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Digital Transformation, Key Audit Matters and Financing Constraints: Evidence from China

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Abstract
This study aimed to empirically test the impact and mechanisms of digital transformation on financing constraints following the implementation of new auditing standards in China. The study uses a panel dataset of 21,290 non-financial A-share firms from 2017 to 2022. Through multiple regression analysis, the research finds that digital transformation and key audit matters (KAMs) disclosures help alleviate financing constraints. Digital transformation significantly increases KAMs disclosures, partially mediating its effect on financing constraints. The findings contribute to the literature on the economic consequences of digital transformation and the effectiveness of revised audit standards.

Keywords: Digital Transformation; Financing Constraints; Key Audit Matters

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1.0 Introduction

Chinese Government Work Report 2023 emphasized promoting deep integration between the digital economy and the real economy to accelerate enterprise digitalization. According to Accenture's China Digital Transformation Index 2022, Chinese companies' digital proficiency rose from 37 to 54 between 2018 and 2021 but declined to 52 in 2022. This reflects a cautious, benefit-driven approach to digital transformation, focusing on financial returns and long-term strategic gains. However, research remains inconclusive on whether digital transformation's overall impact on companies is positive or negative (Viete & Erdsiek, 2020).

Financing constraints are a key factor restricting the optimal production, scale, and performance of companies. Chinese Government Work Report 2023 and 2022 emphasized supporting the real economy and easing companies' financing difficulties. Digital transformation facilitates the deep integration of next-generation digital technologies with the omnidirectional elements of firms (Jafari-Sadeghi et al., 2021). Existing research indicates that enterprise digital transformation significantly eases financing constraints on Chinese listed companies by reducing information asymmetry and transaction costs (Cui & Wang, 2023) while enhancing information disclosure quality (Guo et al., 2023). However, there remains a lack of empirical studies exploring the mechanisms through which digital transformation influences financing constraints.

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Auditing serves as a governance mechanism addressing agency problems, reducing information asymmetry, and enhancing corporate governance through reliable information disclosure. Previous research on the impact of digital transformation on auditing has primarily focused on audit risks, efficiency, quality, reliability, and intelligence of the audit process (He et al., 2024). Studies on factors affecting financing constraints mainly focus on the independence of the audit committee and audit opinions. The Chinese Ministry of Finance issued "Chinese Certified Public Accountants Auditing Standard No. 1504--Communication of Key Audit Matters in the Audit Report" (CSA 1504) in 2016, requiring auditors to disclose critical client risks and their handling. Auditors now have an additional tool to inform users about client risks. (Camacho-Miñano et al., 2024). The Guidelines on the Application of Chinese Institute of Certified Public Accountants Auditing Standard No. 1211 - Identification and Assessment of Material Misstatement Risk provides examples of matters or circumstances that may indicate the existence of significant misstatement risks at the assertion level for audited entities, including the use of information technology (a potential related business risk might be). However, there is limited research on the impact of digital transformation on the disclosure of KAMs.

This study selects Chinese listed companies from 2017 to 2022 as samples and integrates digital transformation, KAMs, and financing constraints into one analytical framework. The contributions of this study are as follows. Firstly, against the backdrop of the digital economy era and new changes in the audit environment, this study enriches the literature on factors influencing the disclosure of KAMs. Secondly, this study tests the impact of KAMs on financing constraints, enriching the literature on factors affecting financing constraints. Thirdly, it also investigates the mechanism through which digital transformation influences financing constraints, focusing on the role of KAMs. The paper is structured as follows: Section 2 reviews the relevant literature and formulates research hypotheses. Section 3 outlines the research design. Section 4 presents the empirical tests and discusses the findings. Finally, Section 5 concludes the study.

2.0 The Literature Review and Research Hypotheses

2.1 Digital Transformation and Financing Constraints

Due to prevalent information asymmetry and agency issues in capital markets, the cost of external financing for firms typically exceeds that of funding internal (Fazzari et al., 1987). Financing constraints arise when firms encounter difficulties securing necessary funds for operational projects or resort to external financing at a higher cost than peers (He et al., 2024).

The impact of digital transformation on financing constraints in firms primarily encompasses four dimensions: Firstly, the crux of financing constraints lies in information asymmetry, impeding external fund providers from accurately appraising firm value. By leveraging digital technologies, firms can swiftly gather internal and external data (George & Schillebeeckx, 2022), convert unstructured data into structured data, and share timely information with capital providers, enhancing transparency and easing financing constraints. Secondly, by furnishing real-time data on internal management procedures, R&D processes, production workflows, financial controls, and supply chains, management can oversee daily business activities and formulate optimal decisions (Lopes de Sousa Jabbour et al., 2018). Simultaneously, external fund providers can assess management decisions and curb short-term behaviors through the timely sharing of information (Guo et al., 2023), consequently minimizing agency costs. Thirdly, digital transformation improves firm performance in multiple ways. Firms with good performance can accumulate more profits and use sufficient internal resources to meet capital needs (Cui & Wang, 2023). Additionally, firms can garner support from funding providers owing to robust competitive advantages. Lastly, firms capable of undergoing digital transformation possess certain resource reserves and high-risk tolerance or align with China's industrial development strategy. Such firms garner higher market valuations from investors due to their future growth prospects. They are more likely to secure additional government policy support, fiscal subsidies, tax incentives, and credit preferences (Vial, 2021). On this basis, the hypotheses are as follows:

H1: Digital transformation has a negative impact on financing constraints.

2.2 Digital Transformation and Key Audit Matters

Enterprise digital transformation involves extensive changes, accompanied by risks and uncertainties. Incorrect strategic choices and organizational changes can result in elevated strategic risks (Luo, 2023). Significant early investments in digital assets like machinery and control systems are required but cannot be fully amortized in the short-term, with ongoing costs for maintenance, updates, and training (Chen & Srinivasan, 2024). Pursuing transformation without aligning with development strategies disrupts cash flows while restructuring business processes and adapting to rapid market and customer changes adds complexity (Leng & Zhang, 2024). The amalgamation of digital business models with traditional business models may hinder synergy and lead to employee adaptability issues. The security risks of digital technologies and the potential for fraudulent activities using high-tech means are latent hazards affecting the regular operation of enterprises (Yang & Han, 2023). These could be potential latent hazards affecting the regular operation of companies. The risk of enterprises committing fraudulent activities using high-tech means also increases. Previous studies have demonstrated that auditors disclose certain matters as KAMs when identified as significant risks, major transactions or events, or involve significant judgments.

Digital technology enables auditors to analyze all data instead of sampling, identify anomalies, and focus on current data for the future sustainability perspective (Yang & Han, 2023). It also provides access to external information sources, enhancing audit evidence verifiability (George & Schillebeeckx, 2022). Additionally, it supports reliable procedures and intelligent tools, reducing repetitive tasks of the auditors, minimizing human manipulation, and improving risk assessment and judgment standards (Leng & Zhang, 2024). Since

the number of KAMs hinges on the auditor's professional judgment, identifying factors influencing auditor behavior is crucial. When auditors verify digital transformation companies, the convenience, comprehensiveness, timeliness of data acquisition, and digital tools enable auditors to execute more critical procedures, comprehensively identify potential risks of client enterprises, and disclose KAMs. According to CSA 1504, KAMs should emanate from "matters communicated with those charged with governance" by auditors. Digitization aids those charged with governance by enabling real-time data access, risk management, and internal control monitoring (Lopes de Sousa Jabbour et al., 2018), facilitating the supervision of operations. It provides auditors with multidimensional information, helping them understand the enterprise's true situation and disclose KAMs. On this basis, the hypotheses are formulated as follows:

H2: Digital transformation positively influences the number of KAMs disclosed.

2.3 Key Audit Matters and Financing Constraints

There are two opposing views on KAMs' impact on financing constraints. One suggests KAMs increase constraints, as they disclose enterprise risks, significant judgments, or transactions, leading external investors to lower expectations and demand higher risk premiums (Guo et al., 2023). KAMs may worsen operational and litigation risks for already-constrained firms, further deteriorating financing conditions. Conversely, the Soft Budget Constraint View argues that KAMs could ease financing constraints in China's audit market, where the government and controlling shareholders may provide related-party financing after negative audit opinions to improve performance. Additionally, KAMs help investors better understand audits and access incremental information, reducing information asymmetry and facilitating lower-cost investment decisions, thereby mitigating financing constraints (Camacho-Miñano et al., 2024).

KAMs, derived from matters communicated with governance, require improved auditor-governance communication, enhancing transparency and external supervision, thus strengthening corporate governance (Leng & Zhang, 2024). Based on insurance theory, KAMs provide reliable risk information, aiding stakeholders' risk assessment and reducing agency issues, which helps alleviate financing constraints(Guo et al., 2023). On this basis, the hypotheses are as follows:

H3: The number of KAMs disclosures is negatively related to financing constraints.

2.4 Digital Transformation, Key Audit Matters, and Financing Constraints

Digital transformation facilitates auditors in disclosing a greater number of KAMs, aiding external fund providers in comprehending significant risks, transactions, and matters of firms. Information asymmetry has long been a critical barrier to improving financing constraints (Cui & Wang, 2023). The disclosure of KAMs can mitigate this issue by lowering transaction costs for both parties and improving both internal and external oversight mechanisms. Based on the previous analysis, the following hypotheses are proposed:

H4: The number of KAMs disclosures medicates the impact of digital transformation on financing constraints.

3.0 Research Design

3.1 Sample Selection and Data Sources

The sample includes Chinese A-share firms listed on the Shanghai and Shenzhen stock exchanges from 2017 to 2021. Following the implementation of CSA 1504 on January 1, 2018, companies listed on these exchanges were required to disclose KAMs in their audit reports for the 2017 financial statements issued in 2018. Firms excluded were financial institutions, ST/*ST/delisted companies, and those with missing data, with continuous variables winsorized annually at the 1st and 99th percentiles. The final dataset consists of 21, 290 samples.

3.2 Variable Definitions

Previous studies assess enterprise digital transformation using a dummy variable, digital asset-to-intangible asset ratio, and text analysis. However, it is noted that the dummy variable fails to capture the intensity of enterprise digital transformation. Additionally, the degree of enterprise digital transformation does not equate to the enterprise's digitalization level, rendering the measure with the digital asset-to-intangible asset ratio inaccurate. This study, therefore, combines annual reports of A-share listed companies related to digital transformation with text analysis according to extant literature (Cui & Wang, 2023; Luo, 2023). The Digital Transformation Index used in this study is sourced from the CSMAR database (Luo, 2023). The index is built on five dimensions of digital transformation: strategy, technology, organization, environment, achievement, and application. Creating keywords for retrieval based on Chinese government work reports, policy documents, and literature. The process begins using Python to extract keywords related to each dimension of "digital transformation" from annual reports. The extracted data is then cleaned, and each firm's keywords frequency is used to measure the respective dimension of digital transformation. Finally, scores for the five dimensions, weighted accordingly, are summed to calculate the Digital Transformation Index, with each subdivision standardized.

Previous studies have employed accounting characteristics, quantitative models, or various sorting criteria based on firm attributes to measure financing constraints, such as the SA Index, KZ Index, WW Index (Whited & Wu, 2006), investment-cash flow model (Fazzari et al., 1987), and cash-cash flow model. Following prior literature (Tang, 2022), this study adopts the FC Index from the CSMAR database to assess financing constraints. The FC Index model, developed based on Hadlock & Pierce (2010), involves the following steps:

Firm size, age, and cash dividend payout ratio are standardized by year. A dummy variable, QUFC, is then created based on

standardized mean values. Firms above the 66th percentile are classified as having low financing constraints (QUFC=0), while those below the 33rd percentile are categorized as having high financing constraints (QUFC=1). A Logit regression is performed using Model (1) to estimate the annual probability (P) of financing constraints for each firm. This probability represents the FC Index, ranging from 0 to 1, where higher values indicate more severe financing constraints.

$$P(QUFC = 1 \ or \ 0|Z_{i,t}) = \frac{e^{Z_{i,t}}}{1+e^{Z_{i,t}}} \quad (1)$$

in which,

$$Z_{i,t} = \alpha_0 + \alpha_1 size_{i,t} + \alpha_2 lev_{i,t} + \alpha_3(\frac{CashDiv}{ta})_{i,t} + \alpha_4 MB_{i,t} + \alpha_5(\frac{NWC}{ta})_{i,t} + \alpha_6(\frac{EBIT}{ta})_{i,t}$$

Where size represents the asset size of the firm, measured as the natural logarithm of total assets; lev donates the financial leverage of the enterprise, calculated as the debt ratio (total liabilities divided by total assets); $CashDiv$ refers to the cash dividends distributed by the firm in the current year; MB is the market-to-book ratio, defined as the market value divided by the book value; NWC represents net working capital, calculated as operating working capital minus cash and short-term investments; $EBIT$ refers to earnings before interest and taxes; ta was total assets.

The disclosure of the KAMs variable is quantified by the total number of matters mentioned in the KAMs section of the audit report, following the methodologies of Sierra-García et al. (2019).

This study draws on recent studies to identify the control variables included in the digital transformation model (Cui & Wang, 2023; Tang, 2022; Whited & Wu, 2006). This study includes property rights nature, return on assets, loss, ownership concentration, and big 4. Additionally, industry and year factors are controlled for in the analysis. Definitions of all variables are detailed in Table 1.

Table 1. Variable Definition

Variable Name	Variable Symbol	Variable Definition
Financing Constrain	FC	Specific variable definition
Digital Transformation	DT	DT Index = 0.3472×Strategy Driven Score + 0.162×Technology-enabling Score + 0.0969×Organization-enabling Score +0.0342×Environment-enabling Score + 0.2713×Digital Achievement Score + 0.0884×Digital Application Score
KAMs	KAMs	The total number of matters mentioned in the KAM section of the annual audit report of listed companies
Property Rights Nature	SOE	A dummy variable set to 1 if the firm is a state-owned enterprise (SOE) and 0 otherwise.
Return on Assets	ROA	Return on Assets equals the net profit divided by total assets
LOSS	LOSS	A dummy variable equal to 1 if the firm has the net income of less than 0 in a current year and 0 otherwise
Ownership Concentration	OWNCONC	The proportion of common shares held by the largest shareholder
BIG 4	BIG 4	A dummy variable set to 1 if the firm is audited by a Big 4 audit firm (PricewaterhouseCoopers, Deloitte, Ernst & Young, or KPMG) and 0 otherwise.

3.3 Research Model

To verify the impact of digital transformation on financing constraints and KAMs, the study constructs Model (2) and Model (3), to test H1 and H2, respectively. This study establishes Model (4) which verifies the relationship between KAMs and financing constraints, to test H3.

$$FC_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Control_{i,t} + \sum Industry_i + \sum Year_t + \varepsilon_{i,t} \quad (2)$$

$$KAMs_{i,t} = \beta_0 + \beta_1 DT_{i,t} + \beta_2 Control_{i,t} + \sum Industry_i + \sum Year_t + \varepsilon_{i,t} \quad (3)$$

$$FC_{i,t} = \gamma_0 + \gamma_1 KAMs_{i,t} + \gamma_2 Control_{i,t} + \sum Industry_i + \sum Year_t + \varepsilon_{i,t} \quad (4)$$

The study employs the model (5), which examines the mediating effect of KAMs on the impact of digital transformation on financing constraints, to test H4.

$$FC_{i,t} = \delta_0 + \delta_1 DT_{i,t} + \delta_2 KAMs_{i,t} + \delta_3 Control_{i,t} + \sum Industry_j + \sum Year_t + \varepsilon_{i,t} \quad (5)$$

Where $DT_{i,t}$ denotes the firm's degree of digital transformation, $FC_{i,t}$ denotes the financing constraints of the firm. $Control_{i,t}$ represents the control variables; The industry fixed and year fixed have been included in the model; $\varepsilon_{i,t}$ is the residual term from the regression.

4.0 Empirical Test and Result Analysis

4.1 Descriptive Statistical Analysis of Variables

Table 2 presents the results of descriptive statistics. The mean value of DT is 37.35 with the variances of 109.776, indicating the significant potential for enhancement in the firms' digital transformation. The FC variable ranges from 0 to a maximum of 0.98898, highlighting substantial variation in financing constraints across firms in the sample. Table 3 displays the correlation matrix for all

variables. None of the correlations are high enough to raise significant concerns about multicollinearity. The coefficients between financing constraints and DT, KAMs, as well as most control variables, are significant, supporting the validity of the selected variables.

Table 2. Descriptive Statistics

Variables	Mean	S.D.	Variance	Minimum	Median	Maximum
DT	37.3495	10.4774	109.7764	21.3532	35.6548	79.8115
FC	0.4663	0.2869	0.082	0.0001	0.4813	0.9890
KAMs	2.03	0.646	0.418	1	2	6
SOE	0.32	0.465	0.216	0	0.0000	1
ROA	0.0288	0.4960	0.0180	-3.1643	0.0348	7.4461
LOSS	0.15	0.353	0.125	0	0	1
OWNCONC	0.3321	0.1453	2.1121	0.0184	0.3072	0.8999
BIG 4	0.06	0.235	0.055	0	0	1

Table 3. Pearson Correlations among the Dependent Variables and Variables of Interest

Variables	DT	FC	KAMs	SOE	ROA	LOSS	OWNCONC	BIG 4
DT	1							
FC	-0.091**	1						
KAMs	0.110**	- 0.123**	1					
SOE	-0.060**	-0.340**	-0.043**	1				
ROA	-0.060**	0.100**	-0.087**	-0.008	1			
LOSS	0.050**	-0.076**	0.079**	-0.043**	-0.087**	1		
OWNCONC	-0.151**	-0.129**	-0.068**	0.229**	0.115**	-0.147**	1	
BIG 4	0.003	-0.234**	-0.015*	0.142**	0.030**	-0.040**	0.142**	1

*** Correlation coefficients are significant at the 1 percent level or better, * Correlation coefficients are significant at the 5 percent level or better, two-tailed test.*

4.2 Results of The Regression Model

Table 4 presents the regression results for Models (2) to (5). The result in Column (1) supports Hypothesis 1, showing a negative and significant coefficient (-0.0092, 1%) for digital transformation on financing constraints, indicating that firms undergoing digital transformation are less likely to face financial constraints. This effect is attributed to the enhanced information transparency provided by digital transformation, which signals positive information to investors and creditors. The result in Column (2) supports Hypothesis 2, showing a positive correlation between digital transformation and KAMs disclosures (coefficient = 0.0069, 1%), suggesting that auditors disclose more KAMs for firms undergoing digital transformation. As a significant event for listed companies, digital transformation inherently carries risks, which fall within the scope of KAMs disclosures according to CSA 1504. Column (3) shows that KAMs disclosures negatively influence financing constraints (coefficient = -0.0601, 1%), indicating that more disclosed KAMs reduce financing constraints. By conveying additional risk information, KAMs enhance external governance and mitigate information asymmetry, thereby alleviating financing constraints. Model (5) examines the mediating role of KAMs disclosures between digital transformation and financing constraints. Column (4) tests this mediation, with financing constraints as the dependent variable. The results show that KAMs disclosures reduce financing constraints (coefficient = -0.0505, 1%), while the effect of digital transformation on financing constraints remains negative (coefficient = -0.0089, 1%). Compared to the result in Column (1), the coefficient for digital transformation on financing constraints is lower, suggesting that KAMs disclosures partially mediate its effect on financing constraints. These results support Hypothesis 4.

Table 4. Logistic Regression Analysis of Audit Opinion on RPT

Variables	FC Model (2)	KAMs Model (3)	FC Model (4)	FC Model (5)
Constant	0.8982*** (51.679)	1.4949*** (30.626)	0.6723*** (37.746)	0.9792*** (53.23)
DT	-0.0092*** (-46.214)	0.0069*** (12.658)		-0.0089*** (-44.299)
KAMs			-0.0601*** (-22.848)	-0.0505*** (-19.989)
SOE	-0.1255*** (-33.882)	-0.0381*** (-3.641)	-0.1404*** (-34.892)	-0.1242*** (-32.124)
LOSS	-0.0537*** (-10.557)	0.1005*** (7.091)	-0.0433*** (-7.896)	-0.0422*** (-8.052)
ROA	0.142*** (10.049)	-0.2445*** (-6.068)	0.1127*** (7.254)	0.1015*** (6.831)
OWNCONC	-0.0007*** (-5.844)	-0.0017*** (-5.415)	-0.0003** (-2.471)	-0.0008*** (-6.409)
BIG 4	-0.1907*** (-28.472)	-0.0141 (-0.753)	-0.2104*** (-29.235)	-0.1912*** (-27.71)
Adj. R Square	0.3229	0.1537	0.2824	0.3432
F	141.9699	14.9847	104.4512	136.6512

*This table reports the logistic regression. In each cell, the regression coefficient and Wald statistics in parentheses are reported in the upper and lower case, respectively. ***, **, and * denote the significance level of 1%, 5%, and 10%, respectively.*

5.0 Conclusions

As a new driver of China's economic development, digitalization profoundly impacts corporate decision-making, auditing, and financial financing. Based on data from 21,290 listed companies on the A-share market from 2017 to 2022, it was concluded that digital transformation can alleviate firms' financing constraints. The main barriers to corporate financing arise from information asymmetry and agency costs. The primary impediments to corporate financing stem from information asymmetry and agency costs. The implementation of digitalization and new audit reporting standards can provide external fund providers with more transparent corporate information, as well as more rigorous external supervision. Additionally, auditors adopt a more circumspect and proactive stance when addressing digitally transformed enterprises. Thus, digital transformation can significantly and positively influence the number of KAMs disclosures. This study enriches the literature on the economic impact of corporate digital transformation and the effectiveness of revised audit standards. It provides empirical support for reducing financing costs, guiding firms' digital transformation decisions, and refining auditing standards. However, due to ongoing debates regarding the effectiveness of information disclosure regulations and investor protection mechanisms in China's capital market, where the costs of corporate violations tend to be relatively low, the role of KAMs disclosures in corporate governance becomes even more important. Applicability to other markets requires further study. Future research will further explore the impact of other corporate governance characteristics, as well as regulatory and institutional factors, on the relationship between digital transformation and financing constraints.

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Paper Contribution to Related Field of Study

This paper contributes to the field by providing empirical evidence on the economic effects of digital transformation and the effectiveness of revised auditing standards in China. Specifically, it demonstrates that digital transformation and the disclosure of Key Audit Matters play a significant role in alleviating financing constraints for nonfinancial A-share firms. Additionally, the study highlights the mediating role of KAMs disclosures in the relationship between digital transformation and financing constraints. These findings enrich the existing literature by linking digital transformation with audit practices and their combined influence on financial outcomes, and offering new insights into the interplay between technological advancements and regulatory frameworks.

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