

Research on the Impact of Digital Development on the Quality of Internal Control in Enterprises

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Abstract

In order to adapt to the current trend of digital economy development and explore ways to improve the effectiveness of internal control quality, this study investigates the impact of digital development on internal control quality. Taking A-share listed companies in Shanghai and Shenzhen from 2012 to 2021 as the research object, this study found through empirical analysis that digital development can improve the quality of internal control of enterprises, and this conclusion still holds true after a series of robustness tests. Furthermore, from the perspective of enterprise characteristics, further research has found that in larger and capital intensive enterprises, the impact of digital development on internal control quality is more significant. The above conclusions have certain reference value for scientifically promoting the digital transformation and development of China's physical industries and effectively promoting the improvement of internal control levels in enterprises.

Keywords

Digitalization; Internal Control Quality; Internal Control Elements.

1. Introduction

With the development of information technology, digitization has had a significant impact on internal control in enterprises. Digitization enables enterprises to collect, store, and analyze data more effectively, enhance regulatory and auditing capabilities, and reduce human errors and fraud. Enterprises need to re-examine their internal control framework, adapt to the digital environment, and effectively manage information technology related risks. Digital transformation has changed the business model and management philosophy of enterprises, and there is an urgent need to enhance competitiveness through digitization. The combination of digital technology and internal control has brought new efficiency models and convenient paths to improve the quality of internal control, which is an important issue that enterprises urgently need to explore.

Studying the relationship between digitalization and internal control quality in enterprises is of great significance for theoretical construction, practical guidance, and interdisciplinary integration. This article conducts empirical research to analyze the data of A-share listed companies in Shanghai and Shenzhen from 2012 to 2021, and explores the impact of digital transformation on the quality of internal control of enterprises. The research has verified the positive impact of digitization on internal control and enriched management theory. At the same time, it supports the national policy of developing the digital economy and provides a theoretical basis for the digital transformation of enterprises. In addition, this study has promoted the understanding of the relationship between internal control and digital technology, facilitated the comprehensive development of related disciplines, and provided guidance for optimizing internal control in enterprises.

2. Literature References

2.1. Economic Research on Digital Development

The rapid development of the digital economy has attracted widespread attention from the academic community, and numerous empirical research results continue to emerge. Gartner, a consulting firm, was the first to propose the concept of "digitalization" as a future development trend. Since the initial development of digital technology in 1995, enterprises have begun to use digital technology in production and operation, and the academic community has also begun to explore digitization.

At the macro level, Huang Qunhui et al. analyzed the application of digital technology in the production and sales processes of enterprises through empirical calculations, and believed that digital development has improved the overall effectiveness of enterprises[1]. Ding Zhifan proposed that the digital economy can promote high-quality development by enriching the sources of factors and improving allocation efficiency[2]. Bai Yongxiu and Song Liting analyze the impact of digitization on production, distribution, exchange, and consumption from the perspective of Marxist political economy[3].

At the micro level, He Wenbin's research found that digital investment promotes the high-end transformation of the manufacturing industry[4]. Zhao Chenyu et al. empirically studied the relationship between digital transformation and total factor productivity of enterprises, and found that the two promote each other[5]. Liu Shuchun et al. explored the mechanism of improving the efficiency of digital management in enterprises through survey data, and analyzed the impact of digital management investment on enterprise efficiency[6]. Overall, existing literature directly or indirectly demonstrates the role and impact of digitization on the economy of enterprises.

2.2. Factors Influencing the Quality of Internal Control in Enterprises

The quality of internal control is crucial for the stable development of enterprises, reflecting the effectiveness of the internal control system. The academic community explores the influencing factors from both internal and external perspectives of enterprises. Internal factors include financial condition, size, audit committee characteristics, equity structure, and internal control environment. Xiang Rui found that the education level, salary, reputation, and localization of audit committees have a positive impact on the internal control quality of listed companies[7]. Ma Ying confirmed that companies with a larger number of major shareholders have more effective internal controls[8]. Digital enterprises can improve the utilization of funds and optimize the internal control environment. Ni Kejin and Liu Xiuyan pointed out that digitization can improve the efficiency of risk assessment and achieve risk warning[9].

External environmental factors include media attention, government audits, and differences in corporate culture. Xu Yu and Chen Zeyi believe that media attention can improve the effectiveness of internal controls[10]. Chu Jian and Fang Junxiong found that government audits can improve internal control deficiencies in enterprises[11], while Zhang Zenglian believes that government audits are not beneficial for the internal control of listed companies controlled by central enterprises[12]. These studies provide multidimensional insights into the influencing factors of internal control quality[13].

2.3. Digital Development and Internal Control

Internal control is the core of enterprise management, ensuring the safe and efficient operation of business, enhancing competitiveness and sustainable development capabilities. The digital development has a profound impact on internal control, mainly reflected in five aspects:

1) Internal control environment: The digital economy drives the transformation of corporate strategy, affecting organizational structure, human resources policies, and corporate culture.

2) Risk assessment: Digitization enables enterprises to more accurately and timely identify business risks, achieve risk management from passive to active, and enhance preventive and warning functions.

3) Control activities: digital technologies such as cloud computing and mobile Internet liberate the time and space constraints of control activities to achieve intelligence and improve timeliness and flexibility.

4) Information and Communication: Digitization improves data utilization and management efficiency, strengthens internal communication, and enhances the quality of internal control.

5) Internal supervision: Digital technology enriches the methods and content of supervision, increases supervision channels, strengthens supervision mechanisms, and improves the quality of internal control.

In summary, digitalization has a positive impact on all five elements of internal control and is a key factor in improving the quality of internal control in enterprises.

3. Theoretical Analysis and Research Hypotheses

3.1. Theoretical Analysis

The resource-based theory was proposed by Penrose, emphasizing that enterprises need to possess unique resources to win in market competition. Wempe B C emphasizes that resource input is the foundation of enterprise growth, and Barney points out that valuable and irreplaceable resources can enhance enterprise capabilities and promote growth. The digital economy integrates data through digital technology, improves enterprise production capacity and efficiency, and lays the foundation for the future of enterprises.

The theory of internal control involves organizational policies, procedures, and mechanisms to ensure the effectiveness, efficiency, and compliance of business operations and reduce risks. In the process of digitization, enterprises face data security challenges and need to strengthen internal controls to protect data security and privacy. The Basic Norms for Enterprise Internal Control issued by the Chinese Ministry of Finance stipulate the five elements of internal control. Scholars often use the internal control index method to study, and the index is sourced from the DiBo database.

The theory of information asymmetry was proposed by Stiglitz, which points out that differences in information mastery in a market economy lead to uneven resource allocation. The implementation of digitalization in enterprises can reduce information asymmetry and increase market expectations. The Chinese government supports the digital development of enterprises, which is a measure to respond to policies and adapt to digital trends.

3.2. Hypothesis Research

This article proposes the hypothesis that:

- (1) Implementing digitalization in enterprises will enhance the quality of internal control.
- (2) The higher the degree of digitalization of an enterprise, the higher the quality of its internal control.

4. Model Construction

This article selects A-share and SME board listed companies in Shanghai and Shenzhen from 2012 to 2021 as samples. 2012 is regarded as the year of big data, with a significant increase in data volume and significant impact on enterprises. To ensure the robustness of the study, ST/PT companies, financial enterprises, companies with abnormal financial data due to insolvency or negative income (excluding data with ROE less than 10% or greater than 33%), and companies with missing data were excluded. Financial and governance data are sourced

from Guotai An CSMAR database, while internal control indices are sourced from Shenzhen Dibo database. Use Stata16 software to process data and perform 1% Winsor truncation on insignificant variables.

This article uses the "Internal Control Index" from the Shenzhen DIB database to measure the quality of internal control in enterprises. The index is divided by 100 and expressed as IC. The larger the value, the higher the quality of internal control. The explanatory variable is based on the frequency statistics of the vocabulary related to "enterprise digital transformation" in the annual report, including the application frequency of technologies such as artificial intelligence and cloud computing. Control variables include asset liability ratio (Lev), company size (Size), and accounting performance (Roe). Lev measures financial risk, Size reflects the impact of enterprise size on internal control, and Roe measures enterprise performance through return on equity, which affects internal control investment and effectiveness. These variables help control for the impact of other factors on the quality of internal control.

This article constructs the following empirical model:

$$IC = \alpha_0 + \alpha_1 Digital + \sum \alpha_j Control + \varepsilon \quad (1)$$

Among them, the dependent variable is the internal control quality IC of the enterprise, and the explanatory variable is the digital value of the enterprise. Drawing on the research of Cao Yue and Zhang Yongkun, this article controls for variables such as company size and asset liability ratio Lev.

5. Empirical Result Analysis

5.1. Descriptive Statistics

Table 1 shows the descriptive statistical results of the main variables. The average internal control quality (IC) of enterprises is 6.718, with a minimum value of 0 and a maximum value of 9.856, indicating significant differences in the level of internal control quality among listed companies in China. The average digital degree of enterprises is 11.607, with a standard deviation of 28.211, a minimum value of 0, and a maximum value of 518, indicating significant differences in the progress of digital transformation among different enterprises, with most enterprises progressing slowly. The company size is measured by the natural logarithm of total assets, with a mean of 22.521 and a standard deviation of 1.389, indicating significant differences in sample company size. The average asset liability ratio (Lev) is 0.417, with a maximum value of 0.987 and a minimum value of 0.02, reflecting severe financing constraints for some enterprises. The average accounting performance (Roe) is 0.151, which means the average return on equity is 15.1%. The maximum value is 0.305, the minimum value is 0.101, and the standard deviation is 0.046, indicating a significant gap in the profitability of listed companies.

Table 1. Descriptive statistical results

Variable name	sample size	mean	Standard deviation	minimum	maximum
IC	7917	6.718	1.237	0	9.856
Digital	7917	11.607	28.211	0	518
ROE	7917	0.151	0.046	0.101	0.305
SIZE	7917	22.521	1.389	15.729	28.502
LEV	7917	0.417	0.199	0.02	0.987

5.2. Correlation Statistics

This article found through correlation analysis that the quality of internal control (IC) in enterprises is positively correlated with the level of digitalization (Digital), and at a significance level of 1%, it supports the hypothesis that digital level can improve the quality of internal control. At the same time, IC is positively correlated with enterprise size and accounting performance, both at the 1% level, indicating a positive correlation between internal control quality and these factors. On the contrary, IC is negatively correlated with the asset liability ratio (Lev), which is also significant at the 1% level, indicating that the quality of internal control decreases with an increase in the Lev.

Table 2. Correlation coefficient table

	(1)IC	(2) Digital	(3)SIZE	(4)LEV	(5)ROE
(1)IC	1.000				
(2)Digital	0.034	1.000			
(3)SIZE	0.240	0.007	1.000		
(4)LEV	-0.035	-0.020	0.492	1.000	
(5)ROE	0.028	-0.007	0.091	0.067	1.000

5.3. VIF Inspection

VIF (Variance Inflation Factor) is a measure of multicollinearity, with a VIF value exceeding 10 indicating severe multicollinearity. Using Stata software to analyze the data, it was found that the VIF values of all explanatory variables were far below 10. The VIF values of enterprise size (Size) and asset liability ratio (Lev) were 1.34, and the VIF value of accounting performance (Roe) was 1.01, both close to 1. This indicates that the multicollinearity problem between these variables is mild, and their explanations for the dependent variable are independent.

Table 3. VIF test results

Variable	VIF	1/VIF
Digital	0.034	1.000
SIZE	0.240	0.007
LEV	-0.035	-0.020
ROE	0.028	-0.007
Mean VIF	1.88	

5.4. Regression Result Analysis

The article examines the effect of corporate digitalization on internal control quality. Table 4's columns (1) and (2) present fixed effects regressions, with and without control variables and fixed enterprises, for years and industries. Column (1) reveals a digitalization coefficient of 0.001, significantly positive at the 1% level, indicating that digitalization enhances internal control quality, thus supporting the initial hypothesis.

Table 4. regression results

	(1)	(2)
variable	IC	IC
Digital	0.001***	0.001***
	(4.22)	(3.04)
SIZE	0.301***	
	(19.46)	
LEV	-1.259***	
	(-10.99)	
ROE	0.296	
	(0.83)	
Constant	0.407	6.700***
	(1.32)	(445.87)
Observations	7,917	7,917
R-squared	0.089	0.001
F test	0	0.00239
r2_a	0.0889	0.00104
F	112.8	9.228

Robust t-statistics in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

5.5. Robustness Test

Table 5. Robustness test

	(1)	(2)	(3)	(4)
variable	IC	IC	IC	IC
Digital	0.001***	0.001***		
	(2.99)	(2.58)		
L2.Digital				0.001***
				(27.46)
LEV	-0.230***	-1.259***	0.302***	0.303***
	(-3.28)	(-16.38)	(27.47)	(27.46)
SIZE		0.301***	0.292	0.281
		(27.35)	(1.00)	(0.96)
ROE	0.836***	0.296	-1.259***	-1.260***
	(2.74)	(1.01)	(-16.38)	(-16.40)
Constant	6.670***	0.407*	0.369	0.365
	(120.85)	(1.73)	(1.57)	(1.55)
Observations	7,917	7,917	7,916	7,915
R-squared	0.003	0.089	0.090	0.089
F test	8.10e-06	0	0	0
r2_a	0.00294	0.0889	0.0895	0.0890
F	8.793	194.2	195.5	194.2

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

After adding sensitivity testing, Table 5 shows that after controlling the size of the enterprise, there is a positive correlation between digitalization and internal control quality, with a coefficient of 0.001, which is significant at the 0.1% level, supporting the conclusion that digitalization improves internal control quality. The results are shown in Tables 5 (1) and (2).

At the same time, in order to alleviate endogeneity issues, this article conducts regression analysis on the implementation of enterprise digitization one and two periods in advance. The results showed that the digitization coefficients were 0.002 and 0.001, respectively, which were significantly positively correlated at the 0.1% level, supporting the hypothesis. The results are shown in Tables 5 (3) and (4).

6. Research Conclusion and Implications

6.1. Conclusion

The digital transformation of enterprises is an inevitable trend, which has a significant impact on improving the quality of internal control. This article finds through empirical analysis that digital transformation can enhance the effectiveness of internal control, improve the quality of internal control by optimizing the internal control environment, activities, and supervision system, and this conclusion still holds true after robustness testing.

6.2. Enlightenment

Enterprises should actively adapt to digital trends, seize transformation opportunities, deepen digital business, and deeply integrate it with business operations and organizational management to improve the effectiveness of internal controls. Enterprises should introduce talents, increase research and development investment, and elevate digital construction to a strategic level according to their own digital needs, in order to promote enterprise transformation, reduce management inconsistency, improve efficiency, and achieve the integration of digitalization and enterprise development. These conclusions have guiding significance for both corporate practice and national policy-making.

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