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An Empirical Study on Digital Transformation and Firm Value in China: The Moderating Role of Institutional Investors and Board Independence

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Abstract: **Digital transformation (DT) has emerged as a key strategy for enhancing firm value and operational competitiveness in the context of China's rapid digital policy development and unique institutional environment. However, whether digital investments translate into tangible performance often depends on corporate governance quality. This study uses a sample of Chinese A-share listed companies from 2018 to 2023 to explore the impact of digital transformation on firm value (Tobin's Q) and examines the moderating effects of two governance mechanisms: institutional investors and board independence. The empirical results show that digital transformation significantly enhances firm value, and both institutional investors and board independence are positively correlated with firm value. Institutional investors exhibit a significant positive moderating effect on the relationship between digital transformation and firm value, indicating that external professional capital can amplify the value contribution of digital strategies. In contrast, the moderating effect of board independence is only marginally significant, possibly limited by the professional composition of boards and governance environment. This study contributes to the Asia-Pacific corporate governance and digital strategy literature by offering China-specific evidence on how institutional investors and board structures shape the value realization of digital transformation.**

Keywords: **digital transformation, corporate governance, firm value, institutional investors, board independence.**

1. INTRODUCTION

In recent years, the rapid development of artificial intelligence, big data, and cloud computing has propelled digital transformation (DT) to the forefront of global competition. DT involves not only the adoption of technology but also a fundamental restructuring of business models and value creation logic (Vial, 2021). Prior studies indicate that DT can make decisions regarding transparency, foster innovation, and influence long-term firm value (Bharadwaj, 2000; Zhai et al.,2022). In China, the national"14th Five-Year Plan for Digital Economy Development"explicitly calls for comprehensive digital upgrades, providing a unique institutional context where firm behaviors are shaped by both market competition and national strategic guidance.

However, technology adoption alone does not guarantee value creation. According to McKinsey's (2022) survey, nearly 70% of transformation projects fail to meet their targets, achieving only one-third of expected economic benefits on average. This underscores that the success of digital investments heavily hinges on corporate governance quality. While prior literature largely focuses on the technological or operational aspects of DT , this study incorporates governance quality as a key driving factor, focusing on two critical mechanisms: institutional investors (external oversight) and board independence (internal checks and balances).

This study aims to investigate three core research questions using Chinese A-share listed companies from 2018 to 2023 : 1) Does DT significantly enhance firm value? 2) Do institutional investors strengthen the contribution of DT to firm value? 3) Does board independence play a positive moderating role?

2. LITERATURE REVIEW AND HYPOTHESES

2.1 Digital Transformation and Firm Value

Digital transformation (DT) has become a key strategy for companies to enhance their competitiveness and value. Based on the resource-based view (RBV), Bharadwaj (2000) points out that IT capabilities can serve as internal resources that effectively promote improvements in organizational performance. In recent years, many empirical studies have supported the positive impact of DT on firm value. Guo and Xu (2021), analyzed Chinese manufacturing firms and found that digital transformation improves overall company performance by enhancing organizational efficiency and resource integration capabilities. Zhai et al. (2022), using Chinese listed companies as a sample, provide empirical evidence that digital transformation enhances profitability and innovation, thus positively influencing firm value. Ren and Lin (2024) further indicated that the strategic choices companies make during DT implementation affect their market valuation, suggesting that the effectiveness of digital transformation depends on the interplay between internal governance structures and external market strategies. Digital transformation is critical for small and medium-sized enterprises (SMEs). Guo et al. (2024) empirically find that DT alleviates financing constraints for SMEs, thereby boosting their growth potential and market valuation. Based on this, we propose the following.

Hypothesis 1 (H1): Digital transformation has a positive impact on firm value.

2.2 Governance Role of Institutional Investors and Firm Value

Institutional investors are regarded as a crucial external force that enhances corporate governance efficiency and firm value. They perform governance functions that promote firm value by improving information transparency, strengthening accountability mechanisms, and participating in decision-making processes. Chen et al. (2013) explore the impact of family and institutional ownership on SME internationalization, showing that institutional investors can enhance governance through professional oversight and resource infusion, thereby indirectly increasing firm value. Zhang et al. (2024) found that institutional ownership significantly and positively affects corporate innovation investment, highlighting its role in fostering long-term value orientation. Salehi et al. (2022) also point out that institutional investors play a moderating role between investment efficiency and firm value, especially in markets with high information asymmetry, where their governance advantages are more pronounced.

Thus, we propose the following.

Hypothesis 2 (H2): Institutional investors have a positive impact on firm value.

2.3 Governance Role of Independent Directors and Firm Value

Independent directors, as core members of the internal oversight mechanism, have also drawn attention to their impact on firm value. Using Chinese listed companies as examples, Liu et al. (2015) confirm that a higher proportion of independent directors correlates with better financial performance. Similarly, Nor et al. (2017) indicate that board independence has a positive effect on investment efficiency, particularly in capital allocation and risk management. At the top management decision-making level, Saini and Singh (2023) focused on CEO confidence and found that independent directors play a counterbalancing role in situations involving highly confident CEOs, preventing overexpansion and poor investment decisions, thus highlighting their importance in corporate checks and balance. Salehi et al. (2022) further verify that board independence moderates the relationship between investment efficiency and firm value by improving governance transparency and enhancing shareholder trust. Thus, we propose the following.

Hypothesis 3 (H3): Board independence has a positive impact on firm value.

2.4 Moderating Role of Governance Mechanisms Between Digital Transformation and Firm Value

Corporate governance mechanisms are increasingly being regarded as key moderating factors in the relationship between digital transformation and firm value. Sound governance structures—such as a high proportion of institutional investors and independent directors—can improve the transparency and efficiency of digital investments, reduce agency problems and resource misallocation, and strengthen the positive impact of DT on firm value. Meng et al. (2022) noted that board independence and institutional ownership have a positive moderating effect on the relationship between DT and corporate social responsibility (CSR) performance, indicating that good governance enhances the external spillover benefits of DT. Chen and Hao (2022) also found that board characteristics—such as independence and diversity—moderate the impact of DT on environmental performance, highlighting the role of internal governance in promoting sustainable digital

transformation. In addition, Zareie et al. (2024) proposed that organizational capital is a key moderating factor; only enterprises with high governance quality and strong organizational synergy can fully realize the potential of digital transformation. Thus, we propose the following.

Hypothesis 4a (H4a): Institutional investors positively moderate the digital transformation's impact on firm value.

Hypothesis 4b (H4b): Board independence positively moderates the digital transformation's impact on firm value.

2.4 Research Framework

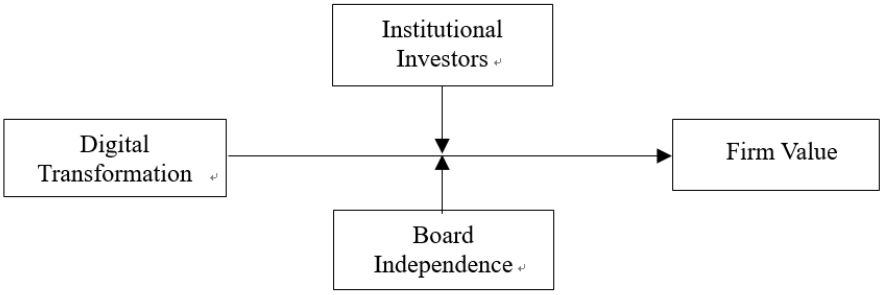

Figure 1: Conceptual Research Framework (Self-developed by the author)

3. RESEARCH DESIGN

3.1 Sample and Data Sources

The initial sample covers Chinese A-share listed companies from 2018 to 2023. Financial and governance variables are obtained from the CSMAR database. Following standard literature, we exclude financial/insurance firms, companies designated as ST or *ST, and records with missing data. Continuous variables are winsorized at the 5th and 95th percentiles to eliminate extreme outliers. The final dataset comprises 18,440 firm-year observations. Regression analyses are performed using SPSS 23.0.

3.2 Variable Selection

1) Dependent Variable: Firm Value (Tobin's Q)

Tobin's Q was used to measure firm value, with higher values indicating greater firm value.

Tobin's Q = (Market Value + Liabilities) ÷ Total Assets

2) Independent Variable: Degree of Digital Transformation (DT)

The degree of digital transformation is measured using the frequency of five keywords—"artificial intelligence technology," "big data technology," "cloud computing technology," "blockchain technology," and "digital technology application" digital technology application—extracted via Python from the information disclosure texts of the sampled companies' annual financial reports.

3) Control Variables:

Firm Size (LnSize): Natural logarithm of total assets.

Financial Leverage (Lev): Debt-to-asset ratio = Total Liabilities ÷ Total Assets.

Profitability (ROA): Return on assets = Net Profit ÷ Average Total Assets.

4) Moderating Variables:

Institutional Investors (IIs): Proportion of shares held by institutional investors (including QFII, insurance, and funds).

Board independence (BI): Proportion of Independent directors on the board.

3.3 Empirical Models

To test the main effects (H1, H2, H3), Model 1 is established:

$$\text{Tobin's Q\_it} = \beta 0 + \beta 1\ \text{DT\_it} + \beta 2\ \text{IIs\_it} + \beta 3\ \text{BI\_it} + \beta 4\ \text{Controls\_it} + \varepsilon\text{\_it} \quad (1)$$

To test the moderating effects (H4a, H4b), Model 2A and 2B incorporate interaction terms using standardized (Z-score) variables to avoid multicollinearity:

$$\text{Tobin's Q\_it} = \beta 0 + \beta 1\ \text{DT\_it} + \beta 2\ \text{IIs\_it} + \gamma 1\ (\text{DT\_it} \times \text{IIs\_it}) + \beta 4\ \text{Controls\_it} + \varepsilon\text{\_it} \quad (2)$$

$$\text{Tobin's Q\_it} = \beta 0 + \beta 1\ \text{DT\_it} + \beta 3\ \text{BI\_it} + \gamma 2\ (\text{DT\_it} \times \text{BI\_it}) + \beta 4\ \text{Controls\_it} + \varepsilon\text{\_it} \quad (3)$$

4. EMPIRICAL RESULTS AND ANALYSIS

4.1 Descriptive Statistics and Correlation Analysis

As shown in Table 1, Tobin's Q averages 2.34. DT has a mean of 21.27 and a maximum of 544.00, reflecting wide cross-firm variance and indicating that digital adoption is still in its early stages in China. The Pearson correlation analysis (Table 2) shows that DT is significantly and positively correlated with Tobin's Q ($r = 0.061$, $P < 0.01$), providing preliminary support for H1. Control variables behave as expected: ROA is positively correlated with firm value, while Lev and LnSize exhibit negative correlations. Variance Inflation Factor (VIF) values are consistently below 10, confirming the absence of multicollinearity.

Table 1: Descriptive Statistics of Main Variables (N = 18,440)

Variable	Mean	Minimum	Maximum	Std. De
Tobin's Q	2.34	0.06	33.37	1.84
DT	21.27	1.00	544.00	40.41
IIs	0.41	0.00	1.00	0.26
BI	0.16	0.00	0.80	0.19
Lev	0.41	0.01	4.72	0.21
ROA	0.03	-4.95	7.43	0.11
LnSize	22.34	17.88	28.70	1.35

Table 2: Pearson Correlation Coefficients

Variable	Tobin's Q	DT	IIs	BI	Lev	ROA	LnSize
Tobin's Q	1.00	.061**	-.018*	.002	-.284**	.135**	-.312**
DT		1.00	-.110**	-.003	-.077**	-.057**	-.050**
IIs			1.00	-.063**	.127**	.100**	.418**
BI				1.00	.048**	.014	.021**
Lev					1.00	-.292**	.464**
ROA						1.00	.037**
LnSize							1.00

Note: * and ** indicate significance at the 5% and 1% level, respectively (two-tailed).

4.2 Regression Analysis

Table 3 presents the integrated regression results for the main and interaction effects.

In Model 1, the coefficient for DT is consistently 0.003 ($P < 0.001$), demonstrating that digital transformation significantly enhances firm value, supporting H1. Furthermore, both IIs ($\beta = 0.868$, $P < 0.001$) and BI ($\beta = 0.205$, $P < 0.001$) are significantly and positively related to firm value after financial and size adjustments, fully supporting H2 and H3.

Regarding the moderating effects, Model 2A reveals that the interaction term Z(DT)*Z(IIs) is significantly positive (gamma_1 = 0.050, t = 3.624, P < 0.001), confirming that higher institutional ownership effectively amplifies the market value contribution of digital strategies, validating H4a. In contrast, Model 2B shows that the interaction term Z(DT)*Z(BI) yields a small coefficient of 0.024 (t = 1.906), which is only marginally significant at the 10% level. This indicates that the internal board monitoring mechanism plays a relatively weaker role in strengthening DT's impact, only partially supporting H4b. This limitation might stem from a lack of digital expertise among independent directors, leading to superficial oversight or compliance-oriented roles.

Table 3: Integrated Regression Results (Dependent Variable: Tobin's Q) N=18440

Variable	Model 1 (Main Effects)	Model 2A (Institutional Moderation)	Model 2B (Board Moderation)
Constant	11.660***(48.898)	12.060***(48.944)	10.462***(46.151)
DT / Z(DT)	0.003***(8.146)	0.119***(8.867)	0.083***(6.498)
IIs / Z(IIs)	0.868***(16.309)	0.227***(16.265)	—
BI / Z(BI)	0.205***(3.053)	—	0.022(1.772)
Z(DT) * Z(IIs)	—	0.050(3.624)*	—
Z(DT) * Z(BI)	—	—	0.024(1.906)
Lev	-1.096***(-15.003)	-1.089***(-14.913)	-1.166***(-15.867)
ROA	1.645***(13.800)	1.647***(13.820)	1.766***(14.736)
LnSize	-0.419***(-36.075)	-0.417***(-35.926)	-0.345***(-32.049)
Adj. R2	0.146	0.146	0.134
F-value	526.064***	13.13***	3.630***

Note: t-values are in parentheses. ***P < 0.001, **P < 0.01, *P < 0.05. Model 2A and 2B are standardized.

4.3 Robustness Analysis

To ensure reliability, several robustness checks were performed:

1.Year Fixed Effects & Centering: Including year fixed effects maintains a highly significant main effect for DT (beta = 0.003, P < 0.001) , while the interaction terms remain highly robust for institutional investors (beta = 0.005, P < 0.001) and marginally significant for independent directors (beta = 0.003, P < 0.05).

2.Alternative DT Measurement: Re-estimating the baseline models using log(1+DT) yields consistent results, confirming that the main effect of DT (beta = 0.124, P < 0.001) and the governance interaction structures remain highly robust.

3.Alternative Dependent Variable: Replacing Tobin's Q with short-term profitability (ROA) shows that DT does not immediately boost short-term earnings (beta = -0.000, P < 0.001). However, the interaction terms DT*IIs and DT*BI remain significantly positive (beta = 0.000, P < 0.001), confirming that strong governance effectively mitigates the severe resource depletion risks associated with digital transformation.

5. CONCLUSION AND IMPLICATIONS

This study verifies that digital transformation significantly enhances firm value among Chinese listed companies from 2018 to 2023. Importantly, this value creation process is heavily contingent on external professional capital. Proactive institutional investor participation creates synergistic governance benefits that amplify the market valuation of digital strategies. Conversely, the internal oversight role of independent directors appears limited, likely restricted by a lack of digital expertise and a tendency toward formalistic board compliance.

Managerial and Policy Implications:

1. For Enterprises: Digital transformation must be treated as a long-term strategic configuration and integrated seamlessly with corporate governance capabilities. Management should deliberately recruit independent board members with strong tech-sector backgrounds to improve digital governance quality.

2. For Policymakers: Regulatory bodies should design clear policies that encourage active institutional investor participation and improve the substantive effectiveness of independent directors, ensuring that corporate governance structures evolve in tandem with technological advancements.

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