

THE RELATIONSHIP BETWEEN ENTERPRISE DIGITAL TRANSFORMATION AND ENTERPRISE PERFORMANCE BASED ON THE PERSPECTIVE OF DATA ELEMENTS

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Abstract: With the rapid development of information technology, the construction of digital government has become an important means to promote the modernization of national governance system and governance capacity. At the same time, the digital transformation of enterprises has also become a key way to enhance enterprise competitiveness and achieve sustainable development. Based on the perspective of data elements, this paper discusses the complex relationship between enterprise digital transformation and enterprise performance. The research results show that the digital transformation of enterprises has a significant positive impact on their performance. The digital transformation significantly improves the return on equity of enterprises by optimizing business processes, improving operating efficiency and innovation ability. Among them, digital transformation is particularly critical to the improvement of innovation ability, which is reflected in shortening the product time to market, promoting knowledge sharing and teamwork, and timely capturing market trends and customer needs. In addition, the study also examined the impact of financial leverage ratio, asset size and cash asset ratio on enterprise performance. Based on the research conclusion, this paper puts forward the corresponding policy suggestions, which provides the scientific basis and reference for the implementation of the digital transformation strategy of enterprises, and is of great significance for promoting the high-quality development of China's economy and society.

Keywords: Digital transformation of enterprises; Enterprise performance; Data elements; Regression analysis; Robustness test

1 INTRODUCTION

With the rapid development of information technology, the construction of digital government has become an important means to promote the modernization of national governance system and governance capacity. In the research field of discussing the digital transformation of enterprises and its impact on enterprise performance, many scholars have revealed the complexity and diversity of the digital transformation from different perspectives and methods. The construction of the theoretical model of the study of Wang Kaiyang et al. may be limited by the researchers' subjective cognition and assumptions[1,2], Leading to the universality and reliability of the conclusions are affected. Because the construction of theoretical models and the empirical test have certain subjectivity and limitations, it is difficult to fully and accurately reflect the actual process and effect of digital transformation. The disadvantage of this method is that the acquisition and processing of big data may be affected by many factors, leading to the accuracy and reliability of the conclusions. The acquisition and processing process of big data is relatively complex and easy to be influenced by many factors, while the fixed-effect model of panel data also has some limitations. In this paper, more accurate and comprehensive data sources and processing methods are adopted, which can more accurately reflect the actual impact of digital government construction on the digital transformation of enterprises. Although the study of Hu Jinyan et al. has discussed the impact of digital government construction on enterprise performance[3]. However, its disadvantage is that it mainly focuses on the single dimension of public data opening, and does not fully consider the diversity and complexity of digital transformation. Limitations may result from an incomplete understanding of the digital transformation process, leading to certain limitations on the application scope of the conclusions. In contrast, although the research of Wu Jie et al. starts from the two dimensions of digital depth and breadth[4], But relying on text mining methods for data acquisition and processing may be restricted by the subjectivity and completeness of text content. In speaking, this paper combines a variety of data sources, the construction of more rigorous theoretical model and the introduction of more control variables to more accurately capture the dynamic and non-linear relationship in the process of enterprise digital transformation, so as to provide a more in-depth and reliable analysis conclusion for the research of enterprise digital transformation.

2 THE IMPACT OF ENTERPRISE DIGITAL TRANSFORMATION ON ENTERPRISE PERFORMANCE

2.1 Variable Interpretation

Refer to existing studies[5-8], This paper controls the factors that may affect the digital transformation of enterprises from the city level and the enterprise level. Enterprise level control variables include: leverage ratio, final total liabilities / total assets, cash ratio, the final cash and cash equivalent balance / total assets, enterprise age, with the observation

year (2023) -IPO year, assets, measured by the end of the number of natural assets, equity nature (SOE), state-owned enterprises value of 1, non-state-owned enterprises value 0, audit opinions, if the company's current financial report is issued by the standard audit opinion, the opinion value is 1, otherwise 0, the board of directors (board), with the number of the board of directors. The control variables at the city level include: industrial structure, measured by the proportion of the tertiary industry in GDP (%), the level of opening to the outside world: measured by the actual foreign investment, and measured by the economic development level (lnGDPper) from the per capita GDP. The specific variables are shown in Table 1:

Table 1 Variable Declaration

Type Of Variable	Variable Symbol	Variable Name	Explain
Explained Variable	ROE	Enterprise Performance	Return On Total Assets
	Dt	Digital Transformation Of Enterprises	Digital Technology Application
	Lev	Leverage Ratio	Total Ending Liabilities / Total Assets
	Cash	Cash Ratio	Closing Balance Of Cash And Cash Equivalents / Total Assets
	Lnasset	Asset Size	Natural Logarithm Of The Total Assets At The End Of The Year
	Age	Enterprise Age	Years Of Listing = Observation Year (2023) -Ipo Year
Controlled Variable	Soe	Nature Of Stock Rights	The Value Of State-Owned Enterprises Is 1, And That Of Non-State-Owned Enterprises Is 0
	Opinion	Audit Opinion	For The Standard Audit Opinion, Then Opinion Assigns 1, Otherwise 0
	Board	Board Size	Number Of Board Members
	Struct	Industrial Structure	The Tertiary Industry Accounts For (%) In Gdp
	Trade	Open To The Outside World	Actual Foreign Investment
	Lngdpper	Economic Development Level	Per Capita Gdp

2.2 Data Source and Processing

In this paper, China's A-share listed enterprises from 2012 to 2023 are selected as empirical regression samples. The relevant data of the sample enterprises are from the database of China Tai'an (CSMAR) and the National Bureau of Statistics, and the government data are from the official website of the Chinese provincial government. In terms of basic data, this paper deleted the sample of enterprises with delisting, ST, finance (including banking, securities, insurance, etc.), listing less than 2 years after listing and seriously missing main variables in the sample period. In order to avoid the impact of extreme values, this paper conducts bilateral 1% tail reduction of continuous variables.

2.3 Model Building

In order to test the impact of enterprise digital transformation on enterprise performance, the following basic regression model is constructed:

$$ROE_{i,t} = \beta_0 + \beta_1 DT_{i,t} + \beta_2 Controls_{i,t} + \varepsilon_{i,t} \quad (1)$$

Among, i on behalf of the enterprise, t representative year, $ROE_{i,t}$ indicates return on total assets in year t , that is, enterprise performance. $\beta_1 DT_{i,t}$ represents the degree of digital transformation of the i enterprise in year t . $Controls_{i,t}$ represents the above series of control variables. These control variables are designed to capture other factors that may have effects on business performance to ensure the accuracy of the study results. $\varepsilon_{i,t}$ for the random error term, to capture partial variation that is not explained in the model. β_1 reflects the causal relationship between digital government and enterprise performance. According to the above theoretical analysis, the estimated coefficient is expected to be significantly positive.

2.4 Relationship Between Enterprise Performance and Digital Transformation

Through the benchmark regression analysis of the panel data, the following conclusions, as shown in Table 2:

Table 2 Regression Analysis Table

Variable	Return On Equity
Digital Transformation	0.324***
/	(0.011)

Financial Leverage Ratio	-2.248***
/	(0.141)
Asset Size	0.188***
/	(0.035)
Cash Asset Ratio	0.745***
/	(0.177)
Company Age	-0.020***
/	(0.007)
Nature Of Stock Rights	0.130
/	(0.092)
Type Of Audit Opinion	0.913***
/	(0.084)
Board Size	-0.009
/	(0.015)
_Cons	-3.883***
/	(0.742)
Time Fixed Effect	Controlled
Enterprise Fixed Effect	Controlled
N	24738
R2	0.015

Note: Standard errors in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

There is a significant positive correlation between the digital transformation of enterprises (represented by the variable of "digital transformation") and its performance (measured by the "ROE of return on equity"). This discovery means that digital transformation can not only directly affect enterprise performance by improving operational efficiency and reducing operating costs, but also bring more competitive advantages and value growth to enterprises through indirect ways such as innovating business models and improving customer experience. The coefficient of digital transformation is as high as 0.324 and is statistically significant ($p < 0.01$), which further strengthens its important role in the enterprise performance improvement.

In addition to the digital transformation, the regression model considers several other control variables, including financial leverage ratio, asset size, cash asset ratio, age of the company, nature of equity, type of audit opinion and size of the board. The coefficients and significance levels of these variables provide a more comprehensive perspective on the influencing factors of business performance. The negative correlation between financial leverage ratio and return on equity indicates that high debt level may have adverse effects on enterprise performance, while asset size, cash asset ratio and audit opinion type are positively correlated with enterprise performance, showing the positive effects of economies of scale, good cash flow and positive audit opinion on enterprise performance. Although the influence of equity nature on enterprise performance is not statistically significant, there may be differences in governance structure and decision-making efficiency, which may have some impact on the long-term development of the enterprise; the influence of board size on enterprise performance is not statistically significant. However, an efficient, professional board is essential for the strategic decisions, risk management and long-term development of the enterprise. Based on this, enterprises should pay attention to the professionalism and diversity of their members when building the board of directors to improve the decision quality and efficiency of the board of directors.

3 THE ROBUSTNESS TEST OF THE RELATIONSHIP BETWEEN ENTERPRISE DIGITAL TRANSFORMATION AND ENTERPRISE PERFORMANCE

3.1 Model Building

To verify the reliability of the benchmark regression results, the robustness test was conducted from the perspective of variable hysteresis. Enditary problems are common challenges in empirical research, especially there may be a two-way causal relationship between digital transformation (DT) and company performance: on the one hand, digital transformation may improve enterprise operational efficiency and improve performance; on the other hand, high-performance enterprises may have more resources to invest in digital transformation. To alleviate this endogeneity problem, this paper adopts the method of lagging phase one core explanatory variable to construct a model for testing.

In the robustness test, the core explanatory variable "digital transformation" was replaced with its lag phase one (1. digital transformation), and other control variables and fixed effects setting were consistent with the benchmark model. Through lagging processing, the mutual influence of digital transformation and performance can be partially eliminated, and the sustainability of digital transformation effect can be tested. If the lag variable is still significantly positive, it indicates that the improvement effect of digital transformation on performance has time continuity, and the benchmark results are not seriously endogenous interference.

3.2 Conclusion of the Robustness Test

The model results are shown in Table 3:

Table 3 Results Table for the Robustness Test

Variable	Return On Equity Robustness Test (Lag: 1 Period)
Digital Transformation (Lag: 1 Phase)	0.289*** (0.125)
Financial Leverage Ratio	-2.341*** (0.149)
Asset Size	0.186*** (0.037)
Cash Asset Ratio	0.853*** (0.187)
Company Age	-0.016** (0.007)
Nature Of Stock Rights	0.135 (0.097)
Type Of Audit Opinion	0.908*** (0.086)
Board Size	-0.008 (0.016)
_Cons	-3.879*** (0.792)
Time Fixed Effect	Controlled
Enterprise Fixed Effect	Controlled
N	23623
R ²	0.016

Note: Standard errors in parentheses * p < 0.1, ** p < 0.05, *** p < 0.01

From the model goodness of fit, the benchmark regression model and robustness test model adjustment r^2 values were 0.015 and 0.016, respectively, little difference occurred, indicating that the robustness test did not significantly change the goodness of fit of the model. This demonstrates the robustness and reliability of the benchmark regression results. As can be seen from table 3, the coefficient of the lagging first-phase digital transition in the model is 0.289 ($p < 0.01$), which is slightly lower than the 0.324 of the benchmark model, but still remains highly significant. This shows that the positive effect of digital transformation on return on equity (roea) is sustainable in the time dimension, and the core conclusion has not been substantially changed by the lagging adjustment of variables, that is, the previous digital transformation efforts will continue to have a positive impact on enterprise performance in the subsequent period. through the robustness test of the lag-phase variable method, this paper found that the coefficient direction and significance of the core explanatory variable "Digital transformation" Were consistent in the benchmark regression and the robustness test, and the direction and significance of the coefficients of most control variables also remained stable. this indicates that the benchmark regression results in this paper are robust and reliable, and that the digital transformation has a significant and robust positive impact on enterprise performance.

4 CONCLUSION

Based on the perspective of data elements, this paper deeply discusses the complex relationship between enterprise digital transformation and enterprise performance. Through the empirical analysis, the following main conclusions are drawn: the digital transformation of enterprises has a significant positive impact on their performance. Specifically, digital transformation has significantly improved the return on equity of enterprises by optimizing business processes, improving operational efficiency and innovation ability. The improvement of enterprise innovation ability by digital transformation is mainly reflected in the following aspects: first, by introducing advanced digital technologies and tools, enterprises can carry out research and development activities more efficiently and shorten the market time of products; second, digital technology promotes the internal knowledge sharing and communication and improves the innovation collaboration ability of the team; third, digital transformation helps enterprises to timely capture market trends and customer needs, so as to drive the continuous innovation of products and services. In addition, control variables such as financial leverage ratio, asset scale, cash asset ratio also have a significant impact on enterprise performance, further verifying the view that enterprise performance is affected by multiple factors.

This paper not only confirms the key role of digital transformation in improving enterprise performance, but also provides a useful reference for policy makers and business practitioners. With the continuous development of information technology, enterprises should actively embrace digital transformation, enhance competitiveness through technological innovation, and achieve sustainable development. In the future, the government should also step up efforts to promote the construction of digital government, provide a good policy environment and support system for the digital transformation of enterprises, and jointly promote the high-quality development of the economy and society.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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