



Corporate Digital Transformation and Information Disclosure Quality: An Empirical Study from the Perspective of Information Effect

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Abstract: Based on panel data of A-share listed companies in China from 2015 to 2023, this study empirically examines the impact of corporate digital transformation on the quality of information disclosure, focusing on the underlying mechanism of the information effect. The findings reveal that digital transformation significantly improves the quality of information disclosure, and this effect remains robust after addressing endogeneity and conducting a series of robustness checks. Further analysis suggests that digital transformation enhances the transparency and reliability of information disclosure by improving internal control quality and reducing information asymmetry, thereby exerting a significant information effect. Moreover, heterogeneity analysis indicates that the positive impact of digital transformation on disclosure quality is more pronounced among state-owned enterprises, non-high-tech firms, and large-scale enterprises. This study provides empirical evidence for policymakers and corporate managers on leveraging digital transformation to enhance information disclosure quality.

Keywords: Digital transformation; Information disclosure quality; Information effect; Internal control; Information asymmetry

1. Introduction

With the deep penetration of digital technology globally, the digital economy, driven by information technology, has become the core engine of economic growth. The Chinese government has explicitly stated: “It is necessary to accelerate the development of the digital economy, promote the deep integration of the digital economy and the real economy, and build internationally competitive digital industrial clusters.” According to statistics, by 2023, the scale of China’s digital economy has accounted for 42.8% of its GDP. Promoting digital transformation is an inevitable path for enterprises to respond to national strategies, achieve high-quality development, and drive economic and social transformation. With the continuous deepening of digital transformation, it has brought new challenges and opportunities to the core system of information disclosure. As a communication bridge between enterprises and external stakeholders, the quality of information disclosure directly affects corporate transparency and market efficiency (Xin et al., 2022). Therefore, how to optimize information disclosure and improve its transparency and reliability in the process of digital transformation has become a key factor in promoting sustainable enterprise development and enhancing market competitiveness. Digital technology clusters represented by artificial intelligence, blockchain, and big data are driving structural changes in the information disclosure system. These changes are not only reflected in the transformation of information disclosure media from one-way transmission to real-time interaction, but also extend to the multidimensional expansion and value deepening of information content. Therefore, exploring the impact of corporate digital transformation on information disclosure quality, especially in promoting voluntary information disclosure, is of great significance for improving enterprise information transparency and promoting the healthy development of capital markets.

Existing literature has explored the influencing factors of information disclosure quality from multiple dimensions, mainly from two levels: internal factors and external environmental factors. Internal influencing

factors mainly focus on governance structure, ownership structure, etc. An appropriate board size (Eriqat & Al-Khazaleh, 2023), a higher proportion of independent directors (Wang & Zuo, 2020), and high-quality external audits (Ni et al., 2024) can effectively supervise management and promote the accuracy and completeness of information disclosure; at the same time, ownership concentration (Jain & Raithatha, 2024) and the pledge ratio of controlling shareholders' equity (Yao & Chen, 2022) can also affect the quality of corporate information disclosure. External influencing factors mainly focus on external supervision and market environment. Media and investor attention (Call et al., 2024), product market competition (Cappa et al., 2021), and legal and regulatory systems (Bayong et al., 2024) also have significant positive effects on the quality of information disclosure. With the vigorous development of the digital economy, more and more studies have begun to focus on the impact of digital transformation on information disclosure quality from the perspective of governance mechanisms and supervision effects. On the one hand, digital transformation improves the transparency of internal information and the efficiency of management coordination, enabling dynamic tracking of business information and strengthening risk prevention, which reduces managerial opportunism and standardizes the quality of information disclosure (Xiao et al., 2021). On the other hand, digital transformation broadens stakeholders' information channels, increases the convenience of information acquisition and verification (Cartwright et al., 2023), reduces the ability of enterprises to hide or distort information, and external regulatory pressure and reputation constraints further reduce violations in information disclosure.

As a core issue in capital market reform, information disclosure quality has received extensive attention from academia. However, existing studies mostly focus on governance effects and supervision effects, while ignoring the unique role of digital transformation in information transmission and processing. At the same time, there is still insufficient exploration in current research on the internal mechanism through which digital transformation affects the quality of information disclosure, lacking in-depth theoretical analysis and logical reasoning. Therefore, this paper aims to analyze the impact of corporate digital transformation on information disclosure quality and its mechanism from the perspective of information effect, based on micro-level data of China's A-share listed companies from 2015 to 2023, providing new perspectives and theoretical support for the organic integration of capital market reform and digital transformation.

The possible marginal contributions of this paper are as follows: First, focusing on the information effect brought by digital transformation, it explores the impact of digital transformation on the quality of corporate information disclosure, further enriching related research on addressing principal-agent problems and information asymmetry. Second, using a mediating effect model, the paper empirically tests the path mechanism of the information effect from two dimensions: information transmission quality and the degree of information asymmetry, expanding the depth of related research and contributing to a deeper understanding of the logical relationship between digital transformation and information disclosure quality. Finally, the paper examines the asymmetric effect of digital transformation on the quality of information disclosure under heterogeneous situations, refining the differentiated impacts of digital elements under multiple dimensions. This research helps to deepen the understanding of the internal connection between corporate digital transformation and information disclosure quality.

2. Theoretical Analysis and Research Hypotheses

Digital transformation can effectively enhance enterprises' capabilities in collecting, analyzing, and processing information, helping enterprises acquire high-quality information and improve the quality of information disclosure. According to signaling theory, enterprises usually take a series of actions to convey signals related to their business conditions, financial health, and future prospects to the market (Presccilia & Widiastuti, 2024; Tan, 2017). Digital technology can deeply mine the massive amount of information accumulated in the enterprise operation process and strengthen the disclosure of non-financial information, making it a supplement to traditional accounting information disclosure (Xue, 2024), thereby enhancing the comprehensiveness of information disclosure. The combination of cloud computing and big data visualization analysis technology can efficiently process complex and unstructured data, converting it into structured and standardized information formats (Goldstein et al., 2021), making the information presentation clearer and more intuitive, and significantly improving the understandability of information disclosure. At the same time, the application of blockchain technology enables enterprises to realize real-time collection, automatic processing, and dynamic release of information (Roper et al., 2008), which can generate highly transparent financial statements in real time and disclose them synchronously through multi-platform digital methods, ensuring the timeliness of data updates and the immutability of information content (Wu & Yao, 2023) effectively suppressing managers' opportunistic behavior and improving the real-time and reliability of information disclosure.

Digital transformation can realize information sharing, drive the willingness of management to disclose enterprise information, and promote the improvement of information disclosure quality. According to agency theory, management may manipulate financial data for personal interests through earnings management, affecting the authenticity and transparency of information disclosure (Sequeira et al., 2024). Digital technology effectively

breaks down departmental barriers and information silos caused by poor data circulation, promotes the integration and collaboration of internal information systems, and improves information flow efficiency (Dong, 2024). Through data analysis and intelligent decision support systems, enterprises can implement personalized information disclosure strategies according to the needs of different stakeholders, protect the security of core technologies and trade secrets, and prevent potential competitive risks caused by excessive information disclosure, thus alleviating management's concerns about the risks and uncertainties that may be caused by information disclosure, and motivating them to disclose enterprise information more actively and normatively, thereby enhancing the effectiveness and pertinence of information disclosure. In addition, digital transformation promotes enterprises to build intelligent information sharing mechanisms and further strengthens trust relationships with external stakeholders (Öberg, 2023). Under the background of economic globalization, enterprises face the challenges of multilingual environments and diversified accounting standards. With the help of intelligent translation platforms and cloud-based financial systems, enterprises can achieve high-quality, multilingual information disclosure that complies with international accounting standards (Yin, 2024). This not only meets the information needs of international investors, but also effectively broadens the enterprise's financing channels, promotes the management to actively improve the quality of information disclosure, enhances the compliance and comparability of disclosed information, and improves the enterprise's competitiveness and reputation in the global capital market. Based on the above analysis, this paper proposes Hypothesis 1:

Hypothesis 1: Digital transformation can promote the quality of enterprise information disclosure.

Digital transformation can improve the level of internal control in enterprises, thereby enhancing the quality of information disclosure. Based on internal control theory, internal control, as an important part of enterprise management, is an important mechanism to ensure the effectiveness of company operations and the compliance of company disclosure. According to the *Basic Norms for Enterprise Internal Control* issued by the Ministry of Finance of China, internal control includes five elements: internal environment, risk assessment, control activities, information and communication, and internal supervision. With the widespread application of digital technology, internal control in enterprises is gradually upgrading from traditional manual control to digital internal control, promoting the realization of all-round dynamic management in enterprises (Wang et al., 2024), and improving the quality of information disclosure. Firstly, with the deep integration of digital technology and business, the organizational form is shifting from traditional vertically closed to a flat network structure supported by digital technology (Ye, 2023), which optimizes the corporate governance structure and supervision level, helps reduce opportunistic behavior of internal personnel, and alleviates the agency problem caused by the separation of ownership and control (Ivaninskiy & Ivashkovskaya, 2022), thereby fundamentally ensuring the authenticity and reliability of information disclosure. Secondly, digital transformation integrates enterprise resource elements, processes various types of data into information, and assesses various potential risks (Zeverte-Rivza et al., 2024), promoting information circulation and coordination among different departments in the company, and ensuring that information users can obtain feedback in a timely manner (Doetzer & Pflaum, 2021). This efficient information flow not only avoids major decision-making risks caused by human factors, but also ensures the authenticity and transparency of information disclosure. In view of this, this paper proposes Hypothesis 2:

Hypothesis 2: Digital transformation can improve internal control level and thereby enhance the quality of information disclosure.

Digital transformation plays a crucial role in reducing information asymmetry. It significantly enhances enterprises' capabilities in integrating and processing information, enabling enterprises to more accurately grasp resource allocation and market dynamics (Mikalef & Pateli, 2017). It not only realizes the effective integration of internal information but also promotes information sharing between enterprises and external stakeholders, reducing the communication cost and delay of information exchange. According to information asymmetry theory, in capital markets, information asymmetry leads to higher uncertainty for investors and other stakeholders in the decision-making process (Mishra & Dalman, 2023). Digital transformation of enterprises is a systematic and continuous process, usually accompanied by increasing cost input (Liu et al., 2024). Through the application of cloud computing, artificial intelligence, and big data analysis technologies, investors and other stakeholders can more accurately assess the value and risks of enterprises, and determine whether the losses are temporary phenomena in the process of digital transformation, so as to make more informed decisions. At the same time, these technologies also help to effectively supervise management and suppress earnings management and tax avoidance behavior driven by managers' self-interest motives (Bankewitz et al., 2016), thus improving the overall quality of enterprise information disclosure. In addition, with the help of AI technology and public opinion monitoring systems, enterprises can communicate with external stakeholders in real time (Hoenig & Henkel, 2015; Novotny et al., 2023), quickly correct misunderstandings or clarify facts, thereby further reducing information asymmetry, enhancing market trust, and establishing a good reputation. This helps achieve stable long-term interests, reduces concerns about financial sustainability, and weakens the motivation of management to manipulate financial statements and conceal key information, thus improving the quality of information disclosure.

Based on the above analysis, this paper proposes Hypothesis 3:

Hypothesis 3: Digital transformation can enhance the quality of information disclosure by reducing the degree of information asymmetry.

3. Research Design

3.1 Sample Selection and Data Sources

Considering that after 2015, enterprises began to widely adopt big data, cloud computing and other technologies to accelerate the process of digital transformation, and the disclosure of annual reports of Chinese listed companies also tended to be standardized during this period, this paper selects A-share listed companies in China from 2015 to 2023 as the research object. The collected sample data were processed as follows: First, considering the particularity of the financial industry, financial enterprises were excluded; second, to reduce the interference of abnormal financial enterprises on the analysis results, companies marked as ST, *ST and PT as well as companies with missing main variables were deleted; third, to reduce the interference of extreme values on the accuracy of the research results, all continuous variables were winsorized at the 1% and 99% levels. Finally, 23,661 firm-year observations were obtained. The data used in this study mainly come from the annual reports of listed companies, the official website of the Shenzhen Stock Exchange, and the CSMAR database provided by GTA.

3.2 Variable Design

3.2.1 Explained variable: Information disclosure quality (Quality)

Referring to the research method of Zhuang & He (2023), this paper evaluates the annual information disclosure quality of listed companies based on the *Measures for the Assessment of Information Disclosure Work of Listed Companies* issued by the Shenzhen Stock Exchange. According to the current digital rating system of the Shenzhen Stock Exchange, the annual information disclosure rating results A, B, C, and D are set as the Quality variable and assigned values of 4, 3, 2, and 1 respectively, to reflect the high or low quality of corporate information disclosure.

3.2.2 Explanatory variable: Degree of digital transformation (DT)

This paper draws on the research of Wu et al. (2021) and uses the text analysis method to quantify the level of digital transformation based on the frequency of keyword occurrence in the annual reports of listed companies. First, a characteristic word bank is formed by referring to relevant literature, policy documents on digital transformation, and combining the text content of annual reports of listed companies, and keywords are classified based on digital underlying technology and technical practice application characteristics. Second, based on Python software, the frequencies of keywords related to artificial intelligence, big data, cloud computing, blockchain, and digital technology are counted and categorized. Finally, after data cleaning, the total frequency of digital transformation keywords is obtained, and the logarithm is taken after adding 1 to measure the degree of digital transformation.

3.2.3 Mechanism variables

(1) Internal Control (IC). The internal control disclosure index published by Dibo Company is selected and the logarithm is taken after adding 1 to measure the quality of corporate internal control. The larger the index, the higher the quality of internal control.

(2) Information Asymmetry (ASY). Referring to the research method adopted by Song et al. (2021), the index is constructed using daily trading data by conducting principal component analysis on liquidity ratio, illiquidity indicators, and return reversal. The first principal component is extracted from the original indicators to build the information asymmetry index (ASY). An upward trend in the value of this index indicates an increasing degree of information asymmetry of the enterprise.

3.2.4 Control variables

Referring to the research of relevant scholars by Cao et al. (2023), this paper selects firm size (Size), asset-liability ratio (Lev), return on equity (ROE), operating income growth rate (Growth), the shareholding ratio of the largest shareholder (Top1), board size (Board), book-to-market ratio (BM), capital occupation by major shareholders (Occupy), audit quality (Big4), and nature of property rights (SOE) as control variables. Year (Year) and industry (Ind) fixed effects are also controlled. The variable definitions are shown in Table 1.

3.3 Model Specification

To examine the impact of digital transformation on the quality of corporate information disclosure, this paper employs a fixed effects model using panel data for empirical analysis. To prevent time-series correlation problems

in the residual terms, cluster adjustments are performed at the firm level in the regression analysis. Furthermore, this paper investigates the mechanism of internal control and information asymmetry in this relationship and constructs a mediation effect model for testing, referring to the method of Wen & Ye (2014). The specific equations are as follows:

Table 1. Variable definitions

Variable Type	Variable Name	Variable Symbol	Variable Description
Explained Variable	Information Disclosure Quality	Quality	Refers to the current information disclosure assessment results in the "Measures for the Assessment of Information Disclosure Work of Listed Companies" by the Shenzhen Stock Exchange.
Explanatory Variable	Degree of Digital Transformation of Enterprises	DT	Refers to the method of Wu et al. (2021), calculated based on keyword frequency in annual reports.
Mechanism Variable	Internal Control	IC	Dibo Internal Control Index, logarithm taken after adding 1.
	Information Asymmetry	ASY	Refers to the method adopted by Song et al. (2021), information asymmetry index constructed accordingly.
	Firm Size	Size	Logarithm of total assets.
	Asset-Liability Ratio	Lev	Total liabilities at year-end / Total assets at year-end.
	Return on Equity	ROE	Net profit / Average balance of net assets.
	Operating Income Growth Rate	Growth	(Operating income of the current year / Operating income of the previous year) – 1.
	Shareholding Ratio of Largest Shareholder	Top1	Number of shares held by the largest shareholder / Total shares.
Control Variable	Board Size	Board	Natural logarithm of the number of board members.
	Book-to-Market Ratio	BM	Book value / Total market value.
	Capital Occupation by Major Shareholders	Occupy	Other receivables / Total assets.
	Audit Quality	Big4	Assigned 1 if the auditing firm is one of the international "Big Four", otherwise 0.
	Nature of Property Rights	SOE	Assigned 1 if state-owned enterprise, otherwise 0.
	Year	Year dummy variable	
	Industry	Industry dummy variable	

$$Quality_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Controls + Year + Ind + \varepsilon_{i,t} \quad (1)$$

$$Z/ASY_{i,t} = \beta_0 + \beta_1 DT_{i,t} + \beta_2 Controls + Year + Ind + \varepsilon_{i,t} \quad (2)$$

$$Quality_{i,t} = \gamma_0 + \gamma_1 DT_{i,t} + \gamma_2 IC_{i,t}/ASY_{i,t} + \gamma_3 Controls + Year + Ind + \varepsilon_{i,t} \quad (3)$$

where, i represents the firm, t represents the year, $Quality_{i,t}$ represents the information disclosure quality of the firm, $DT_{i,t}$ represents the degree of digital transformation of the firm, and the mediating variables $IC_{i,t}/ASY_{i,t}$ represent the internal control and information asymmetry degree of firm i in year t . *Controls* is a set of control variables, and *Year* and *Ind* represent year and industry fixed effects, respectively.

4. Empirical Results and Analysis

4.1 Descriptive Statistics

From Table 2, it can be observed that the mean value of *Quality* is 3.078, and the median is 3. The mean value of *DT* is 1.804, with a standard deviation of 1.430, a maximum value of 5.293, and a minimum value of 0. This indicates that the digital development of Chinese enterprises is still at a relatively low level, and there exists a large disparity among different enterprises in the process of promoting digital transformation, reflecting the uneven

development of enterprises in digital transformation. In addition, a variance inflation factor (VIF) test was conducted for the variables in the model, and the results show an average value of 1.39, far less than 10, indicating that there is no multicollinearity problem in this model.

Table 2. Descriptive statistics of major variables

Variable	N	mean	p50	sd	min	max	VIF
Quality	23661	3.078	3	0.598	1	4	
DT	23661	1.804	1.609	1.430	0	5.293	1.05
Size	23661	22.34	22.13	1.259	20.18	26.38	2.29
Lev	23661	0.408	0.402	0.190	0.062	0.852	1.66
ROE	23661	0.060	0.068	0.118	-0.496	0.343	1.30
Growth	23661	0.139	0.091	0.339	-0.532	1.844	1.13
Board	23661	2.096	2.197	0.193	1.609	2.565	1.13
Top1	23661	0.326	0.302	0.144	0.081	0.726	1.12
BM	23661	1.068	0.678	1.258	0.104	8.250	2.07
Occupy	23661	0.013	0.006	0.0200	0	0.123	1.10
Big4	23661	0.057	0	0.232	0	1	1.13
SOE	23661	0.271	0	0.445	0	1	1.29

4.2 Basic Regression Analysis

Table 3 shows the regression results of Model (1), i.e., the impact of digital transformation on corporate information disclosure quality. To eliminate the interference of heteroscedasticity, this study adopts firm-level clustering to adjust the standard errors in the regression analysis. Column (1) reports the regression result with only year and industry fixed effects included, and without control variables; Column (2) reports the regression result after including a series of control variables. Regardless of whether control variables are included or not, the coefficient of digital transformation is significantly positive at the 1% level. This indicates that under other constant conditions, the degree of digital transformation has a positive effect on the quality of information disclosure, which verifies Hypothesis H1, i.e., corporate digital transformation can improve the quality of information disclosure.

Table 3. The impact of digital transformation on corporate information disclosure

Variables	Quality	Quality
	(1)	(2)
DT	0.026*** (0.006)	0.018*** (0.005)
Size		0.132*** (0.007)
Lev		-0.420*** (0.040)
ROE		1.176*** (0.051)
Growth		0.001 (0.012)
Board		0.044 (0.031)
Top1		0.288*** (0.044)
BM		-0.029*** (0.008)
Occupy		-2.465*** (0.318)
Big4		0.138*** (0.026)
SOE		0.119*** (0.016)
Constant	3.031*** (0.013)	0.037 (0.153)
Year&Ind	Yes	Yes
N	23661	23661
R ²	0.014	0.199
Adjusted R ²	0.013	0.197

Note: ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively. Values in parentheses are t-values. Same below.

4.3 Endogeneity Test

4.3.1 Instrumental variable method

Considering that enterprises with higher information disclosure quality may have stronger internal motivation to promote technological advancement and tend to adopt digital transformation strategies to explore better development opportunities, this study adopts the method of Wang et al. (2022) to alleviate the endogeneity problem caused by reverse causality. Specifically, the average digital transformation degree of other firms in the same province and year (IV1) is selected as the instrumental variable. From the perspective of correlation, firms in the same industry or province usually face similar industrial characteristics and external environments; and currently, there is no evidence indicating that the digital transformation degree of other firms in the same province directly affects a firm's information disclosure quality, thus satisfying the principle of exogeneity. As shown in Columns (1) and (2) of Table 4, the F-value of IV1 is greater than 10, supporting the hypothesis of relevance for the instrumental variable; the statistics of the under-identification test and weak instrument test are both greater than the critical value 16.38 at the 10% significance level of the Stock-Yogo weak instrument test, indicating that the selected instrumental variable in this study passes the tests of under-identification and weak identification.

The inherent relationship between digital transformation and information disclosure quality is highly likely to cause endogeneity problems due to omitted variables and measurement errors, which may further affect the accuracy and reliability of the research results. Referring to the study of Zhang et al. (2023), this paper considers that the mobile phone penetration rate can reflect the level of digital development in a region and is closely related to the trend of digital transformation, thus meeting the correlation criterion for instrumental variables. Meanwhile, as social infrastructure providing communication services to the public, the mobile phone penetration rate does not directly affect the quality of corporate information disclosure. Therefore, mobile phone penetration rate (IV2) is adopted as an instrumental variable for testing. In Columns (3) and (4), the regression coefficient of DT remains positive at the 1% significance level, confirming again the positive promoting effect of digital transformation on information disclosure quality.

Table 4. Instrumental variable method

	IV1		IV2	
	(1)	(2)	(3)	(4)
	First Stage DT	Second Stage Quality	First Stage DT	Second Stage Quality
IV	0.407*** (0.0492)		0.00344*** (0.000694)	
DT		0.278*** (0.0522)		0.257*** (0.0836)
Controls	Yes	Yes	Yes	Yes
Year&Ind	Yes	Yes	Yes	Yes
N	23658	23658	23432	23432
F-value	68.45		24.60	
Kleibergen-Paap rk LM test		67.773		24.388
Cragg-Donald Wald F statistic		368.049		121.442
Kleibergen-Paap rk Wald F statistic		68.446		24.603

Table 5. Endogeneity and robustness tests

	Quality (1)	Quality (2)	Quality (3)	Quality (4)	Quality (5)
DT1	0.038*** (0.013)				
DIGI		0.934*** (0.269)			
L1.DT			0.018*** (0.005)		
DT				0.014*** (0.005)	
DT					0.017*** (0.005)
Controls	Yes	Yes	Yes	Yes	Yes
Year&Ind	Yes	Yes	Yes	Yes	Yes
N	23624	23661	19292	17444	19241
R ²	0.202	0.198	0.210	0.199	0.191
AdjustedR ²	0.201	0.197	0.208	0.197	0.189

4.3.2 Propensity score matching method

To avoid the sample self-selection problem, this study adopts the Propensity Score Matching (PSM) method for empirical testing. According to the industry-year median standard, the degree of digital transformation (DT) is defined as a dummy variable DT1. If a firm's digital transformation degree exceeds the corresponding industry-year median, then DT1 is assigned a value of 1; otherwise, it takes the value of 0. At the same time, all control variables are selected as covariates, and a 1:1 nearest neighbor matching method with caliper is used, setting the threshold to 0.01 to calculate the propensity score. According to the parallel trend test, there were significant differences in variables before matching, while after matching, the standard deviation of covariates was within $\pm 5\%$, indicating that after the matching process, the characteristics of the treatment group and the control group became consistent. Subsequently, regression analysis was conducted on the matched sample, and DT1 remained significantly positive at the 1% level, as shown in Column (1) of Table 5, once again confirming the previous hypothesis.

4.4 Robustness Test

4.4.1 Replacing the explanatory variable

Given that differences in the degree of digital transformation may lead to bias in the research results, this paper refers to the study of Zhao (2021) and changes the measurement method of the digital transformation indicator. The results are shown in Column (2) of Table 5, and the regression results are consistent with the main regression effect.

4.4.2 Adjusting the period

Digital transformation of enterprises is a long-term process, and its impact on the quality of information disclosure often shows a certain lag effect. Therefore, this paper extends the time window of the impact of enterprise digital transformation on information disclosure quality and adopts the lagged digital transformation indicator for testing. The results are shown in Column (3) of Table 5. The regression results are significantly positive at the 1% level, indicating that hypothesis H1 still holds.

4.4.3 Excluding the influence of extreme events

Due to the impact of the COVID-19 pandemic, enterprises may encounter resistance in the process of digital transformation. Therefore, this paper excludes the enterprise samples of 2020 and 2021 and conducts regression again. As shown in Column (4) of Table 5, the coefficient of variable DT is significantly positive at the 1% significance level, consistent with the conclusion of the baseline regression.

4.4.4 Reducing the sample size

The level of urban development may influence the degree of enterprise digital transformation to a certain extent. Since municipalities directly under the central government enjoy more significant advantages in terms of policy support, financial resources, and infrastructure, which are conducive to enterprise digital transformation, this paper excludes enterprise samples from Beijing, Shanghai, Tianjin, and Chongqing and conducts regression again. The results are shown in Column (5) of Table 5. DT remains significantly positive at the 1% level, and the research conclusion remains robust.

5. Further Analysis

5.1 Mechanism Test

According to the previous theoretical analysis, this paper argues that internal control and information asymmetry are possible mechanisms through which digital transformation affects the quality of information disclosure. Therefore, this paper uses a mediation model to further discuss the relationship between the two. The results are shown in Table 6.

Columns (1) and (2) of Table 6 present the results of the mediation model test for the internal control mechanism. In Column (1), the coefficient of DT is positive and passes the 1% significance level test. In Column (2), the coefficients of DT and IC are both significant at the 1% level and share the same sign, indicating that internal control plays a partial mediating role between enterprise digital transformation and information disclosure quality, thus verifying hypothesis H2. In Columns (3) and (4), the coefficients of DT are both significant at the 1% level, and the coefficient of ASY is -0.253, which is significantly negatively correlated at the 1% level, indicating that enterprise digital transformation can indirectly improve the quality of information disclosure by reducing information asymmetry, thus verifying hypothesis H3.

Table 6. Mechanism test

Variables	IC	Quality	ASY	Quality
	(1)	(2)	(3)	(4)
DT	0.012*** (0.005)	0.016*** (0.005)	-0.010*** (0.003)	0.017*** (0.005)
IC		0.151*** (0.007)		
ASY				-0.101*** (0.020)
Constant	6.226*** (0.123)	-0.900*** (0.154)	6.298*** (0.114)	0.674*** (0.196)
Controls	Yes	Yes	Yes	Yes
Year&Ind	Yes	Yes	Yes	Yes
N	23661	23661	23661	23661
R ²	0.049	0.227	0.613	0.201
Adjusted R ²	0.048	0.225	0.612	0.199

5.2 Heterogeneity Test

Although previous sections have provided empirical evidence that corporate digital transformation positively influences information disclosure quality, this effect may vary based on specific characteristics. This study further investigates the differential impact of digital transformation on disclosure quality across three dimensions: ownership structure, industry characteristics, and firm size.

Table 7. Heterogeneity analysis

	Ownership Type		Ownership Type		Ownership Type	
	(1)	(2)	(3)	(4)	(5)	(6)
	Non-SOEs	SOEs	Non-High-Tech Enterprises	High-Tech Enterprises	Large-Scale Enterprises	Small-Scale Enterprises
DT	0.027*** (0.006)	0.019* (0.010)	0.032*** (0.007)	0.009 (0.007)	0.020** (0.010)	0.004 (0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year&Ind	Yes	Yes	Yes	Yes	Yes	Yes
N	17248	6413	12806	10855	7099	7099
R ²	0.147	0.220	0.169	0.206	0.221	0.143
Adjusted R ²	0.145	0.215	0.166	0.204	0.217	0.139

5.2.1 Ownership structure

State-owned enterprises (SOEs) possess economic, political, and social attributes (Li, 2021), often receiving government support and regulation, with relatively rigid management systems. This leads to slower responses to market pressures, rendering the enhancement effect of digital transformation on their information disclosure quality relatively limited. In contrast, non-state-owned enterprises (non-SOEs) rely more on their own funds (Xu et al., 2023), and typically face stronger market competition and external supervision. Under such high-pressure environments, these enterprises are more inclined to seize the opportunities presented by digital transformation to improve information disclosure quality, thereby enhancing credibility and competitive advantage, and promoting high-quality development. Table 7 columns (1) and (2) report the analysis results of ownership heterogeneity. Digital transformation significantly promotes information disclosure quality in both non-SOEs and SOEs, but the effect is more pronounced in non-SOEs. This indicates that digital transformation has a stronger facilitative effect on improving information disclosure quality in non-SOEs.

5.2.2 Industry characteristics

Non-high-tech enterprises, often in traditional industries, typically face challenges such as low information processing efficiency and insufficient transparency. Digital transformation offers these enterprises an opportunity to reshape their information management and disclosure systems, helping them overcome delays in information processing and significantly enhancing information accessibility and transparency. In contrast, high-tech enterprises, being knowledge-intensive industries, possess higher information transparency and mature data processing capabilities (Zandiatashbar & Hamidi, 2021), with a higher starting point in information disclosure. Therefore, the marginal improvement brought by digital transformation is relatively limited. Based on the research by Zhang & Zhang (2023), this study categorizes sample enterprises into non-high-tech and high-tech enterprises and conducts group regressions. The results, as shown in Table 7 columns (3) and (4), indicate that the regression

coefficients of DT are positive. Although the facilitative effect is not significant in high-tech enterprises, it is both larger and significant at the 1% level in non-high-tech enterprises. This result validates the heterogeneity analysis based on industry characteristics.

5.2.3 Firm size

Digital transformation requires sustained investments in capital, technology, and talent. Large-scale enterprises have inherent advantages in resource acquisition, technological accumulation, and institutional support, enabling them to develop systematic capabilities in digital infrastructure, system integration, and data governance, thereby facilitating comprehensive improvements in information disclosure quality. Additionally, large enterprises place greater emphasis on information compliance and transparency in response to external regulation, attracting investment, and brand building. This drives them to proactively utilize digital tools in information disclosure, fully leveraging digital technologies to enhance disclosure quality (Yao, 2024). Conversely, small and medium-sized enterprises (SMEs) often face challenges such as limited resources, financing difficulties, and insufficient policy support (Owen et al., 2023), making it difficult for them to effectively implement digital transformation and achieve significant results. Based on asset size, this study divides enterprises into large-scale and small-scale groups using the top and bottom 30% quantiles and conducts group regressions. The regression results, as shown in Table 7 columns (5) and (6), indicate that digital transformation has a significant positive impact on large-scale enterprises, with DT coefficients significantly positive. However, in smaller enterprises, the impact of digital transformation on information disclosure quality is not significant. This suggests that digital transformation can significantly enhance information disclosure quality in larger enterprises.

6. Conclusion and Implications

This study utilized data from Chinese A-share listed companies between 2015 and 2023 to empirically analyze the impact of digital transformation on information disclosure quality and its underlying mechanisms. The findings reveal: (1) Corporate digital transformation significantly enhances information disclosure quality. The results remain robust after addressing endogeneity and conducting various robustness tests. (2) Mechanism analysis indicates that digital transformation effectively plays an informational role, significantly improving information disclosure quality by enhancing internal control quality and reducing information asymmetry. (3) Heterogeneity analysis shows that digital transformation improves information disclosure quality, with more pronounced effects in non-state-owned enterprises, non-high-tech industries, and large-scale enterprises.

Based on these findings, the following policy implications are proposed:

From the government level, first, the government should improve the legal and regulatory system for digital transformation, formulate and improve laws and regulations related to digital transformation, and ensure that key issues such as data protection, privacy security, and information transparency are effectively regulated. Second, the government should introduce more incentive policies related to digital transformation, continue to strengthen support for enterprises' digital transformation, and actively play the role of a guide. The digital transformation of enterprises is a long-term and systematic process. The government can provide incentives such as tax incentives and financial support to encourage enterprises to invest in digital infrastructure construction and data governance systems. Finally, the government should coordinate the operation of digital transformation strategies for different types of enterprises. At present, there are significant heterogeneity phenomena in the digital transformation of enterprises with different ownership nature, industry characteristics, and scales. Therefore, governments at all levels should implement policies based on different types of enterprises, implement differentiated strategies according to the development needs of different enterprises, especially formulate preferential measures for non-state-owned enterprises, non-high-tech industries, and large-scale enterprises, encourage the comprehensive integration of digital technology and enterprise operation and development, provide a good external development environment for the digital transformation of various enterprises, further promote the structuring and standardization of information disclosure of listed companies, and improve the transparency and regulatory efficiency of the capital market.

From the enterprise perspective, first, enterprises should fully grasp the opportunity of digital transformation, attach importance to the positive promotion effect of digital transformation on enterprise development, actively exert subjective initiative, promote the construction process of new digital infrastructure, and use the information effect of digital transformation to achieve high-quality information disclosure. Second, enterprises should use the driving role of digital transformation to improve the construction of internal digital management platforms, smooth information circulation channels, and weaken the adverse impact caused by information asymmetry. Through digital technology to monitor enterprise operation data in real-time, strengthen data governance and supervision, and carry out quantitative assessment of potential operational risks, ensure data security and transparency, and at the same time promote the scientific and rational decision-making process, and promote the disclosure quality of voluntary information. In addition, enterprises should accelerate the construction of digital information systems, promote the deep integration of technologies such as cloud computing and big data analysis in all aspects of

production and operation. Relying on diversified digital devices, create an efficient information environment, realize accurate data mapping and information sharing, provide higher quality information for the capital market, and improve the market trust of enterprises. Finally, enterprises should formulate appropriate strategic decisions based on their own characteristics and external environment, especially non-state-owned, non-high-tech and large-scale enterprises, which should pay more attention to digital transformation, fully exert its role in information disclosure, and then improve the competitiveness and market position of the enterprise.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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