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디지털 혁신이 중국 상장기업의 성과에 미치는 영향에 관한 연구

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Research on the Impact of Digital Transformation on the Performance of Chinese Listed Enterprises

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요 약 기업의 디지털 혁신은 새로운 비즈니스 모델이자 전략적 사고이다. 경제대국인 중국의 경제상황은 세계경제에 많은 영향이 미치게 된다. 중국의 사회주의적 시장경제 하에서 주도적인 경제주체로서 중국의 상장기업들은 중국 경제성장의 중요한 원동력이 되고 있다. 이를 바탕으로 본 논문은 2015년부터 2022년까지 중국 상하이 및 선전 주식시장의 A주 상장기업 관련 데이터를 연구 표본으로 고정효과 회귀모형을 구축하고, 실증분석을 통해 상장기업의 디지털 혁신이 비즈니스 성과에 미치는 영향에 관하여 연구하였다. 디지털 혁신은 기업의 비즈니스 성과를 크게 증가하도록 촉진할 수 있는 것으로 분석되었다. 기업의 규모가 다른 그룹에서는 디지털 혁신이 비즈니스 성과에 미치는 영향이 다르게 나타났다. 연구결과, 디지털 혁신이 기업의 비즈니스 성과에 미치는 영향으로 기업 비용이 절감되고 있는 것으로 분석되었다.

주제어 : 디지털 혁신, 경영 실적, 운영비용, 중국 상장기업, 기업규모

Abstract Enterprise digital transformation is a brand new business model and strategic thinking. As the world's second largest economy, China's economic situation affects the development of the world economy under the background of globalization. As an active market subject under the socialist market economy with Chinese characteristics, Chinese listed enterprises are an important driving force for China's economic growth. Based on this, this paper uses the relevant data of A-share listed enterprises in Shanghai and Shenzhen stock markets in China from 2015 to 2022 as research samples, constructs A fixed effect regression model, and explores the impact of digital transformation of listed enterprises on business performance through empirical analysis. It is found that digital transformation can significantly promote the increase of business performance of enterprises. In enterprises of different sizes, digital transformation has different impacts on business performance. Finally, this paper finds that the impact of digital transformation on business performance is achieved by reducing enterprise costs.

Key Words : Digital Transformation, Business performance, Operating Costs, Chinese listed enterprises, Enterprise Scale.

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1. Introduction

With the continuous progress and innovation of information technology, new technologies such as cloud computing, blockchain, artificial intelligence and data mining have gradually penetrated into various industries, and digital transformation has become the core issue facing the development of today's listed enterprises. Based on this, governments have introduced policies to support the development and application of the digital industry, and actively promote the new economic model represented by the upgrading of data-driven industries. According to the 2022 Global Digital Economy White Paper released by the China Academy of Information and Communications Technology, by the end of 2021, the digital economy added value of 47 countries in the world has reached 38.1 trillion US dollars, an increase of 15.6% compared with 2020, accounting for 45.0% of the overall GDP. This data shows that the digital economy has not only made a significant contribution to global economic growth, but also provided strong support for economic recovery under the impact of the epidemic. The rapid development of the digital economy has played a great role in promoting employment and enhancing competitiveness. In recent years, China has increased investment in scientific and technological innovation and industrial transformation, promoted digital transformation and upgrading, and achieved remarkable results. China Digital Economy White Paper 2022 points out that the current digital economy scale of Chinese enterprises is as high as 7.1 trillion US dollars, accounting for 39.4% of GDP, ranking second in the world.

Chen Zhongfei et al.[1] found that digital transformation can reduce corporate debt costs by alleviating information asymmetry . For a long time, corporate performance has had a non-negligible impact on the stock price trend of listed companies and the sustainable development ability of the companies themselves[2]. Zheng Lili and Liu Chen(2021)[3] pointed out that under the background of policy guidance and the comprehensive impact of the COVID-19 epidemic on the economy, companies in the period of digital transformation have relatively better performance than traditional companies. It has become an indisputable fact that digital transformation can significantly improve enterprise labor productivity[4]. Therefore, this paper uses A-share listed enterprises in Shanghai and Shenzhen as research samples, and uses 2015-2022 as the research period to explore the impact of digital transformation of listed enterprises on business performance through empirical testing.

2. Theoretical background

Digital transformation means that enterprises make use of advanced digital technologies such as big data and industrial Internet to carry out comprehensive reform and innovation on their organizational structure, business process, production and business activities, aiming to enhance their core competitiveness and inject new vitality into their innovation activities[5]. When reviewing the existing research literature, it is found that scholars have conducted in-depth exploration on how digital transformation affects enterprise performance from various perspectives.

Chen Jing and Kong Lingyi[6] took 100 listed manufacturing enterprises on the main board of Shanghai and Shenzhen Stock Exchange from 2019 to 2021 as research samples, calculated enterprise performance by DEA method, and found that among listed manufacturing enterprises, digital transformation has a significant negative impact on the business performance of listed manufacturing enterprises, and this impact is more significant in non-state-owned enterprises. Xiao Peng[7] found that digital transformation can have a significant positive impact on the financial performance of enterprises, and this impact is different under different innovation capabilities and different levels of internal control. Shang Hangbiao et al.[8] from the perspective of optimal differentiation theory, found that there is an inverted U-shaped relationship between the difference degree of digital transformation of listed enterprises and the business performance of listed enterprises, and the intensity of market competition faced by listed enterprises will make the inverted U-shaped curve steeper.

Qi Shidong and Cai Chengwei[9] adopted the text mining method to construct an index to measure the degree of digitalization of enterprises based on the

annual reports of listed non-high-tech manufacturing companies in China from 2011 to 2018, and investigated the multiple influences of digitalization degree on enterprise performance and their mechanisms based on the resource-based view. The results show that firm size can strengthen the impact of digitalization degree on firm performance, but digital support and subsidies can weaken the impact of digital transformation on firm performance. Wang Haihua et al.[10] analyzed the relationship between digital transformation and enterprise performance from four dimensions of digital technology, digital strategy, digital capability and digital culture based on 59 empirical literatures, 75 effect values and 44,316 independent samples and applied meta-analysis method. The analysis finds that the relationship between digital technology, digital capability and digital strategy on firm performance is all regulated by moderating factors such as firm size, industry category and measurement method, but there are differences. It is also found that cultural backviolence can also regulate the relationship between firm digital transformation and firm performance.

He Fan and Liu Hongxia[11] also obtained similar results by using A-share data from 2012 to 2017, and found that digital transformation significantly improved the economic benefits of real enterprises by reducing costs, improving asset use efficiency and enhancing innovation ability.Bai Fuping et al.[12] took Chinese A-share listed manufacturing enterprises from 2012 to 2019 as research samples, based on structural equation model test, and found that digital transformation can improve the financial performance of enterprises by reducing production costs, improving the efficiency of human capital use, and increasing the output of technological innovation. Yang Yin and Chen Phil[13] took A-share listed companies in the pharmaceutical manufacturing industry in Shanghai and Shenzhen from 2011 to 2021 as research samples, and found that the digital transformation of the pharmaceutical manufacturing industry is significantly positively correlated with enterprise performance, that is, digitalization can promote the improvement of enterprise performance. In addition, digital transformation improves the operation capability of enterprises by reducing the management expense rate, improving the operation efficiency and reducing the operation cost, thus enhancing the performance of enterprises.

It is found that although the academic circle has conducted a certain degree of research on the impact of digital transformation of listed enterprises on business performance, there is no accurate conclusion on whether the impact of digital transformation of listed enterprises on business performance is positive or negative. This paper attempts to explore the impact of digital transformation of listed enterprises on business performance by using listed enterprises in China as research samples. In addition, this paper uses the word frequency of large data, cloud computing and artificial intelligence in the annual reports of listed companies as the measurement indicators of the digital transformation of listed enterprises, and discusses the impact of digital transformation on the business performance of enterprises, which is helpful for the academic circle to further deepen the research on the economic consequences related to the digital transformation of listed enterprises.

3. Research hypothesis

In the era of information technology, investors pay more and more attention to the annual reports of listed companies [14]. In the annual report, listed companies discuss the impact of digital transformation on their growth, share the strategic layout of the company in the process of digital transformation, and describe the main measures taken by the company and the results achieved in the process of transformation. This paper studies the relationship between enterprise digital transformation and enterprise performance from a financial perspective. From a logical point of view, the higher the transparency of an enterprise's information, the more likely it is to be concerned and supervised by the public, so it will pay more attention to the standardization of operation, which will have a positive effect on enterprise performance [15]. Good financial information helps to enhance corporate value, and a better corporate performance means that it can carry out financing activities more effectively, and obtain widespread praise from shareholders and the society[16]. Based on this, this paper proposes research hypothesis H1:

H1: The digital transformation of Chinese listed enterprises can have a significant positive impact on business performance.

Digital transformation will affect the business model of listed enterprises, making enterprises pay more attention to production management and cost control, and take these two as one of the main indicators to measure the financial performance of enterprises[17]. Digital transformation can not only increase market share, but also help improve financial performance. The introduction of digital technologies into daily operations helps companies better optimize their production processes, reducing labor and manufacturing overhead by reducing raw material and labor costs [18]. In addition, digital transformation can also improve the organizational structure and business processes of enterprises, so that enterprises can maintain an advantage in the fierce competition[19].Cost control plays a key role in the daily operation of enterprises, and reducing the stickiness of expenses is one of the effective ways to control costs [20]. It is found that the digital transformation has an obvious inhibition effect on the cost stickiness of listed enterprises, thus improving the overall efficiency of cost control. With the emergence of digital transformation technologies in the public eye, the application of new technologies has created lower labor costs, higher operational flexibility, and shorter product delivery cycles for enterprises. However, listed enterprises of different sizes in China have different digital transformation costs. According to the marginal theory, the smaller the listed enterprises, the greater the improvement of their performance may be brought by digital transformation. Based on this, this paper proposes research hypothesis H2 and research hypothesis H3:

H2: Among listed enterprises of different sizes in China, the impact of digital transformation on business performance is different.

H3: The impact of digital transformation on business performance of listed enterprises in China is achieved by reducing enterprise costs.

4. Research design

4.1 Sample selection and data source

In order to verify the impact of the digital transformation of listed enterprises on the business performance of listed enterprises in China, this paper selects A-share listed enterprises from 2015 to 2022 as research samples and conducts empirical analysis through Stata16.0 software. In order to ensure the accuracy of the research conclusions, the research data used in this paper are processed as follows: (1) Due to the strong industry characteristics of the banking and financial industries, in order to avoid the possible biased impact of the banking and financial industries on the research results, the relevant data of the banking and financial industries are excluded in this paper; (2) The abnormal listed enterprises usually have poor business performance. In order to avoid the influence of such samples on the results of this study, ST and PT listed enterprises are excluded in this paper; (3) Enterprises with missing data samples cannot be included in the regression model, so this paper also excluded some enterprises with missing data samples; (4) In order to avoid the influence of extreme outliers on the research conclusions of this paper, this paper also conducted 1% Winsor tail reduction for all continuous data ; Finally, we get 25,091 annual data research samples of listed enterprises. The relevant data of listed companies used in this paper are from CSMAR Guotai 'an database.

4.2 Variable definition

According to formula 1, the explained variable listed enterprise performance (ROA) in this paper is measured by the net profit rate of total assets, and the explained variable Digital transformation (Digital) is measured by the natural logarithm of the number of word frequency occurrences of big data, cloud computing, artificial intelligence and blockchain in listed enterprises' annual reports plus 1. The intermediate variable operating Cost (Cost) is measured by dividing operating cost by operating revenue. In addition, this paper also determined the relevant control variables, specifically: listed enterprise Size (Size), asset-liability ratio (Lev), price-to-book ratio (MB), listed years (Age), Board size (Board), proportion of independent directors (Indep), profitability (Net).

4.3 Model building

According to the subject of this study and the determined relevant variables, this paper constructs the following regression model:

$$ROA_{i,t}=a_0+a_1Digital_{i,t}+a_2Size_{i,t}+a_3Lev_{i,t}+a_4MB_{i,t}+a_5Age_{i,t}+a_6Board_{i,t}+a_7Indep_{i,t}+a_8Net_{i,t}+\varepsilon_{i,t} \quad \text{(Formula 1)}$$

5. Empirical analysis

5.1 Descriptive statistics

According to the descriptive statistical results in Table 1, the maximum value of ROA is 1.408, the minimum value is -3.164, and the average value is 0.033, indicating that there are certain differences in the performance of the research samples selected in this paper. There are enterprises with good profitability and enterprises with poor performance or even losses in the selected research samples. The maximum value of Digital is 6.103, the minimum value is 0, and the average value is 0.802, indicating that there are some differences in the digital transformation of enterprises in the research samples selected in this paper, and there are still many enterprises that have not started digital transformation. The other control variables are basically consistent with the existing references, so we will not repeat them in detail.

Table 1 Descriptive statistics

VarName	Obs	Mean	SD	Median	Min	Max
ROA	25091	0.033	0.085	0.036	-3.164	1.408
Digital	25091	0.802	1.107	0.000	0.000	6.103
Size	25091	22.349	1.348	22.165	15.979	28.636
Lev	25091	0.426	0.202	0.417	0.010	0.998
MB	25091	2.216	5.178	1.640	0.609	729.395
Age	25091	11.321	8.048	9.000	1.000	32.000
Board	25091	2.109	0.198	2.197	1.099	2.890
Indep	25091	0.378	0.057	0.364	0.143	0.800
Net	25091	0.870	0.336	1.000	0.000	1.000

5.2 Correlation analysis

As can be seen from the correlation analysis results in Table 2, there is a significant positive correlation between enterprise Digital transformation (Digital) and enterprise business performance (ROA), with a correlation coefficient of 0.042, which is statistically significant at 1% level. Hypothesis H1 is verified to a certain extent, but the specific relationship between Digital transformation (Digital) and business performance (ROA) still needs to be tested by regression. From the table of phase relations, it can be found that the correlation coefficient between variables is small, there is no multicollinearity, and regression analysis can be carried out.

5.3 Baseline regression results

Table 3 shows the regression results between enterprise Digital transformation (Digital) and enterprise business performance (ROA), in which (1) is listed as the regression results without control variables, and (2) is listed as the regression results with control variables. It is found from the regression results that digital has a significant positive impact on ROA when there are no control variables. The coefficient was 0.005 and was statistically significant at 1% level. After the addition of relevant control variables, Digital still has a significant positive effect on ROA, but the coefficient is reduced to 0.003, indicating that Digital always has a significant positive effect on ROA regardless of whether there are control variables, and all pass the statistical significance test at the 1% level. It shows that enterprises' digital

Table 2 Correlation analysis

	ROA	Digital	Size	Lev	MB	Age	Board	Indep	Net
ROA	1								
Digital	0.042***	1							
Size	0.044***	0.002	1						
Lev	-0.287***	-0.040***	0.468***	1					
MB	0.028***	-0.000	-0.176***	-0.063***	1				
Age	-0.123***	-0.120***	0.388***	0.315***	-0.014**	1			
Board	0.015**	-0.048***	0.264***	0.127***	-0.051***	0.183***	1		
Indep	-0.021***	0.035***	0.002	0.003	0.017***	-0.024***	-0.563***	1	
Net	0.580***	0.011*	0.089***	-0.187***	-0.015**	-0.090***	0.039***	-0.031***	1

***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively

transformation has a significant positive impact on business performance, and hypothesis H1 is verified. Ind and Year indicate that the annual and industry effects are controlled respectively.

Table 3 Baseline regression results

	(1)	(2)
	ROA	ROA
Digital	0.005 * * *	0.003 * * *
	(8.927)	(7.221)
Size		0.009 * * *
		(20.917)
Lev		-0.096 * * *
		(-37.446)
MB		0.001 * * *
		(8.884)
Age		-0.001 * * *
		(-9.230)
Board		-0.000
		(-0.063)
Indep		-0.010
		(-1.121)
Net		0.133 * * *
		(99.968)
_cons	0.028 * * *	-0.227 * * *
	(40.686)	(-21.936)
Ind	Yes	Yes
Year	Yes	Yes
N	25091	25091
R2	0.021	0.391

***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively, with regression T-values in parentheses

5.4 Regression results by enterprise size

In order to test hypothesis H2, the grouping regression method is used in this paper. The grouping variable is enterprise size, and the samples are grouped according to the annual industry median of enterprise size, and the samples are divided into large enterprises and small enterprises. The regression results are shown in Table 4, where column (1) is the regression result of large enterprises, and column (2) is the regression result of small enterprises. It can be found from the regression results that the regression coefficient of Digital on ROA in large-scale enterprises is 0.001, which is much smaller than that of 0.004 in the regression group of small-scale enterprises. This indicates that the impact of Digital transformation on ROA varies with the size of enterprises. That is, the regression coefficient is larger and the impact is greater in small-scale enterprises. This paper assumes that H2 is verified.

Table 4 Regression results grouped by firm size

	(1)	(2)
	ROA	ROA
	Large-scale enterprise	Small scale businesses
Digital	0.001 * * *	0.004 * * *
	(3.613)	(5.010)
Size	0.007 * * *	0.008 * * *
	(15.073)	(7.297)
Lev	-0.098 * * *	-0.084 * * *
	(-36.784)	(-20.619)
MB	0.012 * * *	0.001 * * *
	(33.920)	(5.044)
Age	-0.000 * * *	-0.001 * * *
	(-3.187)	(-6.702)
Board	-0.002	0.000
	(-0.932)	(0.091)
Indep	-0.009	-0.011
	(-1.172)	(-0.652)
Net	0.106 * * *	0.147 * * *
	(77.994)	(71.581)
_cons	-0.190 * * *	-0.241 * * *
	(-16.433)	(-8.820)
Ind	Yes	Yes
Year	Yes	Yes
N	11498	13593
R2	0.535	0.366

***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively, with regression T-values in parentheses

5.5 Intermediate effect test

In order to verify hypothesis H3, according to the method of Wen Zhonglin et al.[21], the mediation effect test was conducted using the three-step mediation effect test procedure.and the intermediary variable is operating Cost (Cost). The specific regression results are shown in Table 5, where column (1) is the result of Digital's regression to ROA, and column (2) is the result of Digital's regression to cost. Column (3) is the regression result of Digital and Cost on ROA. The regression results show that Digital has a significant negative impact on Cost, indicating that enterprise Digital transformation (Digital transformation) promotes business performance (ROA) by reducing business Cost (Cost). Assuming that H3 is verified, enterprise operating Cost(Cost) plays a negative mediating effect in the impact of enterprise Digital transformation(Digital transformation) on enterprise operating performance (ROA).

Table 5 Regression results of intermediation effect

	(1)	(2)	(3)
	ROA	Cost	ROA
Digital	0.003 * * *	-0.007 * * *	0.003 * * *
	(7.221)	(-6.223)	(6.332)
Cost			-0.062 * * *
			(-24.709)
Size	0.009 * * *	-0.006 * * *	0.008 * * *
	(20.917)	(-5.961)	(20.225)
Lev	-0.096 * * *	0.317 * * *	-0.077 * * *
	(-37.446)	(49.206)	(-28.855)
MB	0.001 * * *	-0.002 * * *	0.001 * * *
	(8.884)	(-9.606)	(7.479)
Age	-0.001 * * *	0.003 * * *	-0.000 * * *
	(-9.230)	(16.436)	(-6.740)
Board	-0.000	-0.015 * *	-0.001
	(-0.063)	(-2.167)	(-0.402)
Indep	-0.010	-0.054 * *	-0.014
	(-1.121)	(-2.325)	(-1.498)
Net	0.133 * * *	-0.070 * * *	0.128 * * *
	(99.968)	(-21.172)	(97.008)
_cons	-0.227 * * *	0.806 * * *	-0.177 * * *
	(-21.936)	(31.090)	(-17.023)
Ind	Yes	Yes	
Year	Yes	Yes	
N	25091	25091	25091
R2	0.391	0.239	0.405
***, **, and * are statistically significant at 1%, 5%, and 10% levels, respectively, with regression T values in brackets			

5.6 Robustness test results

In order to ensure the robustness of the regression results and research conclusions in this paper, this paper adopts the methods of business performance and digital transformation variables to conduct the robustness test, and in order to control potential endogenous problems, the method of one-stage lag regression of explanatory variables is also used to ensure the robustness of the conclusions.

5.6.1 Replace business performance variables

In order to ensure the robustness of the research conclusion in this paper, ROE was used to replace ROA, and relevant data was brought into the model for re-regression. The regression results are shown in Table 6. From the regression results in Table 6, it can be found that after ROE was used to replace ROA, Digital still had a significant positive impact on ROE, and the conclusion was consistent with the previous one. It shows that the conclusions of this paper are robust.

Table 6 Robustness test of replacement variables - ROE

	(1)
	ROE
Digital	0.032 * *
	(2.524)
Size	0.078 * * *
	(6.686)
Lev	-0.940 * * *
	(-12.883)
MB	0.000
	(0.165)
Age	0.001
	(0.417)
Board	-0.124
	(-1.583)
Indep	-0.462 *
	(-1.762)
Net	0.617 * * *
	(16.365)
_cons	-1.481 * * *
	(-5.033)
Ind	Yes
Year	Yes
N	25091
R2	0.026
***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively, with regression T-values in parentheses	

5.6.2 Replace enterprise digital transformation variables

The digital transformation variables of listed enterprises used above are continuous variables. In order to ensure the robustness of the research conclusion, this paper constructs virtual variables of enterprise digital transformation according to whether listed enterprises have carried out digital transformation. The samples with relevant word frequency appearing in listed enterprises' annual reports are set to 1, while those that have not appeared once are not set to 0, and a new variable D_Digital is constructed. The regression results are shown in Table 7. From the regression results in Table 7, it can be found that D_Digital still has a significant positive impact on ROA, which is consistent with the previous conclusions, indicating that the research conclusions in this paper are robust.

Table 7 Robustness test of substitution variables – D_Digital

	(1)
	ROA
D_Digital	0.004 * * *
	(4.661)
Size	0.009 * * *
	(21.164)
Lev	-0.096 * * *
	(-37.418)
MB	0.001 * * *
	(8.877)
Age	-0.001 * * *
	(-9.395)
Board	-0.000
	(-0.116)
Indep	-0.010
	(-1.095)
Net	0.133 * * *
	(99.881)
_cons	-0.229 * * *
	(-22.066)
Ind	Yes
Year	Yes
N	25091
R2	0.390

***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively, with regression T-values in parentheses

5.6.3 Regression results lag one phase

In order to control potential endogeneity problems in the research content of this paper, the explanatory variable is reregressed with a one-stage lag, and the regression results are shown in Table 8. From the regression results in Table 8, it can be found that Digital still has a significant positive impact on ROA after regression with a one-stage lag on the explanatory variable Digital, and the conclusion is consistent with the previous one. Indicating the robustness of the research conclusions in this paper.

Table 8: Delayed first-order robustness test

	(1)
	ROA
L.Digital	0.002 * * *
	(4.697)
Size	0.011 * * *
	(23.938)
Lev	-0.102 * * *
	(-34.873)
MB	0.004 * * *
	(15.103)
Age	-0.001 * * *
	(-7.744)
Board	-0.001
	(-0.338)
Indep	-0.018 *
	(-1.717)
Net	0.132 * * *
	(89.233)
_cons	-0.289 * * *
	(-24.120)
Ind	Yes
Year	Yes
N	20144
R2	0.398

***, **, and * are statistically significant at the 1%, 5%, and 10% levels, respectively, with regression T-values in parentheses

6. Research Conclusions

The results of the study of the transformation of Chinese listed enterprises in Chinese listed enterprises are found to have a significant positive effect on the performance of enterprises, and the implementation of digital transformation can increase the performance of the enterprise, and the digital transformation of the digital transformation of the enterprises is different, that the digital transformation of the small enterprises in small enterprises is more influential in the performance of the enterprise. In addition, the study also found that the influence of enterprise number transformation on enterprise performance is achieved by reducing the operating cost of enterprises, which has a good reference price for the transformation of Chinese listed enterprises, reducing the operating cost of enterprises and increasing the performance of enterprises. The above conclusion is still established after replacing the number of enterprises, the performance indicators of the enterprise and the robustness of the return of the two phases of the interpretation variable.Based on this, this paper puts forward the following suggestions:

First, strengthen policy support for enterprises' digital transformation. Policy formulation should focus on supporting the digital needs of enterprises at different stages, establishing sound digital infrastructure and standards, and ensuring data interoperability and technology sharing among industries. Provide support for enterprises to easily and quickly acquire and apply digital technologies, promote the expansion of the initial digital breadth, encourage

enterprises to apply digital technologies in depth to maintain sustainable competitiveness, and provide financial and technical support, including financial subsidies and tax incentives.

Secondly, differentiated digital transformation strategies should be adopted. Managers should reasonably plan the digital transformation path according to the development stage and industry characteristics of the enterprise itself. In the early stages of digital transformation, focus on promoting the wide application of digital technologies in all aspects of operations to improve operational efficiency and market response speed; With the deepening of the digital process, enterprises should pay more attention to the depth of technology application, mining the value of data, optimizing business processes, and improving innovation ability and customer experience. By combining depth and breadth, companies can achieve higher performance and competitive advantage in digital transformation. At the same time, it is necessary to strengthen cost management and improve the efficiency of asset use to promote the success of educational transformation, introduce advanced digital tools and systems, and improve the efficiency of data management and business processes. Actively train employees to improve their digital skills for long-term sustainability.

At present, this paper uses the index constructed by the word frequency analysis method to measure the enterprise digital transformation, which has certain limitations. If the main business field of an enterprise is digital-related, the probability of relevant word frequency appearing in its annual report will be very high. However, due to the availability of sample data, this paper can only measure the degree of enterprise digital transformation in this way, which is also the limitation of this study, and also points out the research direction for the subsequent research of this paper. It is constantly searching for what indicators can be used to better measure the degree of digital transformation of enterprises.

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