelligent monitoring algorithms can continuously track usage of data, evaluate quality changes of data in real time, and automatically adjust governance strategies according to application feedback. In stage of data update and retirement, artificial intelligence can also assist in identifying low-value or outdated data, thereby supporting classified management of data and optimized allocation of data assets. By embedding artificial intelligence into key stages of data life cycle, governance of data quality can transform from passive correction to proactive prevention and from static rule-based management to dynamic optimization, thereby providing stable and reliable data foundation for recognition of data assets on balance sheet and continuous release of their value.

4.3 The Application of Blockchain Technology in Data Governance

In context of recognizing data assets on balance sheet, blockchain technology can serve as important technical foundation for ensuring quality and credibility of data and auditability of governance process, with the core lying in embedding key stages of data quality management into on-chain mechanism, to conduct institutional constraints. In stage of data generation and collection, blockchain can be used to record and save metadata, such as information of data source, collection time and responsible entity on chain, thereby ensuring clear data provenance and definite ownership. In stage of data circulation and sharing, distributed ledger and consensus mechanism of blockchain can be utilized to record entire lifecycle of data access, invocation and modification activities, which prevents data from being arbitrarily tampered with or reused when flowing across departments and organizations.

In data quality validation and governance process, data quality rules, audit procedures and responsibility allocation can be encoded on chain in form of smart contracts, thereby achieving automatic triggering of data quality issues, recording and responsibility traceability. In data asset identification and regulatory oversight stage, blockchain can provide tamper-proof evidence for data quality assessment results, audit records and governance process, thus enhancing credibility and verifiability of data asset identification. Through fusion, deeply integrating blockchain technology with data quality governance process can not only strengthen authenticity, consistency and traceability of data, but also establish trusted collaboration mechanism in multi-stakeholder data governance environment, thereby providing institutional and technical guarantee for value recognition and continuous management of data assets.

4.4 Collaborative Mechanisms and Innovative Models in Data Governance

Under background of balance sheet recognition of data assets and high-quality data governance, establishing collaborative mechanism centered on specialized data governance committee constitutes key organizational path for promoting governance standardization operation of data quality, where the data governance committee is usually composed of representatives from information technology department, business units and finance and accounting departments, legal

and compliance functions as well as audit or internal control departments. In this structure, information technology department is responsible for implementing data standards, developing technology platforms, and providing support for quality monitoring, while business department as main producer and user of data bears direct responsibility for data accuracy and completeness. Finance and accounting department is responsible for coordinating data quality results with requirements for data asset recognition, measurement and balance sheet inclusion, and legal and compliance department supervises data security, privacy protection and regulatory compliance. Audit or internal control department conducts independent supervision of data quality governance processes and results.

In aspect of operational mechanisms, through clarifying data ownership and accountability systems, establishing quality accountability rules, data quality indicators can be incorporated into departments' performance evaluations, thereby reducing shirking of responsibility in governance processes, while at same time, relying on unified data governance platform, a closed-loop process can be established covering issue identification, corrective task assignment, result feedback and continuous improvement. Regarding daily operations, committee should regularly organize assessment of data quality, inspection of risks, and review of data to be included in balance sheet for recognition, while dynamically updating governance rules and technical standards to ensure that governance of data quality remains consistent with business development and asset management needs. Through this method, it is possible to achieve a data quality governance model characterized by cross-departmental collaboration, clear responsibilities and continuous improvement.

5. Conclusion

Governance of data quality may indicate that it plays a critical role in significant digital transformation process, which suggests that such governance can substantially influence efficiency of important decision-making within organizations and effectiveness of related operations, and moreover, through establishing unified data quality assessment standards, research results indicate that organizations may utilize artificial intelligence for automated management. Furthermore, evidence may suggest that utilizing blockchain seems to be able to ensure security and credibility of data, with the mechanism of cross-departmental collaboration showing innovativeness, thereby resolving the core dilemma of data governance effectively. However, governance of data quality continues to face challenges, and nevertheless, inconsistent standards and outdated technological approaches may require continuous technological innovation and cross-departmental collaboration, which considering surge in data volume and continuous evolution of technology, may make governance of data quality become more intelligent and refined. Therefore, in alignment with the requirements for recognizing data assets on the balance sheet, improving a governance system centered on data quality and establishing a sustainable long-term management mechanism through the integration of technical pathways and collaborative mechanisms has become a critical task for organizations of all types to enhance the value of data assets and the feasibility of their balance sheet recognition.

References

[1] Wu, Y., Chen, Y., Wu, H., et al. (2026). Research on the construction of a data governance and sharing standard framework for educational large models. Open Education Research, 32(01), 54-66.

[2] Ling, J. (2026). Research on the data governance path in the digital transformation of manufacturing enterprises. Communication World, 33(01), 169-171.

[3] Cui, Y., & Meng, W. (2026). Path analysis of data governance driving accounting information quality improvement from the perspective of business and finance integration. International Business and Accounting, (02), 50-53.

[4] Su, Y. (2026). Research on data governance in universities under the perspective of big data. Cybersecurity and

Informationization, (01), 19-20.
[5] Yi, A. (2026). Exploration of the fusion method of quality management and anomaly detection for big data governance. Information Recording Materials, 27(01), 73-75.