Accounting and Corporate Management (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/acccm.2024.060419
ISSN 2523-5788 Vol. 6 Num. 4

Digital transformation of Chinese logistics enterprises: Impact on financial performance

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Keywords: Digital transformation, financial performance, technological innovation, logistics enterprises

Abstract: In the era of digital economy, digital transformation has become a necessary path for enterprises to adapt to the environment, seize opportunities, and achieve performance improvement. Based data from A-share logistics listed companies in the Shanghai and Shenzhen stock markets from 2017 to 2023, the study investigates the impact of digital transformation of Chinese logistics enterprises on financial performance and its underlying mechanisms. The empirical research has found a significant positive correlation relationship between digital transformation with financial performance, which still holds true after multiple practices and endogeneity tests. Mechanism analysis reveals that digital transformation improves the technological innovation capability of enterprises, achieve technological breakthroughs, and increase the profitability of enterprises that improves financial performance. Additionally, heterogeneity analysis shows that digital transformation has more significant effect on financial performance for the state-owned, larger scale logistics enterprises located in eastern region.

1. Introduction

With Chinese digital economy and technology development, digital transformation (DT) has become an inevitable choice for enterprises to achieve high-quality development. The Chinese government, provinces and cities have provided policy incentives and invested a large amount of manpower and material resources for the construction of basic digital infrastructure and platforms (Chen Liyi, 2023; Du Baogui and Liu Zhiliang, 2024)[1,2]. Scholars have also conducted extensive research on the connotation, antecedents, mechanisms, and outcomes of enterprise DT (Manuel J, et

al.,2023; Karttunen E, et al.,2023)[3,4].

DT refers to the process in which enterprises utilize underlying technologies such as 5G, the internet of things, big data, blockchain, artificial intelligence, etc. to update their operational models, and seek cost reduction and efficiency improvement internally (Zeya H, et al.,2023)[5]. But enterprise DT has the characteristics of high investment, high risk, long cycle, and uncertainty. Whether these characteristics affect the profitability of enterprises is an important factor considered by 80% of enterprise decision-makers when making strategic plans (Accenture, 2022), and is also a focus of attention for both political and academic parties.

So far, there is still no unified conclusion on whether the implementation of the traditional enterprise DT is able to promote financial performance (Ode, E. and Ayavoo, R. 2020)[6]. Qi Yudong and Cai Chengwei (2020) concluded that there would be a negative correlation between DT and financial performance due to some factors such as large funding gaps, shortage of technical personnel, and mismatched operating models during implementing DT in enterprises[7]. Meng Di (2023) found that enterprises could achieve the goal of reducing costs, improving efficiency of human capital utilization, and ultimately enhancing financial performance by empowering various aspects through DT [8]. Meanwhile, Liang Lina et al. (2022) found that there is a U-shaped relationship [9]. Next, Nasiri et al. (2022) pointed out that only when DT reaches a certain level of maturity it was able to promote the financial performance[10].

The logistics industry is a pillar industry of the Chinese economy. Currently, some logistics enterprises have undergone significant digital transformation. Most of them have been in preliminary DT, and the others are still hesitating and watching (Xie Xinyu and Wang Jian, 2023)[11]. However, research samples on DT mainly focus on manufacturing enterprises (Dong Xiaoxu, et al., 2024)[12], and there is relatively little empirical research on the effectiveness of DT in logistics enterprises. Therefore, this paper selects 153 logistics enterprises listed on the Shanghai and Shenzhen A-shares in 2022 from China Stock Market & Accounting Research Database (CSMAR) as research objects to research the impact of DT on financial performance in logistics enterprises.

2. Theoretical basis and research hypotheses

2.1. Enterprise Digital transformation and financial performance

The resource-based theory points out that factors such as resources, capabilities, and knowledge possessed by enterprises are the foundation of their operation and development, as well as key to gain advantages in market competition (Wernerfelt, B., 1984; Peteraf, M.A., 1993) [13,14]. The process of implementing DT in logistics enterprises is the continuous accumulation and application of important strategic resources. Correspondingly, the digital knowledge and capabilities of enterprise personnel are constantly improving (Hu Yuanlin, et al., 2024) [15]. Specifically, logistics enterprise DT can improve their profitability and have a positive impact on financial performance through leveraging technological advantages to integrate with domestic and foreign digital

platforms, reducing information gaps, effectively avoiding operational risks, and providing strong support for improving financial performance. The following hypothesis is proposed:

Hypothesis 1 (H1): DT in logistics enterprises is positively correlated with their financial performance.

2.2. The mediation effects of enterprise digital transformation on financial performance

DT can have a positive impact on innovation through the application of digital technology (Fitzgerald et al., 2014) [16]. In detail, DT firstly can enhance their ability to process internal and external information and mine data through the application of digital technology, thereby better grasping the cutting-edge dynamics of the market and the true needs of the service side, identifying key links in innovation activities, and improving and optimizing their own products, operational processes, business models, etc. (Yao Xiaotao et al., 2024) [17]. Secondly, DT belongs to skill based technological progress, which requires enterprises to equip sufficient technical human capital with professional knowledge and digital skills, especially in the process of traditional industries transforming towards intelligence and digitization. It is necessary to introduce or cultivate a group of technological research forces that match DT, and the research level of enterprises can be greatly improved. Hence, hypothesis 2a is proposed:

Hypothesis 2a (H2a): There is a positive correlation between enterprise DT and enterprise technological innovation, that is, DT can promote technological innovation.

Schumpeter's innovation theory holds that innovation is a revolutionary change that is endogenous in the production process and can create new value. Technological innovation can bring new production methods, new products, new business models, and new market competition patterns. So the fruits of innovation generally serve the enterprise directly so that technological innovation can be quickly transformed into new economic achievements, achieving a leapfrog improvement in financial performance. Therefore, hypothesis H2b is proposed.

Hypothesis 2b (H2b): There is a positive correlation between enterprise technological innovation and financial performance, that is, technological innovation can promote the improvement of financial performance.

Based on H2a and H2b, Hypothesis 2 is proposed:

Hypothesis 2 (H2): Enterprise technological innovation has a mediating effect between DT and financial performance of enterprises.

3. Methods setting and variable declaration

3.1. Model setting

Equation (1) is constructed to empirically test the impact of enterprise DT on their financial performance in logistics enterprises, and to test whether hypothesis 1 is valid.

$$ROA_i = \beta_0 + \beta_1 DT_i + \sum Controls + \varepsilon_i \quad (1)$$

In equation (1), ROA_i represents enterprise financial performance, DT_i is the core explanatory variable digital transformation, $\sum Controls$ is a series of control variables, and ε_i represents the random error term.

On the basis of equation (1), using the mediation effect test provided by Wen Zhonglin and Ye Baojuan (2014) [18], and referring to the method proposed by He Yong and Ling Ji (2023) [19], equations (2) and (3) are used to test the mediation effect of enterprise technological innovation on the impact of DT on financial performance, also to test hypotheses 2 and 3.

$$Mediators_i = \gamma_0 + \gamma_1 DCG_i + \sum Controls + \varepsilon_i \quad (2)$$

$$ROA_i = \delta_0 + \delta_1 DCG_i + \delta_2 Mediators_i + \sum Controls + \varepsilon_i \quad (3)$$

where, $Mediators_i$ is a mediating variable that represents the technological innovation.

3.2. Variable declaration

3.2.1. Dependent variable

Considering the accounting indicators are applicable to all companies and comparable, this study refers to total asset net profit margin to measure the company's financial performance [20]. Return on Assets (ROA) is measured by the ratio of year-end net profit to total assets, and specific data can be obtained from the annual financial statements of various listed companies.

3.2.2. Explanatory variable

Enterprise digital transformation is chosen as the core explanatory variable. its index comes from the enterprise digital transformation sub library in the CSMAR database, which was weighted based on six indicators: strategic leadership, technology drive, organizational empowerment, environmental support, digital achievements, and digital applications. It is hypothesized that the larger the value, the higher the level of enterprise DT.

3.2.3. Mediator variable

This study uses technological innovation (TI) as a proxy variable for enterprise innovation. Referring to the method of Li Xiumin et al. (2024), the weighted sum of the number of design patents, utility model patents, and technological invention patents of the enterprise in the current year is calculated in a ratio of 1:2:3, and then the logarithm is taken as the measure of technological innovation. It is proposed that the larger the value, the higher the level of technological innovation of the enterprise [21].

Additionally, the study puts a group of control variables into the research framework for

regression analysis. The control variables specifically include the age of the enterprise (ER, establishment years of enterprise), the size of the enterprise (Size, the total assets of the enterprise after logarithmic transformation of Assets), and the concentration of equity (RSR, shareholding ratio of the largest shareholder).

4. Empirical results and analysis

4.1. Data sources and descriptive statistics

The study samples 166 logistics companies listed on the Shanghai and Shenzhen A-shares in China in 2022 from the CSMAR. After excluding the samples with missing key data, ST or * ST. Second, and winsorizing the first and last 1% of the main continuous variables to eliminate the influence of extreme values, finally 153 sample enterprises are remained as the research objects for analysis. The original data comes from the CSMAR database, Wind database, and the website of the National Bureau of Statistics; Additionally, considering the lag of digital transformation in this study, the explanatory variable is obtained from data in 2022, and the dependent variable is from data in 2023. The descriptive statistical results for the main variables are shown in Table 1.

Table 1: Descriptive statistics of variables.

	N	Min	Max	Mean	P50	Sd
DT	153	22.4503	60.8911	36.0991	34.9247	8.0001
ROA	153	0.0382	0.9882	0.4522	0.4415	0.1991
Size	153	-9.9352	10.4533	6.5864	8.5904	5.6572
SRS	153	8.1265	72.6376	38.0399	37.1206	15.7753
EY	153	2.3026	3.6109	3.1512	3.2189	0.2665
TI	153	0.0000	6.1070	3.2004	3.1781	1.3700
Fintech	153	0.0000	2.8633	1.9010	1.9294	0.8089

Note: Sd is the abbreviation for standard deviation, and N is for the number of effective cases.

4.2. Benchmark Regression

4.2.1. Impact of enterprise DT on financial performance

In benchmark regression, the regression coefficients of DT are positive numbers of 0.012 and have passed the 1% statistical significance test in Table 2. This indicates that there is a significant positive correlation between DT and financial performance. Hypothesis 1 is supported by empirical evidence.

Table 2: Regression results of the impact of enterprise DT on financial performance.

Variables	M(1)	M(2)
DT	0.012*** (6.454)	0.012*** (7.116)
Size		-0.010** (-4.063)
EY		-0.032 (0.604)
SRS		0.002 (2.551)
N	153	153
R^2	0.216	0.305

Note: *, * *, and * * * represent significant values at the 10%, 5%, and 1% levels respectively with the value of t in parentheses.

4.2.2. Robustness test

Removing outliers

The DT and financial performance of logistics industry enterprises are closely related to major events worldwide, and enterprises severely affected by the international situation will be excluded. And due to the lack of representativeness of the head and tail enterprises and their susceptibility to uncertain factors, they are excluded in order. The regression results in Table 3 show that the core conclusion that digital transformation of enterprises contributes to the improvement of financial performance has still not changed.

Table 3: Robustness test.

Samples after excluding some ones				Extended observation window			
Variables	M(1) ROA	M(2) ROA	M(3) ROA	Variables	M(4) ROA	M(5) ROA	M(6) ROA
DT in 2022	0.012*** (7.004)	0.013*** (6.758)	0.012*** (5.876)	DT in 2021	0.006** (3.106)		
Controls	yes	yes	yes	DT in 2018		0.003** (1.446)	
	Excluding affected samples	Excluding head samples	Excluding head and tail samples	DT in 2017			0.003* (1.944)
				Controls	yes	yes	yes
N	146	138	131	N	153	153	153
R2	0.298	0.296	0.274	R2	0.124	0.080	0.024
Adj. R2	0.279	0.276	0.251	Adj. R2	0.100	0.055	0.018

Explanatory variables lag by periods

After extending the investigation of the impact of DT on financial performance of enterprises, the test is conducted. In Table 3, M(4)-M(6) show that after pre-processing of enterprise DT, the coefficients of enterprise DT are all positive and have passed the significance test. That is to say, enterprise DT has a positive promoting effect on financial performance. It verifies the core research hypothesis 1.

Endogeneity problems

This study first uses a second-order least squares model for regression. The regression coefficient of enterprise DT is significantly positive at the 1% level. The regression results are consistent with the main regression, which indicates that the selection of the model will not affect the positive correlation between DT and financial performance.

In order to avoid the randomness of regression results, the measure method of Wu Fei et al. is selected as alternative variable of DT, the method of Cao Xiaojun (2021) as alternative variable of the financial performance, the regression results are consistent with the previous results and proves the robustness of the conclusion.

4.2.3. Heterogeneity analysis

The levels of DT in Chinese logistics enterprises are closely related to their development scale, economic development region, and ownership nature. This study conducted heterogeneous regression analysis on these three aspects. As shown in models M(1)-M(7) in Table 4, the regression coefficients of DT are significantly positive. And comparing the coefficient values, it can be seen that the digital transformation of large-scale, state-owned logistics enterprises in the eastern region has more significant impact on their financial performance.

Table 4: Heterogeneity test based on enterprise size, ownership nature, and regional characteristics.

Variables	M(1) ROA	M(2) ROA	M(3) ROA	M(4) ROA	M(5) ROA	M(6) ROA	M(7) ROA
DT	0.012*** (4.637)	0.013*** (5.097)	0.011*** (5.499)	0.020*** (5.482)	0.012*** (5.989)	0.016*** (2.958)	0.016* (2.179)
Size	-0.012 (-3.941)	-0.025 (-0.623)	-0.007 (-2.129)	-0.020 (-5.482)	-0.010** (-3.148)	-0.015 (-1.785)	-0.010 (-1.290)
SRS	0.003** (1.652)	0.002 (1.338)	0.002** (2.255)	0.002 (0.967)	0.002 (1.776)	0.007* (2.189)	0.003 (0.840)
SY	-0.008 (-0.092)	0.058 (0.855)	-0.009 (-0.140)	-0.005 (-0.052)	-0.007 (-0.115)	0.349 (1.875)	0.116 (0.449)
Classification basis	small- size	large -size	no-state owned	state-owned	In the east region	In the middle region	In the west region
	Enterprises based on their size		Enterprises based on their attributes		Enterprises based on region their feature		
N	76	77	114	39	116	20	17

R2	0.332	0.291	0.244	0.611	0.280	0.547	0.377
Adj. R2	0.295	0.251	0.217	0.565	0.254	0.427	0.169

4.3. Mediating effect test of enterprise technological innovation

Enterprise technological innovation (TI) is a mediating variable to characterize the impact mechanism of DT on financial performance. Considering that the variable transmission has a certain time delay, data is selected for the explanatory variable, control variable, and mediator variable in 2022, and dependent variable in 2023.

Table 5: The mediation effect of enterprise TI in the impact of DT on financial performance.

Variables	TI		ROA		
	M(1)	M(2)	M(3)	M(4)	M(5)
DT		0.076** (6.108)			0.007** (4.097)
Size	0.004 (0.208)	-0.005 (-0.248)	-0.009** (-3.044)	-0.009 (-4.076)	-0.010** (-4.589)
SY	0.393 (0.935)	0.221 (0.583)	0.060 (0.987)	0.024 (0.509)	0.016 (0.349)
SRS	0.018** (2.388)	0.022 (3.328)	0.002** (1.532)	0.001 (0.033)	0.001 (0.913)
TI				0.090** (9.878)	0.073** (7.448)
N	153	153	153		153
R2	0.043	0.236	0.067		0.495
Adj. R2	0.024	0.215	0.048		0.478

M(1) and M(2) in Table 5 take technological innovation as the dependent variable and DT as explanatory variable. The results reveal that DT has a positive correlation with technological innovation (B=0.076, $p<0.05$). H2a holds true. M(3)-M(5) show that technological innovation was positively correlated with financial performance (B=0.090, $p<0.05$). H2b is proved. Technological innovation plays a partial mediating role in the positive impact of DT on financial performance.

5. Conclusion

This study adopts the data of logistics companies listed on the Shanghai and Shenzhen A-shares from 2017 to 2023 as the research object, and empirically investigates the effect and mechanism of digital transformation on the improving corporate financial performance. The findings are as follows: First, digital transformation has a significant promoting effect on the financial performance of Chinese logistics enterprises. This promoting effect is not only effective in the later period, but also in the later periods, with a cumulative effect. Second, mechanism analysis proves that digital

transformation promotes the improvement of financial performance as it enhances the technological innovation level of logistics enterprises. Third, heterogeneity analysis shows that the promotion degree of digital transformation on financial performance exhibits heterogeneity characteristics across different enterprise sizes, attributes, and regional characteristics. The digital transformation of state-owned enterprises in economically developed regions with larger scales promotes a greater degree of improvement in financial performance.

References

[1] Chen Liyi. (2023) Evaluation and Research on the Implementation Effect of Promoting the digital transformation policy of state enterprises-Taking G Power Grid Corporation as an example. South China University of Technology, 2023.

[2] Du Baogui, Liu Zhiliang. (2024) Quantitative Research on Digital Transformation Policy of Manufacturing Industry in Beijing-Tianjin-Hebei Region: Based on the PMC Index Model. Innovation Science and Technology, 6, 51-65.

[3] Manuel J, Ianacto D, Mariano S. (2023) The impact of digital transformation on talent management. Technological Forecasting & Social Change, 1, 1-10.

[4] Karttunen E, Lintukangas K, Hallikas J. (2023) Digital transformation of the purchasing and supply management process. International Journal of Physical Distribution & Logistics Management, 6, 685-706.

[5] Zeya H, Huiling H, Hyeyoon C, et al. (2023) Building organizational resilience with digital transformation. Journal of Service Management, 1, 147-171.

[6] Ode, E. and Ayavoo, R. (2020) The Mediating Role of Knowledge Application in the Relationship between Know ledge Management Practices and Firm Innovation. Journal of Innovation & Knowledge, 5, 210-218.

[7] Qi Yudong, Xiao Xu. (2020) Enterprise Management Transformation in the Digital Economy Era. Managing World, 6, 135-152+250.

[8] Mengdi. (2024) Research on the Impact of Digital Transformation on Financial Performance: Based on the Dual Path of Financing Constraints and Technological Innovation. Finance, 1, 122-131

[9] Liang Lina, Zhang Guoqiang, Li Hao, Yang Yangyang, (2022) Research on the Economic Effects of Enterprise Digital Transformation-Analysis Based on Market Performance and Financial Performance. Modern Management Science, 5, 146-155.

[10] Nasiri M, Saunila M, Ukko J. (2022) Digital orientation, digital maturity, and digital intensity: Determinants of financial success in digital transformation settings. International Journal of Operations & Production Management, 13, 274-298.

[11] Xie Xinyu, Wang Jian. (2023) Regional Differences and Dynamic Evolution of Integration Level between China's Logistics Industry and Digital Economy. Research on the World, 2, 33-46. DOI:10.13778/j.cnki.11-3705/c.2023. 02.004.

[12] Dong Xiaoxu, Chen Rui. (2024) Digital Transformation, Innovation Driven and Innovation Resilience of High Technology Manufacturing Industry. Statistics and Decision Making, 17, 167-171. DOI:10.13546/j.cnki.tjyjc. 2024.17.029.

[13] Wernerfelt, B. (1984) A Resource-based view of the firm. Strategic Management Journal, 2, 171-180.

[14] Peteraf, M.A. (1993) The cornerstones of competitive advantage: A resource-based view. Strategic Management Journal, 3, 179-191.

[15] Hu Yuanlin, Wei Hanyu, Zhu Yanchun. (2024) The Impact of Digital Transformation on Corporate Performance: The Mediating Effect of Deleveraging. Soft Science, 9, 1-13.

[16] Fitzgerald M., Kruschwitz N., Bonnet D., Welch M. (2014) Embracing digital technology: A new strategic imperative. MIT Sloan Management Review, 2, 1.

[17] Yao Xiaotao, Qi Hui, Liu Linlin, et al. (2024) Digital Transformation of Enterprises: Reunderstanding and Starting Again. Journal of Xi'an Jiaotong University (Social Sciences Edition), 9. DOI:10.15896/j.xjtuskxb. 202203001.
[18] Wen Zhonglin, Ye Baojuan. (2014) Intermediary Effect Analysis: Method and Model Development. Advances in Psychological Science, 5, 731-745. DOI: 10.3724/SP.J.1042. 2014. 00731.
[19] He Yong, Ling Ji. (2024) The Multiple Effects and Heterogeneous Characteristics of Financial Technology Empowering Enterprise Digital Transformation. Journal of Chongqing University (Social Sciences Edition), 7, 1-19.
[20] Yin Xianan, Zhan Ximing, Tang Shaoqing. (2022) The Impact Mechanism of Digital Transformation of Manufacturing Enterprises on Financial Performance. China's circulation economy, 7, 96-106.
[21] Li Xiumin, Chen Zishuo, Chen Yaqi. (2024) Digital transformation of enterprises and financial performance: Evidence from digital patent data of listed companies. Journal of Technology Economics, 2024, 43(1): 73-87.