Research and Practice of Enterprise Data Governance and Data Control

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Abstract. Data governance and data control can effectively enhance the enterprise data resource management capabilities, help to become the implementation of enterprise digital strategy, and gradually become the key to enterprise digital construction. Based on this, this paper first analyzes the challenges faced by enterprise data governance and data control, further explores the practical application of enterprises to build a data asset value chain, strengthen enterprise data standardization, formulate enterprise data protocols, strengthen data management authority as well as data authority auditing and risk control of data leakage, etc., and finally, from the perspectives of clarifying the goals of digital transformation, integrating data governance and business strategy, increasing technology and infrastructure investment, promoting enterprise cultural change and establishing a sound risk management mechanism. Finally, from the perspectives of clarifying digital transformation goals, integrating data governance and business strategies, increasing technology and infrastructure investment, promoting corporate culture change, and establishing a sound risk management mechanism, it gives suggestions for enterprises to strengthen data governance and data control.

Keywords: Data governance, Data control, Practice recommendations

1 Introduction

In the current digital era, data has become a key element in business management and market competition (Li, Xuan et al. 2022, Wang, Lin et al. 2023) [4,11]. In April 2020, the Opinions on Building a More Perfect Institutional Mechanism for Market-based Allocation of Factors was released, officially listing data as the fifth factor of production, alongside the traditional land, labor, capital, and innovation, and the formulation of this policy signaled the brand new status of data in China's economic development (Ren and Li 2023) [10]. The formal inclusion of data as a factor of production has provided unprecedented opportunities for the certification of the value and full utilization of data resources, and has further promoted the rapid development of the market economy.

Digital transformation has become an inevitable trend for the survival and competition of modern enterprises (Zhang, Yu et al. 2023) [16]. Enterprises have embraced digital transformation, transforming data elements into enterprise productivity through the active application of data, and fully exploiting the value of data in enterprise R&D, production, sales and supply chain in order to increase productivity, improve customer experience and enhance

ICBBEM 2024, March 29-31, Wuhan, People's Republic of China

DOI 10.4108/eai.29-3-2024.2347402

market competitiveness. Data is not just a collection of information, it is a key driver of business operations, providing insights, supporting decision-making, and creating new business opportunities (Wang and Su 2021) [12]. However, despite the enormous potential of data, there is a serious challenge within organizations, namely the problem of data silos. Data silos refer to data segregation and barriers between departments or business areas within an organization, making it difficult to share and collaborate on data utilization (Ye and Wang 2019) [14]. This issue not only affects collaboration and innovation within the organization, but also key business areas such as customer service and precision push, negatively impacting the overall performance of the organization. In addition, the sheer speed of data growth has created new challenges for organizations. As the volume of data continues to increase, organizations are faced with rising storage costs, higher data realization and junk data, making data governance increasingly difficult. Therefore, in order to remain competitive in a highly competitive market, organizations need to have fast, efficient, real-time data processing and analytics capabilities to better cope with the influx and complexity of data.

Data governance and data control refers to a set of norms, policies and processes established within an organization to ensure the quality, consistency, security and compliance of data (Chen 2018) [2]. Data governance and control is not just a technical issue, it also involves organizational structure, process design, and policy development (Al-Ruithe, Benkhelifa et al. 2019) [1]. In view of this, data governance and control has become a core element of enterprise digitalization and a key to competition, providing effective data resource management and helping to facilitate the implementation of digitalization strategies. By establishing a sound data governance and management structure, enterprises can build a solid data foundation, realize digital operations, better meet the challenges of the digital era, improve productivity, provide better customer experience, and stand out in the market competition.

2 Challenges of Data Governance and Data Stewardship

Data governance and data control are becoming more and more critical in the current digital age, however, practices often face multiple challenges. These challenges include data security and compliance, the complexity of data management, data standardization, and the difficulty of regulation (Xin 2023) [13].

Data Security and Compliance. Organizations face increasing data security and compliance challenges while processing sensitive data on a large scale (Liu and Zhao 2020) [5]. This includes responding to data breaches, unauthorized access, and changing regulatory compliance requirements. Especially in the financial industry, organizations need to face financial regulations from different countries to ensure customer privacy and financial data security.

Data management complexity. The complexity of data management lies in heterogeneous data sources, data quality issues, and the difficulty of guaranteeing data consistency. This creates challenges for organizations, especially when dealing with data from different channels and sources. For example, a retail organization may handle sales data from both online and offline channels, making integration and analysis extremely complex.

Enterprise data standardization. Data standardization construction is the foundation for enterprises to do big data analysis application (Rao, Zhang et al. 2020) [9]. However, common

data often have various formats and standards, and there are problems of multiple standards, sources and inaccuracies, making data integration and analysis more difficult. Data standardization is the cornerstone of ensuring data consistency and comparability, but achieving it is not easy. Ungoverned and unstandardized data often struggles to deliver the value it deserves. In the healthcare sector, electronic medical record systems used by different hospitals may use different standards, making patient information integration tricky.

Difficulty in regulating data. Data management is becoming increasingly difficult to regulate, mainly due to changing and escalating regulatory requirements (Zhang and Dai 2023) [15]. This change poses a huge challenge to enterprises, especially in the context of progressively higher international regulatory standards, with the implementation of the General Data Protection Regulation (GDPR) in Europe and HIPAA in the U.S., among others, posing higher requirements for data management and privacy protection for global enterprises, which is an international regulatory challenge.

3 Practical Applications of Data Governance and Data Stewardship

Adapting to the actual needs of enterprise data control, this paper is based on the data governance and control framework in Figure 1, to build the data asset value chain, strengthen data standardization, develop enterprise data protocols, and strengthen data rights management.

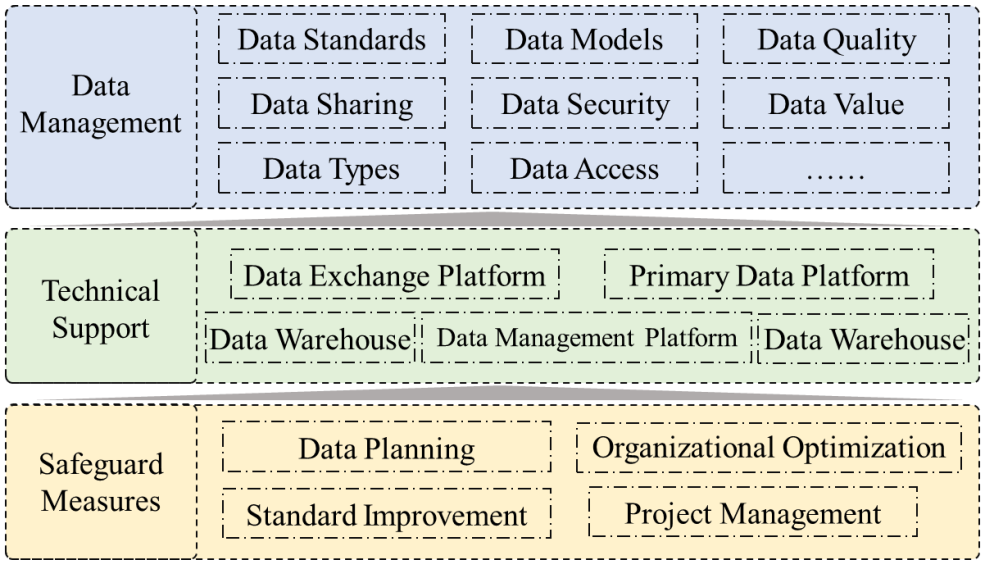

Figure 1. Data control framework.

In practice, the enterprise data control platform functions need to be integrated to realize the data control requirements, the specific procedures are shown in Figure 2.

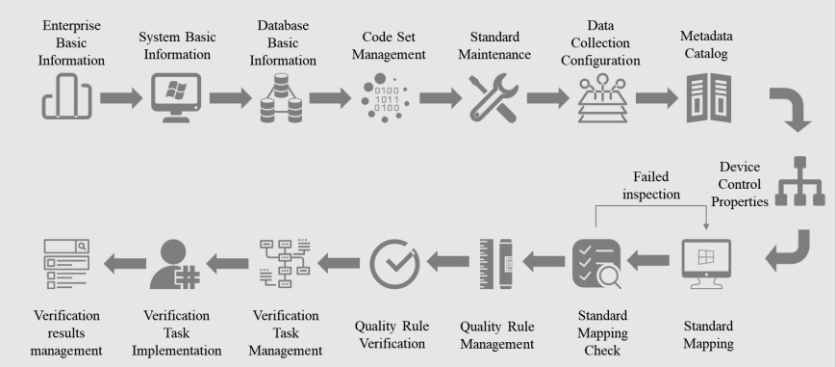

Figure 2. Data Control Platform Process.

3.1 Constructing the Data Asset Value Chain

In the practice of data governance, building the data asset value chain is a critical piece of the puzzle (Faroukhi, El Alaoui et al. 2020) [3]. Establishing a complete data asset value chain by clarifying the source, process, storage and application of data helps to maximize the potential value of data and ensures that data is managed efficiently throughout its life cycle (Liu and Zhao 2023) [6].

First, by identifying and labeling the source of data, companies can ensure the accuracy and credibility of data. This includes tracing where the data was generated and how it was collected, which provides a basis for data traceability and improves the credibility of the data, making it a reliable decision support tool. Second, by optimizing data processes, companies are able to improve the efficiency of data delivery while reducing data processing costs. By gaining an in-depth understanding of the data processing flow at each stage, bottlenecks and redundancies can be identified, thus optimizing the data flow, ensuring that data can efficiently flow between different links, and improving the overall data processing effectiveness. In addition, developing a reasonable data storage strategy is an important step in building the data asset value chain. Ensuring safe, reliable and scalable data storage helps prevent the risk of data loss and improves the manageability and flexibility of data storage. Finally, gain a deeper understanding of the value of data in business applications and further unlock the potential value of data by optimizing how it is used. This includes understanding what data is actually being used for and how to maximize its integration into business decisions and innovations to improve overall business performance.

Through these practices, companies are able to better understand and leverage data, align data governance with business needs, and provide more strategic data support to the organization to drive sustainable growth.

3.2 Enhance Enterprise Data Standardization

Data standardization is the cornerstone of data governance (Zhou, Wang et al. 2023) [18], which aims to improve the quality, understandability and maintainability of data by establishing consistent data standards.

First, metadata management is a key component. Data consistency can be ensured through the establishment of a metadata repository detailing the definitions, formats and uses of data. This not only provides comprehensive documentation of the data, but also helps to understand the meaning behind the data, making it more credible and reliable. Second, the development of data naming conventions cannot be ignored. Ensuring a consistent naming convention helps reduce ambiguity and improves data recognition. Consistent naming conventions simplify the data management process and reduce the risk of misinterpretation and misuse of data. In addition, data format unification is one of the most important measures to promote data standardization. By unifying data formats, enterprises can more easily interact with data across systems and departments, improve data interoperability, and reduce complexity and error rates in the integration process. Finally, establishing a data quality monitoring mechanism is a necessary step in data standardization management. Setting up a data quality monitoring mechanism to detect and correct data quality problems in a timely manner helps to guarantee the accuracy and consistency of data. This can be achieved through automated tools and regular data reviews to ensure that data quality is always at an acceptable level. By strengthening data standardization and management in these areas, enterprises can better establish an efficient data management system, improve data quality and availability, and provide reliable data support for business decisions.

3.3 Developing Enterprise Data Protocols

The establishment of data protocols is a regulatory framework for building a data governance system that aims to ensure that data is used appropriately within the organization by standardizing its use and management. Enterprises may consider the following aspects to strengthen the management of enterprise data protocols.

First, establish a clear data management policy. Regulating the use and sharing of data through clear policies can ensure consistent standards of data handling within the organization. Clear policies help prevent the abuse and misuse of data and improve the efficiency and reliability of data use. Second, ensuring that data processing complies with regulations and industry standards reduces legal risks. As data protection regulations continue to escalate, organizations need to adjust their data processing processes in a timely manner to comply with regulatory requirements. It is recommended to establish a professional legal team to pay close attention to regulatory changes and ensure that data processing complies with the latest regulatory requirements in order to reduce the risk of legal liabilities and fines. In addition, developing a sound data security strategy is a critical step. By ensuring that sensitive data is protected, organizations can effectively respond to data breaches and security threats. This includes employing measures such as encryption, access control, and authentication to ensure data confidentiality and integrity. Finally, train employees regularly to improve communication and enforcement of data protocols. Employee understanding and compliance are key to the successful implementation of data protocols. Through regular training, employees will be able to better understand the importance of data protocols and will be able to correctly implement the requirements of the protocols in their daily work, reducing data security issues caused by human factors.

By strengthening these aspects of data protocol management, companies can establish a more robust and effective data governance framework to ensure that data is used appropriately within the organization, while reducing legal risks and improving overall data security.

3.4 Strengthening Data Rights Management

Data rights management is a crucial aspect of ensuring that data access is legitimate, secure and efficient. The risk of data misuse can be effectively reduced through fine-grained control of user rights.

First, organizations can develop clear user roles and grant appropriate data permissions based on different roles. This helps ensure that employees in different positions can only access data relevant to their job responsibilities, thereby reducing the possibility of data access misuse. Second, establishing a permission approval mechanism is a critical step. By setting up a clear permission approval process, you can ensure that permissions are allocated and monitored appropriately. The approval mechanism can help enterprises effectively control data access and avoid misuse of permissions and improper behavior. In addition, updating user permissions in a timely manner is a critical step in securing data. Changes in employee duties or position adjustments may result in inconsistent permissions; therefore, user permissions are regularly reviewed and updated to ensure that permissions are consistent with changes in actual employee duties. Finally, logging user actions on data is an important practice in data rights management. By establishing a log auditing mechanism, user operations on data, including behaviors such as viewing, modifying and deleting, can be recorded in detail. This helps to detect and respond to potential abnormal behaviors in a timely manner and improve data security.

By strengthening data rights management, enterprises can establish a more secure and efficient data management system to ensure that data is only accessed by legitimate and authorized personnel, thus effectively reducing the risk of data misuse and improving the overall data management level.

3.5 Data Rights Audit and Data Leakage Risk Control

Data rights auditing and risk control constitute the final link in data control, and through monitoring and response mechanisms, organizations are able to detect and respond to potential data leakage risks in a timely manner (Ma, Gao et al. 2023) [8]. The following aspects are practices for organizations to enhance data rights auditing and risk control.

First, real-time monitoring is crucial. By tracking data access behavior in real time with a monitoring system, companies can detect anomalies in a timely manner. Real-time monitoring helps to quickly identify abnormal data access behavior so that urgent measures can be taken to reduce the risk of potential data leakage. Second, establishing a rapid response mechanism is the core of data risk control. When a risky situation is detected, a rapid response mechanism needs to be established to stop further data leakage. This may include urgently blocking data access rights, notifying relevant parties, or initiating an emergency vulnerability remediation process to ensure a rapid response to the risk. In addition, vulnerability management is a critical step in preventing potential security breaches. By conducting regular system vulnerability testing and repair, organizations can reduce potential security breaches and improve the overall security of the system, thereby reducing the risk of data leakage. Finally, employee training is a necessary means to maintain internal security. Raising employee awareness of data security reduces internal threats. Employee training should cover data security best practices, compliance requirements, and how to identify and report potential risks to ensure that employees are adequately equipped to deal with security challenges.

By strengthening data rights auditing and risk control, enterprises can better protect sensitive data, respond to potential risks in a timely manner, improve overall data security, and ensure sustainable development in the process of digital transformation.

4 Recommendations for Strengthening Data Governance and Control

4.1 Importance of Data Governance and Data Control

Digital transformation is one of the key challenges and opportunities facing organizations today, and data governance and data control play a key role in this process (Lv and Li 2022, Zheng, Zhang et al. 2023) [7, 17]. Data intelligence and data-driven can bring great value enhancement to enterprise production and operation, not only achieving significant results in decision making, innovation driving and risk reduction, but also creating more business opportunities and competitive advantages for enterprises.

(i) Decision-making. Decision support is one of the key roles of data in digital transformation. Effective data governance and control ensures that organizations can make more informed decisions based on accurate, consistent, and trustworthy data. First, data, as a driver of digital transformation, provides a more comprehensive, real-time information base for the enterprise. Through data collection, integration and analysis, enterprises are able to better understand market trends, customer needs, business performance and other key factors, providing more comprehensive context and insights for decision-making. Second, effective data governance ensures that data remains accurate and consistent throughout its lifecycle. This provides a credible foundation for decision making. If data has quality issues or inconsistencies, decisions can be misguided, leading to poor business outcomes. With standardized data governance measures, organizations can reduce risks to data quality and consistency and improve the reliability of decision making. In addition, data controls ensure data security and privacy. In the digital age, organizations handle large amounts of sensitive data, and effective data control measures help protect against the risk of data leakage and misuse. This provides a more assured environment for business leaders to be more willing to rely on data to make strategic decisions.

(ii) Innovation drive. Innovation promotion is the process of enabling companies to drive innovation more quickly and flexibly by standardizing and optimizing data processes. A clear data governance framework provides a solid foundation for the application of new technologies. First, normalizing and optimizing data processes enables companies to acquire, process, and analyze data more efficiently. This efficiency provides the data foundation needed for innovation. By standardizing data processes, companies are able to reduce the time and cost of data processing, allowing data to flow and transform more quickly, which is more conducive to the implementation of innovation. Second, a clear data governance framework provides a reliable foundation for enterprise innovation. In the innovation process, there is a higher demand for data accuracy and consistency. A robust data governance framework ensures data quality, reliability, and provides a clear definition and management of data, enabling innovation teams to trust and fully utilize data resources. In addition, standardized data processes and a clear data governance framework support the introduction of new technologies and tools into the enterprise. In the digital era, the application of new technologies usually requires integration

with multiple data sources, and clear data processes and standardized data governance are needed to ensure the effective use of technology. A robust data governance framework helps to remove integration barriers and enable new technologies to be more smoothly integrated into an organization's business processes.

(iii) Risk mitigation. In the process of digital transformation, risks such as data leakage and data inconsistency emerge. By strengthening data governance and control, enterprises can implement strict access control, encryption technology and monitoring mechanisms to reduce the potential risk of data leakage. Ensuring that only authorized personnel can access sensitive data and tracking data access behavior in real time through monitoring systems can help detect anomalies and take urgent measures to prevent data leakage in a timely manner. Meanwhile, data inconsistency may lead to inaccurate business decisions and customer service. By strengthening data control, enterprises can establish unified data standards and data quality monitoring mechanisms to ensure data consistency across different systems and business processes. This helps improve data reliability and reduce the risks associated with data inconsistency.

4.2 Recommendations For Strengthening Data Governance and Building Data Control

By strengthening data governance and building data controls, organizations can better meet the challenges of digital transformation, achieve sustainable development, and ensure that they remain competitive in the highly competitive digital economy.

Clarify digital transformation goals. Before embarking on the construction of data governance and controls, it is important for organizations to clarify the specific goals of digital transformation to ensure the effectiveness and sustainability of the entire process. Clarifying objectives is one of the key steps to successful digital transformation, and it helps organizations identify the business and technology changes they need to pursue in the new digital environment. Traditional enterprises focus on enterprise data governance and control, and dig deeper into the value of data in traditional enterprises' R&D, production, sales and supply chain. In terms of enterprise R&D, by analyzing and applying market and user data, it can help enterprises better understand market demand and user needs, and more accurately carry out product research and development; in terms of production, by monitoring and analyzing data in the production process, it can improve production efficiency, reduce costs, and optimize the quality of the products; in terms of sales, by analyzing sales data, it can help enterprises deeply In sales, the analysis of sales data can help enterprises deeply understand consumer needs and preferences, so as to optimize sales channels and promotional strategies, and increase sales and operating profits; in the supply chain, the analysis of supply chain data can optimize supply chain operations, reduce purchasing costs, and improve the efficiency of goods management, thus further improving the competitiveness of enterprises. By focusing on the value of data in the four major areas of "research, production, sales and supply", and transforming data elements into new productivity to improve competitiveness, reduce costs and optimize efficiency, enterprises can better respond to market changes and competitive pressures, and achieve sustained growth and profitability.

Integrate data governance and business strategy. Integrating data governance with overall enterprise strategy is a critical step in ensuring that data governance practices are aligned with business objectives. By incorporating data governance into the business strategy, synergies can be realized to ensure the quality, reliability, and availability of data to better support business

decisions and achieve strategic goals. Organizations need to be clear about the importance of data in their strategic planning process. Recognizing that data is a key driver of business operations and decision-making helps business executives to prioritize data governance when developing strategy. This includes goals for ensuring data quality, protecting data privacy, and improving data availability. Designating a dedicated data governance team or lead ensures that someone is responsible for developing and executing the data governance strategy. Senior leadership involvement and support is critical to the success of data governance, helping to ensure that data governance practices receive adequate resources and attention. At the same time, data governance practices that are aligned with business goals require ongoing monitoring and evaluation. By establishing monitoring and metrics mechanisms, organizations can track the progress of data governance and make adjustments based on business needs. This circular feedback mechanism helps ensure that data governance is aligned with business strategy and adjusted as the business environment changes.

Increased investment in technology infrastructure. In the context of digital transformation, it is critical to provide advanced technology infrastructure for data governance and control. Increased investment in technology infrastructure not only helps to improve the efficiency and effectiveness of data governance, but also better supports enterprises in achieving their strategic goals of digital transformation. Advanced data management tools can help organizations collect, store, process and manage data more effectively. By using advanced data management tools, enterprises can achieve data quality control, data cleansing and integration, and ensure the reliability and consistency of data throughout the digital transformation process. It is important to note that when making investments in technology infrastructure, organizations need to ensure that the technology chosen fits with their digital transformation strategy and is future-proof. Regular technology assessments and updates are also key steps in keeping the technology infrastructure up-to-date and adaptable.

Promoting corporate culture change. Promoting corporate culture change is an important part of ensuring full participation in data governance. Establishing a data-driven corporate culture means viewing data as a key factor in the success of the organization and having all employees understand and actively participate in data governance practices. To ensure that employees understand the importance of data governance, organizations can provide relevant training, including on the value of data, privacy protection, and compliance. Training should be geared toward all levels and departments to ensure that the entire workforce is able to apply the principles of data governance in their daily work. Clear communication is key to driving culture change. Business leadership should regularly share information with employees about data governance progress, achievements and future plans. Through regular meetings, internal newsletters and other communication channels, ensure that employees are aware of the organization's commitment to data governance and motivate them to actively participate in this change. At the same time organizations can use incentives to motivate employees to actively participate in data governance practices. This could include reward programs, recognition systems, or other incentives to encourage employees to make positive contributions to data quality, privacy protection, and other aspects of data governance. Organizations also need to encourage employees to provide feedback on data governance practices to promote continuous improvement, as well as build an open culture where employees feel that their voices are heard and that their feedback has a material impact on the organization's data governance practices.

Continuous enhancement of management data governance. Data governance is an evolving process and continuous improvement is essential. Regularly review and update data governance strategies, processes and tools to respond to changing business needs and technological advances. Enterprises can establish a data management platform to collect and integrate internal and external data sources and utilize modern data processing technologies and tools to analyze and process data. The platform can integrate data monitoring, data quality assessment, data backup and recovery, and other functions to ensure long-term data reliability and availability. By continuously strengthening data governance, enterprises can effectively manage junk data, improve data quality, reduce the impact of data quality issues, and then ensure the accuracy, integrity and reliability of data, providing a credible data foundation for enterprise decision-making and business.

Establishment of robust risk management mechanisms. Establishing a robust risk management mechanism is critical to effectively responding to data security risks. Organizations need to conduct a comprehensive risk assessment of their data lifecycle to identify possible threats and vulnerabilities. This can include potential risks in terms of internal threats, external attacks, and data leakage. Enterprises need to set up real-time early warning mechanisms to monitor and detect unusual activities, and leverage advanced security technologies and tools to identify potential data security issues in a timely manner and take urgent measures to minimize losses. At the same time, it is necessary for enterprises to establish a robust emergency response plan, clarify the handling process in the event of a data security incident, ensure that team members are aware of the emergency response plan, and conduct regular simulation drills to improve the team's response capabilities. Organizations need to adopt data encryption technology to protect sensitive data in storage and transmission. This helps prevent unauthorized access to data during transmission and storage. Businesses also need to follow relevant regulations and industry standards to ensure that data is processed in accordance with legal requirements and take corrective action in case of non-compliance.

5 Conclusion

This paper examines the current challenges facing enterprise data governance and data control by providing an in-depth analysis of the challenges of data security and compliance, the complexity of data management, the standardization of enterprise data, and the difficulty of data supervision. It then analyzes the practical application of data governance and data control, and puts forward a series of methodological suggestions to strengthen enterprise data governance and data control. This paper not only combs through the problems faced by enterprise data governance and data control, but also puts forward a series of recommendations and measures in terms of clarifying digital transformation goals, integrating data governance and business strategy, increasing investment in technology infrastructure, promoting corporate culture change, continuously strengthening managerial data governance, and establishing a sound risk management mechanism, which provides both theoretical and practical lessons for enterprises in terms of data management and digital transformation. The findings are of positive significance for enterprises to better understand and address data governance and data control challenges and drive digital transformation.

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