

Enterprise Digital Transformation and Accounting Information Transparency

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Abstract. Based on the data of listed companies from 2010 to 2021, this paper discusses the impact of digital transformation of enterprises on accounting information transparency. The results show that digital transformation can improve the transparency of accounting information; The positive relationship between the two is more significant in the diversified business environment. The digital transformation of non-state-owned enterprises has a more significant effect on improving transparency. Digital transformation improves the transparency of accounting information, which in turn enables enterprises to reduce financing constraints and improve future growth prospects. The results of this study provide strong evidence that digital transformation has a positive impact on improving the transparency of accounting information, and can be used as a valuable reference to reduce the information asymmetry between companies and the capital market. The study of this paper provides evidence that digital transformation has positive significance to improve the transparency of accounting information and has reference value to reduce the information asymmetry between companies and the capital market.

Keywords: Digital Transformation; Accounting Information Transparency; Diversified Management; Nature of Property Right.

1. Introduction

In the era of digital economy, technologies like big data, cloud computing, blockchain, and artificial intelligence have become crucial for high-quality economic development. China's digital economy reached 45.5 trillion yuan in 2021, contributing 39.8% to GDP. Digital transformation has stimulated business dynamics, improved productivity, and reduced operational risks.

Transparency of corporate accounting information is vital for sustainable enterprise and market economy development. With the booming stock market, improving accounting information transparency helps investors evaluate company prospects, fosters capital market growth, and reduces information asymmetry between managers and investors.

Digital transformation is the process of using emerging digital technologies to improve corporate value creation and adapt to changes in the external environment[1], and the core lies in the empowerment of digital technologies[2]. Research shows that digital technologies provide companies with more usable information, enabling better analysis and prediction of board members' choices, reducing agency and regulatory costs[3]. Blockchain technology enhances internal control, improves management efficiency, and promotes governance modernization [4]. Digital transformation also reduces information asymmetry [5], improves corporate governance, and mitigates debt default risk [6].

This study examines the relationship between corporate digital transformation and accounting information transparency using empirical data from Chinese A-share listed companies (2010-2021). The findings indicate that digital transformation improves accounting information transparency, with a stronger effect observed in diversified and non-state enterprises. Increased transparency has positive economic implications, such as reduced financing constraints and improved growth prospects.

This study enriches research on factors influencing accounting information transparency and explores the positive impact of digital transformation. It extends research on the economic consequences of digital transformation, highlighting its role in addressing agency problems and providing new governance mechanisms for diversified operations. The study reveals the asymmetric

impact of digital transformation on accounting information transparency in state-owned and non-state-owned enterprises. It also demonstrates the positive economic impact of increased transparency, reducing financing costs and promoting firm growth.

2. Theoretical Analysis and Research Hypothesis

2.1 Theoretical Analysis

2.1.1 Transparency of Accounting Information

Accounting information transparency is an important indicator to assess whether an enterprise can provide timely, accurate, comprehensive, reliable and fair accounting information. This indicator enables users of accounting information to make informed decisions by having a clear and comprehensive understanding of a firm's financial position, business performance, risk allocation and risk management information [7]. Improving the transparency of accounting information is important in preventing and detecting earnings manipulation and promoting corporate governance [8]. A high level of accounting information transparency increases the possibility of obtaining low-cost financing [9]. In addition, improving the transparency of corporate accounting information promotes corporate performance [10]. Therefore, it is necessary for firms to prioritize the improvement of accounting information transparency because it not only benefits the firm itself, but also enhances stakeholders' trust and confidence in the firm's financial information, which leads to better decision-making and overall success.

The existing literature mainly examines the factors influencing accounting information transparency in terms of internal governance, external governance, firm characteristics and disclosure motivations. Specifically, the impact of internal governance on corporate accounting information transparency is mainly from the perspectives of board of directors and shareholding structure as well as internal control. [11-12]. From the perspective of board of directors and ownership structure, some scholars have found that corporate governance variables, such as the proportion of non-state majority shareholders, independent directors, and institutional investors, are positively related to the transparency of corporate accounting information [13]. Improving the nature of state ownership and the presence of non-state majority shareholders can also improve the quality of corporate information [14]. In addition, larger board size and the shareholding of the first largest shareholder can also help improve the transparency of corporate financial reporting [15].

Regarding the internal control perspective, some scholars found that the weaker the internal control of a firm, the lower its accrual quality [16]. Strengthening internal controls can effectively limit firms' surplus management activities and thus effectively improve surplus quality [17]. Higher quality internal controls can limit the space for managers to engage in opportunistic behavior and make firms more inclined to actively and timely communicate expected loss information to stakeholders, thus maintaining a higher level of accounting robustness [18].

External governance also plays a crucial role in the transparency of accounting information. Such as credit ratings, news media coverage, market competition, and accounting standards [19], can influence the quality of corporate disclosures. High credit ratings, positive news media coverage, fierce market competition, and prudent accounting standards are associated with higher levels of accounting transparency.

Firm characteristics, such as operating performance, asset size, and gearing ratio, can also influence accounting information transparency. Studies have found that firms with better operating performance, larger asset size, and lower gearing ratios tend to have higher transparency in financial reporting [20]. Finally, disclosure motivation is also another key factor affecting the transparency of corporate accounting information. Firms with motives such as raising capital, acquiring other firms, increasing stock liquidity, avoiding legal costs, or maintaining product image tend to have higher transparency in financial reporting [11].

2.1.2 Digital Transition

With the rapid development of digital technology, human society has entered a new era characterized by digitalization, and academics have conducted extensive research and discussion on the impact of digital transformation on enterprise management change and business model innovation, a trend that has become increasingly evident in recent years. Digital transformation refers to the process of achieving business improvement, efficiency enhancement, and reshaping of value creation methods based on the widely integrated application of next-generation underlying digital technologies such as artificial intelligence, blockchain, cloud computing, and big data [21].

Digital transformation can have a profound impact on various management activities of enterprises. Specifically, digital transformation can help companies optimize operations management, improve organizational efficiency, optimize strategic planning, enhance financial control, and improve marketing effectiveness. In the area of operation management, digitalization and related technologies facilitate the optimization of operational systems and improve operational efficiency, while providing opportunities for companies to create consumer value, innovate products and services around consumers, reorganize organizational structures and business processes, and reshape supply chain relationships [22]. In the field of organizational management, the addition of digital technology makes management no longer limited to efficiency tapping of enterprise production and operation organizational processes, but through the effective application of multi-source heterogeneous data, more proactive demand forecasting and value creation through data-driven decision-making [23]. In the area of strategic management, combining multiple strategies with digital technologies can enable companies to gain access to different capabilities, knowledge and resources, thus enabling them to gain a greater share [24]. The financial management area will start with "data" and cover every activity and every individual, presenting "finance for all", from "empowerment and activation" to "accounting and measurement". In the field of financial management, we will start with "data", cover every activity and every individual, present "finance for everyone", and assist digitization from the perspective of "empowerment and activation" rather than "accounting and measurement" [25]. In the field of marketing management, companies develop new analytics, especially new machine learning technologies to deeply analyze users' consumption behaviors and intentions, to carry out omnichannel marketing, and to provide personalized products and services to users through precision marketing to gain more markets and customers [26]. In conclusion, it is now generally accepted in academia that digital transformation can provide companies with more efficient, accurate, flexible and sustainable management, which helps them gain a greater competitive advantage in the changing market.

After reviewing existing research, we found that despite fruitful academic research on the factors affecting accounting information transparency and its economic consequences, the transparency of domestic listed companies is still low and there are multiple problems with information disclosure. On the other hand, the rapid development of digital technology has led to an accelerated digital transformation of enterprises, which has resulted in significant changes in internal management and business operations. However, current research has mainly focused on theoretical discussions, and empirical evidence is still needed to support the positive impact of digitization within companies. And whether digitalization can improve the information transparency of companies has not yet been addressed by research; therefore, this study aims to fill the gap in existing research by analyzing and testing whether digital transformation can improve the transparency of corporate accounting information.

2.2 Research Hypothesis

The basic expression of digitization is the process of transforming the original work environment using digital technology. This allows companies to collect, analyze and visualize data in real time by establishing data centers. Storing all business activity data in a data center provides a more efficient and streamlined way to manage business operations [21].

First, digital transformation improves the transparency of accounting information by providing proactive guidance and increasing the ability of companies to disclose actual operating conditions.

Digital transformation reduces human errors and improves the accuracy and efficiency of financial processes. Automated digital financial management systems reduce manual intervention and review efforts by finance staff, increasing efficiency and accuracy [27-28]. Detailed transaction and process data allow companies to manage at a granular level at the grassroots business level [29]. Digital intelligent analysis technology can quickly analyze and process accounting information, detect anomalies and errors, improve the accuracy and authenticity of financial data, and increase the transparency of accounting information. Digitization enables companies to efficiently collect, organize, and analyze large amounts of fragmented data [30], improving the accuracy of financial information disclosure and the transparency of accounting information.

Second, in a rapidly changing digital environment, companies need to respond to market changes in a timely manner. The traditional top-down central control is no longer effective and is replaced by a decentralized, disintermediated networked and flat organizational structure [31]. Cloud collaboration platforms improve organizational responsiveness, visualize departmental behavior, and make it easier to detect behaviors that undermine firm value.

Finally, the link between corporate digital transformation and accounting information transparency can also be explored from a practical perspective. Many companies have recognized the impact of digital transformation on accounting information transparency and are actively exploring the link between the two. Enterprises focus on establishing a comprehensive financial information system and data sharing platform to improve the accuracy and timeliness of financial information and enhance internal information communication and exchange [30]. Digital transformation improves financial management efficiency and control, reduces financial risk and opacity, and enhances market competitiveness and corporate value [32].

In combination with the above analysis, this study concludes that the digital transformation of enterprises enhances the collection and processing of accounting information, allowing them to better disclose the actual operating conditions. This leads to better decision making by stakeholders and enhances information transparency. Therefore, this study proposes the hypothesis.

H_1 : Given other conditions, digital transformation can improve the transparency of accounting information.

3. Research Design

3.1 Data Source and Sample Selection

In this paper, we select the listed companies in Shanghai and Shenzhen A-shares from 2010-2021 as the primary sample, and screen the sample as follows: 1) exclude financial listed companies; 2) exclude companies that are ST, *ST, PT; 3) exclude samples with missing data; 4) exclude the extreme values of asset-liability ratio ($Lev \geq 100\%$) 5) exclude samples with missing research variables, and finally get 19,155 mixed observation samples of annual companies. The data used for the study in this paper were obtained from the CSMAR database. In addition, to reduce the effect of extreme values, this paper performs a tail reduction (Winsorize) of the upper and lower 1% quartiles of the continuous variables.

3.2 Variable Definition and Measurement

3.2.1 Explained Variable: Transparency of Accounting Information

Referring to the study by Yingli Li and Mengzhuo Tan [33], a composite index jointly constructed by earnings aggressiveness and earnings smoothing is used as a proxy variable for accounting information transparency. To measure the surplus aggressiveness of listed companies, this paper draws on Bhattacharya et al. (2003).

$$ACC_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STD_{i,t} - \Delta DEP_{i,t} + \Delta TP_{i,t} \quad (1)$$

$$EA_{i,t} = \frac{ACC_{i,t}}{A_{i,t-1}} \tag{2}$$

where i is the i th listed company, $ACC_{i,t}$ is the accrual in year t , $\Delta CA_{i,t}$ is the increase in current assets in year t , $\Delta CL_{i,t}$ is the increase in current liabilities in year t , $\Delta Cash_{i,t}$ is the increase in money capital in year t , $\Delta STD_{i,t}$ is the increase in long-term liabilities due within one year in year t , $\Delta DEP_{i,t}$ is the depreciation and amortization expense in year t , and $\Delta TP_{i,t}$ is the increase in income tax payable in year t , and $A_{i,t-1}$ is the total assets at the end of year $t-1$. Larger EA values indicate that the firm has a stronger incentive to be aggressive with its surplus and less transparent information. On the other hand, it is likewise measured by drawing on Bhattacharya et al. (2003).

$$ES_{i,t} = \frac{SD\left(\frac{CFO_{i,t-3}}{A_{i,t-4}}, \frac{CFO_{i,t-2}}{A_{i,t-3}}, \frac{CFO_{i,t-1}}{A_{i,t-2}}, \frac{CFO_{i,t}}{A_{i,t-1}}\right)}{SD\left(\frac{NI_{i,t-3}}{A_{i,t-4}}, \frac{NI_{i,t-2}}{A_{i,t-3}}, \frac{NI_{i,t-1}}{A_{i,t-2}}, \frac{NI_{i,t}}{A_{i,t-1}}\right)} \tag{3}$$

where $SD(\cdot)$ denotes the calculation of the standard deviation in parentheses, $CFP_{i,t-k} (k=0,1,2,3)$ is the cash flow from operating activities of company i in year $t-k$, and $NI_{i,t-k}$ is the net profit of company i in year $t-k$.

Although the two indicators, surplus aggressiveness (EA) and surplus smoothing (ES), can be used to judge accounting information transparency intuitively from a certain perspective, considering them together would be more comprehensive and integrated. Therefore, in this paper, EA and ES are assigned a weight of 50%, respectively, to calculate the total accounting information transparency ($Tran$) composite index, which is calculated as follows:

$$Tran_{i,t} = - \frac{EA + ES}{2} \tag{4}$$

where $Tran_{i,t}$ denotes the transparency of accounting information of the i -th listed company in year t . The higher the composite index, the higher the transparency of the company's accounting information.

3.2.2 Explanatory Variable: Degree of Digital Transformation

Existing studies mainly use three methods to measure the digital transformation of enterprises: (i) using dummy variables to measure the digital transformation of enterprises, i.e., taking 1 for the implementation of digital transformation in the current year and 0 otherwise [34]; (ii) measuring the digitalization of listed companies by calculating the proportion of the part of intangible assets related to digital transformation in the total intangible assets disclosed in the financial reports of listed companies to measure the level [35]; (iii) using text analysis to extract the frequency of words related to digital transformation from annual reports to measure the degree of digital transformation of enterprises [21, 36].

The use of dummy variables may not effectively capture the "intensity" of digital transformation of enterprises, which may lead to misestimation of the degree of digital transformation of a given enterprise and ignore the important nuances and complexities of the digital transformation process. The second method only focuses on the proportion of intangible assets of digital technology in the intangible assets of an enterprise, which does not reflect the depth and breadth of digital transformation. In the process of enterprise digital transformation, the application of digital technology involves not only intangible assets, but also the digital transformation of physical assets and human assets, etc., which also have an important impact on the enterprise digital transformation. With the wide application of text analysis technology, it is becoming more and more scientific and feasible to use text analysis to extract the frequency of keywords related to digital transformation from annual reports and to describe the digital transformation of enterprises. And the method allows a more comprehensive examination of corporate digital transformation, including the scope of digital technology application, digital transformation goals and plans, etc.

Table 1. The "ABCD technology" of digital transformation and the key words of technology integration application

Indicator classification	Indicator name
Artificial Intelligence Technology	Artificial intelligence, business intelligence, image understanding, investment decision aid system, intelligent data analysis, intelligent robotics, machine learning, deep learning, semantic search, biometrics, face recognition, voice recognition, identity verification, autonomous driving, natural language processing
Blockchain Technology	Digital currency, smart contracts, distributed computing, decentralization, bitcoin, federated chains, differential privacy technologies, consensus mechanisms
Cloud Computing Technology	In-memory computing, cloud computing, streaming computing, graph computing, Internet of Things, multi-party secure computing, brain-like computing, green computing, cognitive computing, converged architecture, billion concurrency, EB-class storage, information physical systems
Big Data Technology	Big data, data mining, text mining, data visualization, heterogeneous data, credit, augmented reality, mixed reality, virtual reality
Digital Technology Applications	Mobile Internet, industrial Internet, mobile Internet, Internet healthcare, e-commerce, mobile payment, third-party payment, NFC payment, B2B, B2C, C2B, C2C, O2O, Netlink, smart wear, smart agriculture, smart transportation, smart healthcare, smart customer service, smart home, smart investment, smart culture and tourism, smart environmental protection, smart grid, smart energy, smart marketing, digital marketing, unmanned retail, Internet finance, digital finance, Fintech, financial technology, quantitative finance, open banking

3.2.3 Control Variables

Referring to existing studies, this study was selected as a control variable. The definitions and measurements of all variables are shown in Table 2.

Table 2. Variable Definition

Variable type	Variable name	Symbol	Meaning
Explained variables	Accounting Information Transparency	<i>Tran</i>	The calculation is shown in equation (4)
Explanatory variables	Digital Transformation	<i>Dig</i>	The number of words involving digital transformation keywords in the annual report plus one takes the natural logarithm
Control variables	Enterprise Size	<i>Size</i>	Assets are logarithmic
	Gearing	<i>Lev</i>	Liabilities divided by assets
	Profitability	<i>Roa</i>	Net profit divided by assets
	Corporate Growth	<i>Growth</i>	Growth rate of revenue from main business
	Market Capitalization Book-to-Book Ratio	<i>Mtb</i>	Ratio of the company's total market capitalization to the company's net assets at the end of the period
	Board Size	<i>Board</i>	Natural logarithm of the number of directors
	Ratio of independent directors	<i>Idr</i>	Ratio of the number of independent directors to the number of board of directors
	Shareholding Ratio of the First Major Shareholder	<i>Top1</i>	Ratio of shares held by the first largest shareholder to the total shares of the company
	Audit opinion	<i>Opinion</i>	The audit opinion is standard audit opinion takes 1, otherwise it takes 0
	Whether Big Four audit	<i>Big4</i>	Dummy variable, take the value of 1 if the accounting firm is international Big Four, otherwise take the value of 0
	Operating cash flow	<i>Cash</i>	Ratio of operating cash flow to revenue from main business at the end of the year
	Shareholding of management	<i>Mgr</i>	Ratio of shares held by management to total shares of the company
	Double-hatting	<i>Dua</i>	Dummy variable that takes the value of 1 when the positions of chairman and general manager are held by one person, otherwise it takes the value of 0
	Internal control deficiencies	<i>Icd</i>	Dummy variable with a value of 1 if there is a deficiency in the company's internal control and 0 otherwise
	Nature of ownership	<i>Property</i>	Dummy variable, if the controlling shareholder is a state-owned unit or state-owned legal person, the value is 1, otherwise the value is 0
Year	<i>Year</i>	Fixed effects	
Industry	<i>Ind</i>	Fixed effects	

With this in mind, we take inspiration from the approach adopted by Fei Wu et al. [36], and use text analysis techniques to extract and calculate the frequency of keywords related to digital transformation from annual reports to describe the extent of digital transformation in enterprises. Specifically, this study extracts digital transformation-related keywords from the annual reports of listed companies by using the Python open-source "Jieba" word splitting function according to the digital transformation keyword lexicon constructed by Fei Wu et al. [36] The details are shown in Table 1.

Then, the word frequencies of these keywords are summed up. Based on this, the summed keyword frequency of digital transformation is added by 1 and taken as a logarithm as a proxy to portray the digital transformation of enterprises.

3.3 Econometric Regression Model

In order to test the previous hypothesis H_1 , the following econometric regression models were assumed in this study respectively, namely:

$$Tran_{i,t} = \alpha_0 + \alpha_1 Dig_{i,t} + \sum \alpha_k Con_{i,t} + \sum Year + \sum Ind + \delta_{i,t} \tag{5}$$

where $Con_{i,t}$ is the control variable; α_0 is the intercept term, α_1 is the regression coefficient, α_k is the regression coefficient of the control variable, and k is the control variable ordinal number; δ is the residual term. In order to remove confounding factors that do not vary over time as much as possible, both annual fixed effects and industry fixed effects are controlled for in the econometric regression model. According to the expectation of H_1 , α_1 should be significantly positive.

4. Analysis and Discussion of Empirical Results

4.1 Results of Descriptive Statistical Analysis

Table 3. Descriptive statistics results

Variable	N	Mean	Sd	Min	P50	Max
<i>Tran</i>	19,155	-2.123	5.414	-21.26	-0.859	22.88
<i>Dig</i>	18,938	1.169	1.316	0	0.693	4.836
<i>Div</i>	18,491	0.492	0.23	0.316	0.334	0.889
<i>Size</i>	17,959	22.49	1.332	19.75	22.34	26.28
<i>Lev</i>	17,959	49.64	19.68	4.397	50.19	89.79
<i>Roa</i>	17,959	0.94	1.728	-2.476	0.591	9.555
<i>Growth</i>	17,959	9.572	32.09	-72.74	8.086	98.64
<i>Mtb</i>	17,543	64.99	26.34	11.99	65	119
<i>Board</i>	17,958	2.233	0.241	1.609	2.197	2.89
<i>Idr</i>	17,958	37.6	6.372	25	36.36	58.33
<i>Top1</i>	17,958	34.77	15.08	9.31	32.52	74.98
<i>Opinion</i>	17,959	0.958	0.201	0	1	1
<i>Big4</i>	17,959	0.0713	0.257	0	0	1
<i>Cash</i>	17,944	1.087	0.486	0.305	1.027	3.769
<i>Mgr</i>	19,155	679.6	1,388	0	1.87	6,612
<i>Dua</i>	17,670	0.218	0.413	0	0	1
<i>Icd</i>	16,644	0.34	0.474	0	0	1

Table 3 reports the results of the descriptive statistics of the main variables. As can be seen from Table 3, the mean value of accounting information transparency is -2.123 and the standard deviation is 5.414, indicating that there is a large difference in the level of information transparency among the sample companies; the mean value of digital transformation water is 1.169 and the median is 0.693, indicating that the sample companies as a whole are exploring digital transformation; meanwhile its minimum value is 0 and The maximum value is 4.836, indicating that there is a large difference in the level of digital transformation among different companies; the mean value of the complexity of diversification is 0.492 and the median value is 0.334, indicating that the complexity of diversification

of the sample companies is not high. The distribution of the values of other control variables is basically consistent with the actual situation of listed companies, and no abnormalities are found.

4.2 Results of Multiple Regression Analysis

Table 4 gives the results of OLS multiple regression analysis of digital transformation level on accounting information transparency. model 1 is the base regression model with the introduction of control variables only, model 2 is the regression model of digital transformation level, and model 3 is the full regression model with the addition of all control variables on the basis of model 2.

Table 4. Results of OLS regression analysis

VARIABLES	Dependent variable: <i>Tran</i>		
	Models 1	Models 2	Models 3
<i>Dig</i>		0.126*** (2.916)	0.117*** (2.603)
<i>Size</i>	0.121 (1.597)		0.098 (1.269)
<i>Lev</i>	-0.024*** (-6.568)		-0.023*** (-6.502)
<i>Roa</i>	-0.026 (-0.894)		-0.022 (-0.764)
<i>Growth</i>	-0.004*** (-3.381)		-0.004*** (-3.567)
<i>Mtb</i>	-0.008*** (-2.694)		-0.007** (-2.405)
<i>Board</i>	0.016 (0.066)		0.021 (0.084)
<i>Idr</i>	-0.007 (-1.141)		-0.008 (-1.220)
<i>Top1</i>	-0.005 (-1.408)		-0.004 (-1.332)
<i>Opinion</i>	-1.362*** (-10.456)		-1.372*** (-10.466)
<i>Big4</i>	0.335 (1.521)		0.347 (1.572)
<i>Cash</i>	-0.181* (-1.666)		-0.196* (-1.808)
<i>Mgr</i>	0.000** (2.513)		0.000** (2.217)
<i>Dua</i>	-0.204 (-1.441)		-0.221 (-1.554)
<i>Icd</i>	0.119 (1.045)		0.128 (1.126)
Constant	-1.193 (-0.768)	-2.174*** (-24.585)	-0.834 (-0.530)
R-squared	0.074	0.052	0.075
IndFE	Yes	Yes	Yes
YearFE	Yes	Yes	Yes
N	14,805	16,617	14,805
Adj-R2	0.0712	0.0508	0.0718

Robust t-statistics in parentheses*** p<0.01, ** p<0.05, * p<0.1

As shown in Table 4, the regression coefficient of the level of digital transformation is significantly positive at the 1% level, which implies that the higher the level of digital transformation of a company, the higher its information transparency. h₁ is verified that digital transformation not only helps to improve the efficiency of a company's resource operations, but also enhances the level of visualization of business processes, thus monitoring the opportunistic behavior of management in real time. This monitoring capability can inhibit the company management's surplus management activities in terms of both motivation and ability, making the information more transparent.

4.3 Robustness Tests

4.3.1 Robustness Tests for Changing the Measurement of the Explanatory Variables

In this paper, the quality of information disclosure is assessed using the results of the Shenzhen Stock Exchange Disclosure Evaluation based on the study of Li Xiaohui and Yang Kun et al. [19]. The evaluation results are divided into four levels: excellent, good, qualified and unqualified. Companies with excellent evaluation results were assigned a value of 4, companies with good evaluation results were assigned a value of 3, companies with qualified evaluation results were assigned a value of 2, and companies that failed the evaluation were assigned a value of 1. The regression results are shown in model 4 in Table 5, and it can be seen from the table that the regression coefficient between digital transformation and accounting information transparency is significantly positive at the 10% level, and Table 5 shows that the conclusions of this paper are still reliable.

4.3.2 Robustness Tests for Explanatory Variables Lagged One Period

Digital transformation may have a time-lag effect on the transparency of corporate accounting information. In order to eliminate this effect, this paper regresses the indicators of enterprise digital transformation by 1 period for regression analysis. The regression results are shown in Model 5 in Table 5. The effect of digital transformation on corporate accounting information transparency is significantly positive at the 1% level, indicating that the effect of digital transformation on corporate accounting information transparency does not diminish with the extension of the time window, which further supports the conclusion of this paper.

4.3.3 Robustness Tests for Narrowing the Sample Intervals of Explanatory Variables

Table 5. Robustness test results

VARIABLES	Dependent variable: <i>Tran</i>		
	Models 4	Models 5	Models 6
<i>Dig</i>	0.013* (1.760)	0.363*** (3.891)	0.125*** (2.654)
<i>Top1</i>	0.003*** (4.723)	-0.004 (-1.444)	-0.004 (-1.139)
<i>Growth</i>	0.001*** (7.254)	-0.004*** (-3.096)	-0.003** (-2.519)
<i>Board</i>	0.053 (1.637)	0.087 (0.442)	0.038 (0.139)
<i>Idr</i>	0.001 (1.249)	-0.002 (-0.300)	-0.009 (-1.274)
<i>Dua</i>	-0.048** (-2.574)	-0.121 (-1.050)	-0.204 (-1.319)
<i>Icd</i>	-0.110*** (-6.060)	0.061 (0.676)	0.165 (1.273)
<i>Big4</i>	0.158*** (3.902)	0.111 (0.677)	0.351 (1.366)
<i>Opinion</i>	0.959*** (23.437)	-1.078*** (-6.924)	-1.420*** (-10.652)
<i>Cash</i>	-0.010 (-0.728)	-0.231** (-2.076)	-0.194 (-1.583)
<i>Mgr</i>	0.000 (1.177)	0.000** (2.461)	0.000** (2.156)
<i>Roa</i>	0.039*** (6.301)	-0.018 (-0.643)	-0.032 (-0.822)
<i>Mtb</i>	-0.003*** (-5.587)	-0.005*** (-2.116)	-0.007** (-1.982)
<i>Size</i>	0.174*** (16.036)	0.115** (2.130)	0.064 (0.733)
<i>Lev</i>	-0.006*** (-10.856)	-0.015*** (-4.354)	-0.023*** (-5.823)
Constant	-1.659*** (-7.349)	-1.517 (-1.261)	-0.177 (-0.098)
Observations	10,803	11,240	12,259
R-squared	0.255	0.262	0.075
IndFE	Yes	Yes	Yes
YearFE	Yes	Yes	Yes
N	10803	11240	12259
Adj-R2	0.252	0.260	0.0722

In 2013, the State Council issued the "Guidance of the State Council on Promoting the Orderly and Healthy Development of the Internet of Things", which for the first time proposed to promote the synergistic development of Internet of Things applications, technologies, industries and standards, and accelerate the development and industrialization of key technologies. Since then, the government has introduced various policies to support the development and application of Internet, big data, cloud computing and artificial intelligence. Entity enterprises have also accelerated the integration with new technologies such as the Internet, big data, cloud computing and artificial intelligence to promote digital transformation of enterprises [38]. Therefore, this paper shortens the time period of the digital transformation sample to 2013 to 2021 to re-examine the impact of digital transformation on the transparency of accounting information. The regression results are shown in Model 6 of Table 5, and it can be seen that the effect of digital transformation on corporate accounting information transparency is significantly positive at the 1% level, indicating that digital transformation can indeed improve corporate accounting information transparency. Therefore, the findings of this paper remain valid.

5. Further Analysis

5.1 Moderating Effect of the Degree of Diversification

The principal-agent theory states that under the diversification model, companies face problems such as high internal coordination costs and reduced resource operation performance [39], which increases the degree of information asymmetry between company management and external investors and leads to higher external monitoring costs. It may also induce problems such as adverse selection and moral hazard, which reduce the efficiency of the company's overall resource operations [40]. In diversified firms with high information asymmetry, management tends to use surplus management as a manipulative tool more often to achieve private gains [41]. Managers may engage in surplus management by concealing information and reducing the quality of disclosure in order to maintain their positions and compensation in order to reduce the likelihood that the market and regulators will identify their surplus management [42].

In contrast, digital transformation achieves interdepartmental synergy through cross-border entry of horizontal business and integration of vertical business to form an efficient networked organizational structure [31], which stimulates creativity and innovation and provides impetus for the organization to create more value [25]. This weakens management discretion over operational activities, which is particularly beneficial for traditionally diversified companies [21]. In addition, building a cloud collaboration platform and a financial sharing center with the help of digital technology can improve the transparency of accounting information in diversified operating companies [30] and further restrain management's self-interest manipulation.

This study argues that digital transformation can reduce the extent of management's self-interest manipulation in diversified operating companies, thus enhancing the transparency of accounting information. The complexity of diversified operations studied in this paper is measured by the difference between 1 and the diversified Herfindahl index, drawing on Yongtao Cang et al. [39]. The complexity of a firm's diversification in years is calculated as:

$$Div_{i,t} = 1 - Hfd_{i,t} = 1 - \sum \left(\frac{Ini_{i,j,t}}{Toi_{i,t}} \right)^2 \quad (6)$$

where j is the industry, Hfd is the Herfindahl index of diversification, $Ini_{i,j,t}$ is the operating revenue of company i in industry j in year t , and $Toi_{i,t}$ is the sum of operating revenue of company i in all industries in year t . The higher value of Div indicates the higher complexity of diversification.

In order to test the moderating effect of the complexity of diversification, this study adds the interaction term of digital transformation and complexity of diversification to equation (7), and according to the expectation, β_3 should be significantly positive.

$$Tran_{i,t} = \beta_0 + \beta_1 Dig_{i,t} + \beta_2 Div_{i,t} + \beta_3 Dig_{i,t} * Div_{i,t} + \sum \beta_k Con_{i,t} + \sum Year + \sum Ind + \psi_{i,t} \quad (7)$$

Table 6. Results of the moderating effect of diversification

VARIABLES	Dependent variable: <i>Tran</i>	
	Models 7	
<i>Dig</i>	-0.127	(-1.489)
<i>Div</i>	1.393	(0.382)
<i>Dig*Div</i>	0.493**	(2.344)
Observations	14,280	
R-squared	0.071	
Control	Yes	
IndFE	Yes	
YearFE	Yes	
N	14280	
Adj-R2	0.0681	

Table 6 gives the regression results to test the moderating effect of the complexity of diversified operations. In model 7, the regression coefficient of the interaction term between the complexity of diversified operations and the level of digital transformation is significantly positive at the 5% level, implying that the higher the complexity of the company's diversified operations, the more significant the effect of the level of digital transformation on the optimization of the visibility of the company's business processes and the monitoring of organizational departments, making the company's information more transparent.

5.2 Test for Heterogeneity of Business Attributes

Both the level of transparency of corporate accounting information and the degree of digital transformation are often related to corporate attributes in a way that cannot be ignored. However, the aforementioned universal studies do not take into account the structural differences of enterprises, which weakens the reliability of the findings and policy recommendations.

Table 7. Heterogeneity test based on firm attributes

VARIABLES	Dependent variable: <i>Tran</i>	
	Models 8 (State Enterprise)	Models 9 (Non-State Enterprise)
<i>Dig</i>	0.072 (0.874)	0.130** (2.481)
Constant	-2.810 (-1.205)	0.710 (0.336)
Observations	7,191	
R-squared	0.111	
Control	Yes	
IndFE	Yes	
YearFE	Yes	
N	7191	
Adj-R2	0.106	

The impact of digital transformation on the transparency of accounting information cannot be effectively captured without considering the differences between state-owned and non-state-owned enterprises. Therefore, this paper aims to embed enterprise attributes in the "digital transformation-transparency of accounting information" paradigm and conduct heterogeneity tests to better understand the heterogeneous effect of digital transformation on the transparency of accounting information.

Table 7 examines the heterogeneity of "digital transformation-transparency of accounting information" based on the perspective of enterprise attributes, and finds that in model 8, digital transformation of non-state enterprises significantly enhances the transparency of accounting information, and conversely, in model 9, digital transformation of state-owned enterprises does not significantly affect the transparency of accounting information. On the contrary, in Model 9, the digital transformation of state-owned enterprises does not have a significant impact on the transparency of accounting information.

State-owned enterprises (SOEs) are subject to government control and regulation, which aims to ensure they serve national strategies, important industries, and provide essential public services. However, this regulation can limit their digital transformation. Government policies may restrict SOEs' choices in technology, talent, and resources, hindering innovation and agility. Additionally, the bureaucratic structure and slow decision-making of SOEs make it challenging to adapt to market changes. Their limited knowledge and conservative mindset in digital domains further impede transformation. Moreover, SOEs prioritize stability over risk-taking, making them hesitant to invest in new technologies or business models. Conversely, non-SOEs enjoy more autonomy and flexibility in digital transformation, enabling them to leverage digital technologies to improve operations and financial management. It enhances data standardization, transparency, and automation, bolstering accuracy, reliability, and timeliness of accounting information. Digitalization empowers non-SOEs with better tracking, risk management, reduced errors/fraud, improved information disclosure, and increased stakeholder trust. Furthermore, non-SOEs' innovation and competitiveness benefit from digital transformation by enhancing efficiency, adaptability, and market responsiveness. Lastly, improving accounting information transparency can help address financing constraints faced by non-SOEs. Thus, digital transformation has a significant impact on the transparency of non-SOEs' accounting information.

5.3 Economic Consequences of Digital Transformation for Corporate Information Transparency

Table 8. Economic consequences test results

VARIABLES	Intermediate variables: <i>Tran</i>	
	Financing Constraints	Corporate Growth
	Models 10	Models 11
<i>Dig</i>	0.051*** (2.762)	0.051*** (2.762)
<i>Tran</i>	0.007** (2.563)	0.007** (2.563)
Constant	8.844*** (9.946)	8.844*** (9.946)
Observations	14,805	14,805
R-squared	0.354	0.354
Control	Yes	Control
IndFE	Yes	Yes
YearFE	Yes	Yes
N	14805	14805
Adj-R2	0.352	0.352

Whether increased transparency in accounting information helps reduce the financing constraints of firms and enables good growth, this study further examines the effect of accounting information

transparency on the financing constraints and growth of firms. This study uses the FC model and Tobin's Q to measure the financing constraints and growth of firms, respectively.

The correlation regression analysis is conducted and the regression results are shown in Table 8. As shown in Table 4, in Model 3, the regression coefficient between accounting information transparency and digital transformation are significantly positive at the 1% level, implying that digital transformation significantly enhances the transparency of accounting information of the company. Meanwhile, in Model 10, the regression coefficient between accounting information transparency and financing constraints is significantly negative at the 5% level, indicating that the increase in accounting information transparency of firms inhibits the financing constraints faced by firms. Furthermore, in Model 11, the regression coefficient between accounting information transparency and growth is significantly positive at the 1% level, suggesting that the increase in accounting information transparency of the firm promotes the firm's growth.

6. Summary

The rapid growth of the digital economy has significantly impacted national economies, prompting a focus on the underlying processes. This paper investigates the relationship between digital transformation and accounting information transparency in Chinese A-share listed companies from 2010 to 2021. The study finds that a higher level of digital transformation leads to increased transparency of corporate accounting information. The degree of digital economy also positively influences accounting information transparency. The relationship is more significant for companies with complex and diversified businesses, with non-state enterprises benefiting more from digital transformation. Improved transparency has positive economic consequences, including reduced financing constraints and better growth prospects in the capital market. These findings have policy implications, highlighting the role of digital transformation in enhancing market transparency, internal control, and regulation. Governments can support digital transformation to protect the rights of consumers and investors. Diversification in the digital era blurs industry boundaries, but digital technology can help reduce agency problems and enhance accounting information transparency. State-owned enterprises face limitations in their digital transformation due to government policies, conservative strategies, and governance. To leverage digital technologies effectively, state-owned enterprises must prioritize innovation and adaptability. Transparent accounting information increases investor trust, facilitates financing, and supports better decision-making and operational efficiency. However, the study acknowledges the need to expand the measurement of digital transformation beyond keyword-based text mining and explore the underlying mechanisms in future research.

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