Digital Transformation and Its Financial Performance Implications: A Study of Impact Mechanisms

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Abstract. Under the wave of digital technology, many enterprises rely on core digital technologies such as big data and artificial intelligence to innovate and promote digital transformation, in order to achieve long-term financial performance improvement. However, in the stage of transformation and introduction, enterprises generally face capital investment pressure and organizational restructuring difficulties, resulting in short-term financial performance damage. This study conducts empirical analysis based on data from Chinese A-share listed companies from 2018 to 2023, verifying the objective existence of the phenomenon of short-term financial performance decline after implementing digital transformation measures. Furthermore, the study focuses on the key regulatory factor of property rights and deeply analyzes its impact mechanism on the relationship between digital transformation and financial performance of enterprises. Based on this, strategic recommendations with situational adaptability are proposed to address the different property rights characteristics of state-owned and non-state-owned enterprises, in order to help both types of enterprises improve their digital adaptation efficiency and achieve sustainable development.

Keywords: Digital transformation, financial performance, property rights nature.

1. Introduction

The increasing ubiquity of advanced digital tools, specifically AI, cloud-based computing infrastructures, and big-data analytic systems, has driven widespread organizational adoption of digital transformation practices. Digital transformation not only improves operational efficiency but also serves as a critical pathway to cultivate new momentum for development [1]. Digital transformation can bring product, market, technology and other innovations, and promote the transformation of business model and organizational structure [2]. However, digital transformation implementation faces persistent challenges and uncertainties in the results, and many enterprises fail to achieve the expected results. Although digital transformation is widely recognized for its potential long-term value creation, the critical tension between substantial initial digital transformation costs and uncertain short-term financial returns represents a key research gap. Determining whether early-stage investments can translate into measurable financial performance improvements remains a pressing academic and practical question.

Current scholarly literature includes studies examining the link between digital transformation and financial performance. Li et al. compared the financial performance indicators before and after the digital transformation of enterprises with the specific implementation path of "informationize digitize intelligence" three stages, and found that the digital transformation significantly improved the financial performance of enterprises [3]. By building a "financing production" decision-making model, Wang et al. revealed that digital transformation can enhance the ability of enterprises to cope with market fluctuations, and then significantly improve the financial performance of enterprises [4]. While the literature contains numerous longitudinal studies analyzing digital transformation's long-term (10+year) financial outcomes, few investigations focus on its immediate performance consequences.

Focusing on the immediate fiscal consequences often overlooked in prior research, this paper systematically analyzes the short-term performance dip during digital transformation, proposing alternative evaluation paradigms. By investigating the mediating channels through which digital transformation influences short-term financial performance, this research advances the literature

conceptually and empirically. The existing literature discusses the relationship between the two with less moderating effect. This paper innovatively integrates digital transformation, property right nature and financial performance into a unified analysis framework. Crucially, this research probes the moderating influence of property rights in the relationship linking digital transformation to financial performance. This yields new insights into the interplay among these variables, enriching the body of knowledge on digital transformation's success. By demonstrating how property rights structure mediates the short-term decline, this study will enable organizations to develop ownership-specific transformation strategies, optimize the input cost of digital transformation, formulate more reasonable and effective coping strategies, and reduce financial risks.

Grounded in existing research, this work establishes that the adoption of digital transformation is associated with a marked decline in short-term financial performance and elucidates the heterogeneity of this effect concerning property rights. Utilizing 2018–2023 data from China's A-share listed companies, this study empirically validates the short-term decline of digital transformation on corporate financial performance.

2. Theoretical Analysis and Research Hypothesis

2.1. Section Headings Digital Transformation and Financial Performance

The resource-based view suggests that significant investments in technology and funds are imperative during the initial digital transformation implementation, potentially affecting firms' financial risk and performance [5]. Firms undergoing digital transformation require continuous technology and talent investment to strengthen their digital capabilities. This reallocation of resources could not only restrain short-term financial performance but also hamper productivity due to resource misalignment [6]. Organizational change theory suggests that digital transformation may lack internal recognition by the organization's internal management and grass-roots employees, so the implementation process of digital transformation may be hindered, which will reduce the benefits brought by digital capabilities [7]. Therefore, digital transformation will bring high investment and organizational adjustment costs in the short term, leading to a decline in financial performance. To sum up, this paper proposes the following hypotheses:

H1: Digital transformation has a statistically significant adverse effect on near-term corporate financial performance.

2.2. Digital Transformation Property Rights Nature and Financial Performance

Many scholars in the academic community incorporate the property rights structure into the analytical framework. Chen et al. posited that property rights structure materially influences corporate ESG performance, with state-owned enterprises demonstrating systemic superiority over Non-State-Owned Enterprises (non-SOEs) in aggregate assessments [8]. Fu examined how ownership structure moderates the executive compensation-firm performance nexus, concluding that state-owned enterprises exhibit stronger pay-for-performance sensitivity than non-SOEs [9]. Enterprises with different property rights have different strategies for digital transformation. Driven by hard budget constraints and market pressure, non-SOEs adopt more aggressive digital transformation strategies, resulting in a sharp increase in short-term costs. The state-owned enterprises can mitigate short-term impacts via incremental transformation by virtue of government support and resource advantages. To sum up, this paper proposes the following hypotheses:

H2: Non-SOEs experience significantly more pronounced short-term financial deterioration from digital transformation than their state-owned enterprises.

3. Sample Selection and Research Design

3.1. Sample Selection and Data Sources

The primary sample consists of A-share listed companies on the Shanghai and Shenzhen Stock Exchanges (2018-2023), subjected to progressive filtering based on these criteria: (1) Removal of Special Treatment (ST) and ST entities; (2) Omission of financial institutions per the China Securities Regulatory Commission (CSRC) 2012 industry classification; (3) Exclusion of firms with critical variable data deficiencies. After winsorizing all continuous variables at the 1st and 99th percentiles, the final sample comprises 17,743 observations. The data are from China Stock Market & Accounting Research Database (CSMAR) database.

3.2. Variable Definition

Table 1. Variable Definition and Measurement

Variable category	Variable	Variable code	Measurement
Explained variable	Financial Performance	ROE	ROE=Net profit/Shareholders' equity
Explanatory variable	Digital transformation	Dig	CSMAR database Enterprise digital transformation index
Moderator variable	Property Rights Nature	SOE	1 if state-owned; 0 otherwise
Control variable	Enterprise size	Size	Ln(Total assets)
	Leverage ratio	Lev	Total liabilities/total assets
	Intangible asset ratio	Int	Net intangible assets/total assets
	Fixed asset ratio	Cap	Net fixed assets/total assets
	Growth	Growth	Growth rate of operating revenue
	Year	Year	Dummy variable, controlling annual effect
	Industry	Ind	Dummy variable, control industry effect

3.2.1 Explained variable

The explained variable of this paper is financial performance. This paper uses Return On Equity (ROE) to measure financial performance, as shown in Table 1. ROE is the core indicator of DuPont analysis, which is the most comprehensive and directly corresponds to the goal of maximizing shareholder value, and is in line with the shareholder value orientation of digital transformation.

3.2.2 Explanatory variable

The explanatory variable of this paper is digital transformation (Dig). Referring to the relevant research on the measurement of enterprise digital transformation proposed by Mao et al., this paper comprehensively considers the "information disclosure method" and "input-output method" in the measurement of digital transformation, and selects the enterprise digital transformation index in China Stock Market & Accounting Research Database (CSMAR) database as the core explanatory variable [10].

3.2.3 Moderator variable

The moderator variable of this paper is the property right (SOE), which is 1 for state-owned enterprises and 0 for non-SOEs. Using an interaction term, this study examines whether ownership structure moderates the digital transformation-financial performance relationship.

3.2.4 Control variable

Drawing on established literature, this study incorporates firm size (Size), leverage ratio (Lev), intangible asset intensity (Int), fixed asset intensity (Cap), growth potential (Growth), year fixed effects (Year), and industry fixed effects (Ind) as control variables, accounting for multidimensional factors influencing financial performance.

3.3. Empirical Econometric Model

Building on prior analytical results, this study specifies the total effect regression model for digital transformation's impact on financial performance as follows:

$$ROE_{i,t} = \beta_0 + \beta_1 Dig_{i,t} + \sum \beta_2 Controls_{i,t} + \sum Year + \sum Ind + \varepsilon_{i,t} \quad (1)$$

Where: Controls: Vector of control variables
i: Enterprise index
t: Year index
β_0: Constant term
β: Coefficients of corresponding variables
ε: Stochastic error term

Building on the preceding analytical foundation, this study formalizes the moderating effect model, testing how property rights regulates the digital transformation-financial performance linkage:

$$\begin{aligned} ROE_{i,t} &= \gamma_0 + \gamma_1 Dig_{i,t} + \gamma_2 SOE_{i,t} + \gamma_3 Dig_{i,t} \cdot SOE_{i,t} + \\ &\sum \gamma_4 Controls_{i,t} + \sum Year + \sum Ind + \delta_{i,t} \end{aligned} \quad (2)$$

Where:
$Dig_{i,t} \cdot SOE_{i,t}$: Adjustment interaction term
γ_0: Constant term
γ: Coefficients of corresponding variables
δ: Stochastic error term

This paper conducts a grouping regression test on enterprises with different property rights, and deeply discusses the heterogeneity of property rights. The model is established as follows:

$$ROE_{i,t} = \beta_0^{(s)} + \beta_1^{(s)} Dig_{i,t} + \sum \beta_2^{(s)} Controls_{i,t} + \sum Year^{(s)} + \sum Ind^{(s)} + \varepsilon_{i,t}^{(s)} \quad (3)$$

4. Empirical Results and Hypothesis Testing

4.1. Descriptive Statistics

Table 2. Descriptive Statistics

Variable name	Number of samples	Mean	Standard Deviation	Minimum	Maximum
ROE	17,743	0.062	0.132	-0.626	0.403
Dig	17,743	37.818	10.289	23.579	66.048
SOE	17,743	0.290	0.454	0.000	1.000
Size	17,743	22.146	1.272	18.287	28.615
Lev	17,743	0.370	0.199	0.028	0.866
Int	17,743	0.031	0.038	0.000	0.248
Cap	17,743	0.146	0.137	0.000	0.610
Growth	17,743	0.134	0.437	-0.757	2.775

Table 2 reports descriptive statistics of key variables, showing the statistical characteristics of key variables of 17,743 samples of A-share listed companies. The sample exhibits substantial heterogeneity in profitability, evidenced by return on equity (ROE) ranging from -62.6% to 40.3%.

Simultaneously, the digital transformation index (Dig) demonstrates significant dispersion (23.579-66.048), reflecting wide variation in digital maturity across enterprises. There are both digital transformation starters and firms with advanced digitalization.

4.2. Correlation Analysis

Table 3 reveals a statistically significant negative association (1% level) between the digital transformation index (Dig) and ROE, offering initial evidence for the theorized short-term performance deterioration effect. All correlation coefficients were lower than 0.70, and no serious multicollinearity problem was found, which laid a good foundation for subsequent multiple regression analysis.

Table 3. Pearson Correlation Analysis

	ROE	Dig	SOE	Size	Lev	Int	Cap	Growth
ROE	1							
Dig	-0.109***	1						
SOE	-0.0497***	0.00773	1					
Size	0.0478***	0.146***	0.394***	1				
Lev	-0.213***	0.0955***	0.215***	0.444***	1			
Int	-0.0319***	-0.0634***	0.0701***	0.0638***	0.0985***	1		
Cap	0.000356	-0.205***	0.116***	0.0896***	0.125***	0.271***	1	
Growth	0.213***	-0.0333***	-0.0204**	0.0429***	0.00147	-0.0201**	-0.0181*	1

Note: ***p<0.01, **p<0.05, *p<0.1

4.3. Benchmark Regression Results

Table 4 examines the digital transformation-financial performance nexus. The estimated Dig coefficient of -0.0017 (p<0.01) indicates a statistically significant negative association, providing robust support for Hypothesis 1 and confirming digitalization's detrimental short-term financial impact.

Model 2 extends Model 1 by incorporating the ownership-digitalization interaction term (Dig×SOE). The positive interaction term (β=0.0009, p<0.01) substantiates property rights' moderating effect, revealing that state-owned enterprises experience attenuated negative impacts from digital transformation on financial performance relative to non-SOEs. This yields robust confirmation for hypothesis 2.

Table 4. Multiple Regression Results

	Model 1	Model 2
Dig	-0.0017*** (0.0002)	-0.0019*** (0.0002)
Size	0.0227*** (0.0014)	0.0240*** (0.0015)
Lev	-0.1885*** (0.0103)	-0.1872*** (0.0102)
Int	-0.1053*** (0.0356)	-0.1089*** (0.0355)
Cap	0.0198* (0.0104)	0.0240** (0.0104)
Growth	0.0586*** (0.0035)	0.0580*** (0.0035)
SOE		-0.0510*** (0.0112)
interact		0.0009*** (0.0003)
_cons	-0.3142*** (0.0289)	-0.3319*** (0.0299)
Ind	Control	Control
Year	Control	Control
N	17,743	17,743

Note: ***p<0.01, **p<0.05, *p<0.1

4.4. Heterogeneity Analysis

To further examine whether the adverse effect of digital transformation on contemporaneous financial performance varies across firms with different ownership structures, this research conducts subsample regressions based on ownership type and explicitly explores the resulting heterogeneity.

Table 5 shows that the short-term financial impact of digital transformation has significant property heterogeneity. Both coefficients are significantly negative ($p<0.01$), with non-SOEs exhibiting over twice the absolute magnitude of state-owned enterprises. This indicates substantially more severe short-term financial deterioration among non-SOEs during digital transformation, lending strong empirical grounding to hypothesis 2.

Table 5. Property Rights Heterogeneity Analysis

	State-owned enterprise	Non-state-owned enterprise
Dig	-0.0007** (0.0003)	-0.0019*** (0.0002)
Size	0.0234*** (0.0024)	0.0239*** (0.0020)
Lev	-0.1757*** (0.0175)	-0.1909*** (0.0123)
Int	-0.0719* (0.0417)	-0.1410*** (0.0530)
Cap	0.0172 (0.0159)	0.0239* (0.0138)
Growth	0.0332*** (0.0045)	0.0705*** (0.0046)
_cons	-0.3854*** (0.0488)	-0.3273*** (0.0396)
Ind	Control	Control
Year	Control	Control
N	5,149	12,591

Note: ***p<0.01, **p<0.05, *p<0.1

4.5. Robust Test

This paper uses the return on assets (ROA) as an indicator of financial performance, replacing the previous variable (ROE), and further tests the above regression results. Consistent with prior regression outcomes, results indicate a statistically significant negative association ($p<0.01$) between digital transformation (Dig) and ROA. Concurrently, the positive interaction coefficient ($\beta=0.0008$, $p<0.01$) validates the moderating effect's material influence on the digital transformation-financial performance linkage. Overall, the results remain qualitatively unchanged after substituting the dependent variable, indicating that the empirical specification adopted in this study is robust to alternative variable definitions, as shown in Table 6.

Table 6. Robust Test

	ROA full sample	State-owned enterprise	Non-state-owned enterprise
Dig	-0.0013*** (0.0001)	-0.0004*** (0.0001)	-0.0013*** (0.0001)
SOE	-0.0396*** (0.0058)		
interact	0.0008*** (0.0001)		
Size	0.0118*** (0.0008)	0.0109*** (0.0011)	0.0118*** (0.0010)
Lev	-0.1297*** (0.0043)	-0.1027*** (0.0066)	-0.1426*** (0.0055)
Int	-0.0442** (0.0181)	-0.0150 (0.0191)	-0.0686** (0.0282)
Cap	0.0104* (0.0054)	0.0086 (0.0075)	0.0106 (0.0075)
Growth	0.0307*** (0.0019)	0.0156*** (0.0022)	0.0386*** (0.0025)
_cons	-0.1212*** (0.0152)	-0.1584*** (0.0237)	-0.1177*** (0.0208)
N	17,743	5,149	12,591

Note: ***p<0.01, **p<0.05, *p<0.1

5. Conclusion

This research constructs a theoretical framework elucidating the nexus among digital transformation, property rights structure, and financial performance, proposing testable hypotheses subsequently validated empirically. Key conclusions emerge. First, digital transformation imposes an immediate and significant short-term decline on firms' financial performance. Second, ownership structure plays a pivotal moderating role: the financial deterioration is markedly more acute for non-SOEs.

While this study examines digital transformation's short-term financial repercussions, future research can identify the inflection point where digital investments transition from performance liabilities to value-generating assets, mapping the long-term value trajectory. Future research can also compare the decline intensity of different industries, such as manufacturing and service, to help understand the heterogeneity of digital transformation in different industry backgrounds. This paper also gives suggestions for different enterprises. Non-SOEs should implement phased digital transformation initiatives to prevent resource misallocation, while establishing capital buffers to absorb short-term financial volatility risks. State-owned enterprises should leverage institutional advantages by formalizing strategic digitalization roadmaps, ensuring transformation efforts yield sustainable competitive differentiation. Regulators should develop bifurcated support frameworks. While encouraging and supporting the digital transformation of state-owned enterprises, fiscal incentives like tax credits should be provided for non-SOEs to offset transition costs.

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