Science Journal of Business and Management
2023; 11(1): 1-6
http://www.sciencepublishinggroup.com/j/sjbm
doi: 10.11648/j.sjbm.20231101.11
ISSN: 2331-0626 (Print); ISSN: 2331-0634 (Online)

Impact of Digital Transformation on Enterprise Performance with Background of Big Data

Yuting Liu*, Liangcan Liu

The Department of Business Administration, Guizhou University of Finance and Economics, Guiyang City, China

Email address:
18856221219@163.com (Yuting Liu), 66391409@qq.com (Liangcan Liu)

*Corresponding author

To cite this article:
Yuting Liu, Liangcan Liu. Impact of Digital Transformation on Enterprise Performance with Background of Big Data. *Science Journal of Business and Management*. Vol. 11, No. 1, 2023, pp. 1-6. doi: 10.11648/j.sjbm.20231101.11

Received: January 12, 2023; **Accepted**: January 31, 2023; **Published**: February 6, 2023

Abstract: In the 21th century, ushered in the fourth industrial revolution, promoted the development of digital technology, the advent of intelligent technology, so that the world economy is reinvigorated. Digital economy is developing at an unprecedented speed, with a wide range of radiation and an unprecedented depth of influence. Even in this context, as the main body of industrial transformation and upgrading, enterprises still face more uncertainty and complexity of the environment. In view of this situation, the Chinese government closely follows the pace of The Times, proposes the construction of "digital China", and takes digitization as the leading force in the development of digital economy. Letting digitization lead Chinese enterprises to achieve qualitative growth. Based on the above background, this paper studies the impact of Chinese enterprises' digital transformation on enterprise performance. From the list of A-share companies from 2010 to 2020, we collected the keywords of "digital transformation (DT)" in the annual reports of enterprises. With a quantitative analysis method and empirical analysis, digital transformation's impact on enterprise performance is verified. It is concluded that DT has a positive effect on improving enterprise performance. Innovation capability shows the positive effect of DT on the performance or enterprises. The study result shows a way how to carry out DT of companies.

Keywords: Big Data Background, Digital Transformation, Enterprise Performance, Innovation Ability

1. Introduction

The new round of scientific and industrial revolution is gaining momentum in the world, accompanied by industrial development, the suggestions of the CPC Central Committee and the guidelines of the Committee, people are paying more attention to the enterprise's digital transformation (DT). As the tide of digital economy approaches in an all-round way, DT has become an important practice for enterprises to thrive. Based on digital technology, digital products and digital platform infrastructure, DT is a process of realizing individual, organizational and industrial transformation at multiple levels [1]. However, due to the impact of the epidemic, the market development prospect is not good, leading to a problem for enterprises' survival. In existing studies, He et al. [2] deconstructed DT into two dimensions and empirically studied their positive impact on enterprise performance based on questionnaire survey data. Thus, enterprises have to carry out DT, but the relevant theoretical research is far behind the practice. Therefore, in the context of big data, enterprises carry out DT and innovate resource utilization capacity, thus promoting the improvement of enterprise performance. Although scholars have studied the economic effects of DT, most of them are still in exploration, and theory and demonstration have not yet been formed for the following reasons. First, the mechanism of DT's influence on enterprises is relatively complex, and there is no theoretical framework and model support. Second, the measurement of DT is difficult in measuring and supporting data. Through the literature review, we select the data of listed companies in 2010−2020 Shanghai and Shenzhen A shares. With the data, we study the DT's impact on the performance of the enterprise and the intermediary role of innovation capability.

2. Theoretical Analysis and Research Hypotheses

2.1. Digital Transformation and Business Performance

At present, more and more enterprises respond to the development trend of digital economy and embark on the road of digital transformation. With the development of digitization, big data and intelligent technology also emerge.

Make companies increasingly dependent on the network. Enterprises can get rid of the current predicament and improve economic benefits through DT. According to a questionnaire survey, Hu [3] found that a company's digital transformation affects company performance positively. In response to this result, He et al. [2] hold the same view. Their research shows that the current digital economic policy in China has affected the performance of the DT of physical companies significantly. Guzman and Reverte [4] studied the relevant data of the Bank of Spain from 2000 to 2004 and found that total factor productivity provided a good explanation for the improvement of the market return rate of stocks. Therefore, the following assumption is proposed.

H1: Enterprise digital transformation has a significant effect on enterprise performance.

2.2. Digital Transformation and Innovation Capabilities

At the Fifth Plenary Session of the 19th Central Committee of the CPC, it was clearly stated that, "We should maintain the key position of innovation in building socialism with Chinese characteristics, and not allow core technologies to be controlled by others or face the dilemma of being "stuck". We should support national development with a strategy based on scientific and technological independence," and "we should strengthen the national strategic scientific and technological strength and enhance the technological innovation capacity of enterprises." The response speed and satisfaction degree to different customer needs become the core of attention [5], which greatly enhances the innovation ability of individuals [6]. The innovation and creativity of an enterprise are important to the enterprise's development. The combination of enterprise process digitization, product design, supply chain management, and marketing promote enterprises to improve their innovation capabilities [7]. Digital transformation accelerates enterprise informatization development. Loebbecke et al. [8] pointed out that when digital technology is embedded in enterprises, the operation efficiency of enterprises can be improved to some extent, enabling enterprises to obtain more innovation output results based on the previous R&D and innovation resources, increasing the attractiveness of external investors, and thus improving corporate performance [9, 10]. At present, enterprise digital transformation seems to have become the mainstream, helping enterprises to grasp the wind vane of development. In the era of digital economy, technological upgrading makes the boundaries between enterprise departments unclear and the organizational structure flat, and the response speed and satisfaction degree to different customer demands will become the core of attention [11], greatly improving individual innovation ability [12]. Therefore, the following assumption is proposed.

H2: Digital transformation of enterprises can significantly enhance innovation capabilities.

2.3. Mediating Effect of Innovation Ability

To develop new markets, that is, markets that have not yet been entered, is the key measure for enterprises to achieve high-quality development, optimize and upgrade the industrial structure, and improve innovation ability. In his research, Pan Qingquan [13] borrowed Xiong Bentt's theory and found through empirical research that the innovation ability of enterprises has a direct impact on the improvement of enterprise performance. To be specific, enterprises can improve their innovation ability by obtaining funds through enterprises' own initiative and government support, and thus expand the enterprise scale and promote the development of enterprises by attracting partners. Wu Fei et al. [14] believed that enterprise DT has become an important measure for more enterprises to get rid of difficulties and move towards stable development under the contemporary background. DT reduces information errors. Technological innovation activities require enterprises to continuously invest in innovation resources [15]. According to the combination of technological upgrading and enterprise development needs, digital transformation becomes important to improve the innovation ability of the enterprise [16]. In order to follow the law of the market, not to grow up, always understand the market environment, to meet the demand users enterprises are keen to invest funds in R&D and innovation, which is reflected in the increase of corporate stock trading volume, thus contributing to the continuous rise of corporate financial performance.

H3: Innovation capability mediates between enterprise digital transformation and enterprise performance.

3. Research Design

3.1. Sample Selection

We collect the data from Shanghai and Shenzhen A-share listed companies from 2010 to 2020 and use the following standards to process the data. We used the 1% and 99% quantiles of all continuous variables. A total of 23757 observations were collected. The original data is obtained from the Cathay Pacific (CSMAR) database, and You have obtained the original data.

Cathay Pacific Airways (CSMAR) database information, other relevant information in the relevant annual returns data section from the Shanghai Stock Exchange and Shenzhen Stock Exchange.

3.2. Variable Setting

(1) Explained variable: enterprise performance (TBQ). Business performance (TBQ) refers to an enterprise's ability to gain long-term advantages in market

competition. Tobin Q value is selected as the proxy variable of enterprise performance.

(2) Explanatory variables: digital transformation (DT). Qi and Cai used specific keywords to construct digital-related indicators [17]. Wu searched, matched, and counted the word frequency of the feature words. He then classified and collected the keyword frequency and formed the final total word frequency [12], See Figure 1.

We filter the target through the relevant root. The total word frequency through logarithmic processing is used to represent the index of the degree of DT.

(3) Mediating variable: innovation ability (Patent). The number of applied patents of listed companies from 2010 to 2020 is used as an indicator to measure innovation capability.

(4) Control variables: We select enterprise scale, enterprise age, asset-liability ratio, cash flow, total asset turnover rate, ownership concentration, and board size as control variables. The definition of variables and the methods of calculation.

Table 1. *Variable Definition.*

Variable type	Variable name	Variable symbol	Calculation method
Explained variable	Business Performance	TBQ	Market Cap/Total Assets
Explanatory variables	Digital transformation	DT	Add 1 to the total word frequency of digital transformation vocabulary in the annual report to take the natural logarithm
Mediating variable	Creativity	Patent	Add 1 to the number of patent applications to take the natural logarithm
Control variable	Enterprise size	Size	Natural logarithm of total assets
	Business age	Age	Take the natural logarithm of the number of years the company has been listed
	Assets and liabilities	Lev	Total Liabilities/Total Assets
	Cash flow	Cflow	Net cash flow from operating activities/total assets
	Total asset turnover	Turnover	Operating Income/Total Assets
	Ownership concentration	Pfsh	Number of shares held by the largest shareholder/total number of shares
	Board size	Board	The logarithm of the total number of board members

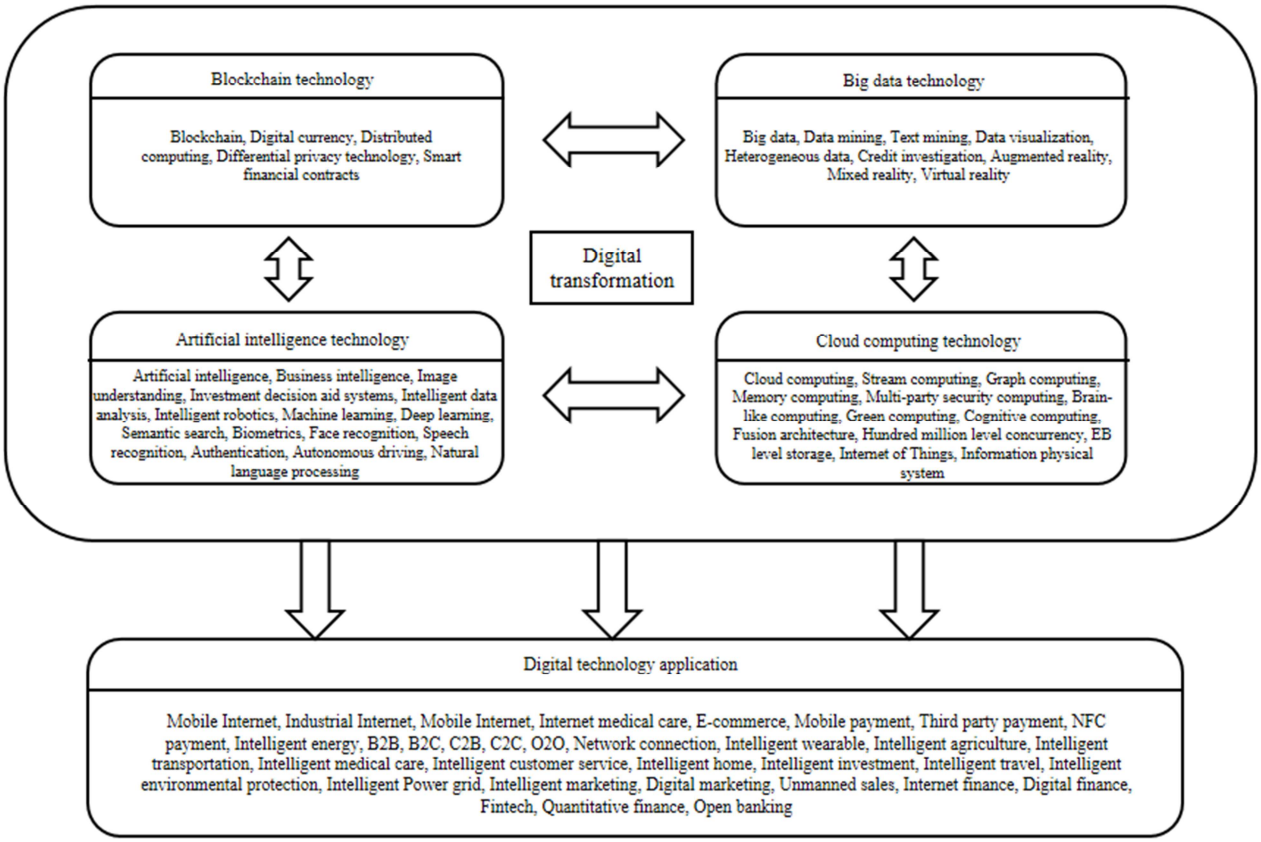

Figure 1. *The structural feature word graph of enterprise digital transformation.*

3.3. Model Design

3.3.1. Benchmark Model

For testing the impact of enterprise digital transformation on enterprise performance, we use a panel data model to estimate as follows.

$$TBQ_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Age_{i,t} + \alpha_4\ Lev_{i,t} + \alpha_5 Cflow_{i,t} + \alpha_6 Turnover_{i,t} + \alpha_7 Pfsh_{i,t} + \alpha_8\ Board_{i,t} + a_9 \sum Year\ + a_{10} \sum Industry + \delta \quad (1)$$

3.3.2. Mediation Effect Model

The mediating effect of innovation capability is examined on the digital transformation and performance of the enterprise. The model is as follows.

$$TBQ_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Age_{i,t} + \alpha_4\ Lev_{i,t} + \alpha_5 Cflow_{i,t} + \alpha_6 Turnover_{i,t} + \alpha_7 Pfsh_{i,t} + \alpha_8\ Board_{i,t} + a_9 \sum Year\ + a_{10} \sum Industry + \delta \quad (2)$$

$$Patent_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Age_{i,t} + \alpha_4\ Lev_{i,t} + \alpha_5 Cflow_{i,t} + \alpha_6 Turnover_{i,t} + \alpha_7 Pfsh_{i,t} + \alpha_8\ Board_{i,t} + a_9 \sum Year + a_{10} \sum Industry + \delta \quad (3)$$

$$TBQ_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \alpha_2 Patent_{i,t} + \alpha_3 Size_{i,t} + \alpha_4\ Age_{i,t} + \alpha_5 Lev_{i,t} + \alpha_6 Cflow_{i,t} + \alpha_7 Turnover_{i,t} + \alpha_8\ Pfsh_{i,t} + \alpha_9\ Board_{i,t} + a_{10} \sum Year\ + a_{11} \sum Industry + \delta \quad (4)$$

where i and t represent the individual and year, and δ is the random error term. In order to make the results of this study more authentic and meet the accuracy of the impact of DT on enterprise performance,, we control the dummy variables of time (Year) and industry (Industry) to absorb fixed effects as much as possible.

4. Empirical Analysis

4.1. Descriptive Statistical Analysis and Correlation Analysis

The descriptive statistics of this study are shown in Table 2. The average of the digital transformation (DT) of enterprises is 1.177, the standard deviation is 1.331, the maximum value, and the minimum value are 4.942 and 0, respectively. There are great differences in the digitalization level among enterprises. The mean value of corporate performance (TBQ) is 2.063, the standard deviation is 1.385, and the maximum and minimum values are 9.030 and 0.860.

Table 2. *Descriptive Statistics.*

3	Observations	Mean	Standard Deviation	Min	Max
TBQ	23,757	2.063	1.385	0.860	9.030
DT	23,757	1.177	1.331	0	4.942
Patent	23,757	0.536	1.359	0	5.652
Size	23,757	22.300	1.311	19.760	26.210
Age	23,757	2.164	0.831	0	3.258
Lev	23,757	0.445	0.211	0.055	0.924
Cflow	23,757	0.045	0.070	-0.166	0.241
Turnover	23,757	0.618	0.433	0.073	2.494
Pfsh	23,757	34.420	14.980	8.544	74.820
Board	23,757	2.142	0.199	1.609	2.708

Table 3 shows the correlation analysis between the variables. From the perspective of the correlation coefficient, a significant positive relationship is observed between the level of enterprise digital transformation and enterprise performance, which preliminarily verifies Hypothesis 1.

Table 3. *Correlation Analysis.*

Variable	TBQ	DT	Patent	Size	Age	Lev	Cflow	Turnover	Pfsh	Board
TBQ	1									
DT	0.058***	1								
Patent	0	0.040***	1							
Size	-0.449***	0.066***	0.055***	1						
Age	-0.034***	0.004	-0.058***	0.339***	1					
Lev	-0.243***	-0.099***	-0.024***	0.466***	0.357***	1				
Cflow	0.075***	-0.003	0.022***	0.074***	0.013*	-0.167***	1			
Turnover	-0.002	0.019***	0.031***	0.030***	0.051***	0.135***	0.125***	1		
Pfsh	-0.117***	-0.122***	0.008	0.228***	-0.057***	0.063***	0.086***	0.083***	1	
Board	-0.146***	-0.090***	0.003	0.250***	0.099***	0.145***	0.051***	0.036***	0.041***	1

***, **, and *: significant levels at 1, 5, and 10%, respectively.

4.2. Evidence Consequence

4.2.1. Regression of Benchmark Model

As can be seen from Table 4, the impact on corporate performance in regression analysis. Column (1) includes digital transformation. The regression coefficient of DT on enterprise performance is 0.036 at the significant level of 1%. In order to eliminate the influence of other factors, the regression coefficient of digital transformation is shown as 0.034 after control variables are added in column (2), The regression coefficient of DT is 0.034 at a significant level of 1%. After controlling other factors, digital transformation is still positively correlated with enterprise performance, indicating that digital transformation significantly improves enterprise performance, which verifies Hypothesis 1.

Table 4. *Digital transformation and enterprise performance return.*

	(1)	(2)
	TBQ	**TBQ**
DT	0.036***	0.034***
	(0.004)	(0.004)
Size		-0.39***
		(0.008)
Age		0.11***
		(0.004)
Lev		-0.025***
		(0.006)
Cflow		0.092***
		(0.007)
Turnover		0.016**
		(0.007)
Pfsh		0.011**
		(0.004)
Board		-0.023***
		(0.006)
Year		Yes
Industry		Yes
Constant term	0.139***	0.235***
	(0.001)	(0.009)
Observations	23757	23757
R^2	0.003	0.34

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; robust standard errors are in brackets.

4.2.2. Intermediate Effect Test

See 5 for the mediating role of innovation capability in the relationship between digital transformation and enterprise performance. Column (1) shows the results of the first step of stepwise testing regression coefficient method. The coefficient of regressionof DT on enterprise performance is 0.034 at a significant level of 1%, and the second test is continued. Column (2) examines the relationship between innovation capability and digital transformation. The regression of DT is 0.089 at a significant level of 1%. Digital transformation significantly improves innovation capability, which verifies Hypothesis 2 which is tested in the third step. Column (3) also includes digital transformation and innovation capabilities. The results show that the regression coefficients are 0.033 and 0.006 for digital transformation and innovation capabilities, respectively at a significant level of 1 and 5%. To sum up, the regression results demonstrate that innovation ability mediates between DT and enterprise performance significantly, which verifies Hypothesis 3.

Table 5. *The regression of the mediating effect of innovation ability.*

	(1)	(2)	(3)
	TBQ	**Patent**	**TBQ**
DT	0.034***	0.089***	0.033***
	(0.004)	(0.009)	(0.004)
Patent			0.006**
			(0.003)
Size	-0.39***	0.168***	-0.391***
	(0.008)	(0.013)	(0.008)
Age	0.11***	-0.044***	0.111***
	(0.004)	(.008)	(0.004)
Lev	-0.025***	-0.022**	-0.025***
	(0.006)	(0.009)	(0.006)
Cflow	0.092***	0.002	0.092***
	(0.007)	(0.01)	(0.007)
Turnover	0.016**	0.032***	0.016**
	(0.007)	(0.011)	(0.007)
Pfsh	0.011**	-0.002	0.011**
	(0.004)	(0.009)	(0.004)
Board	-0.023***	-0.006	-0.023***
	(0.006)	(0.01)	(0.006)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Constant term	0.235***	0.016	0.234***
	(0.009)	(0.015)	(0.009)
Observations	23757	23757	23757
R^2	0.34	0.059	0.34

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively; robust standard errors are in brackets.

5. Conclusion and Suggestion

According to the data of A-share listed companies from 2010 to 2020, we collect the information on "DT" in the enterprise's annual report and evaluate the impact of DT on enterprise performance.

Based on the above research conclusions, the following suggestions are given in this paper: First of all, enterprises should grasp the rhythm of digital transformation according to their own actual conditions. DT is a gradual process, not overnight, so enterprises need to combine their own conditions, keep abreast of the correct direction and development process of digital technology application, to find a suitable transition opportunity, to achieve the increase in corporate performance. Nowadays, it is common for enterprises to rush for quick success and instant benefits in the process of digital transformation: they invest a lot of money in the early stage and blindly introduce digital technology, but the transformation results are full, which

increases the cost of enterprise transformation and is not conducive to the development of enterprises. Therefore, enterprises should identify their own strategic positioning, clarify their development goals, define the scope of digital transformation, grasp the direction of DT, and ensure that actions are consistent with strategic positioning and enterprise development. For the government, it is necessary to strengthen top-level design and formulate supportive policies according to local conditions. Secondly, for the government, it is necessary to promote the construction of intelligent decision-making system, guide decision-making scientifically, encourage enterprises to promote the use of digital technology decision-making system, accelerate the establishment of a data exchange mechanism while promoting high-quality development of enterprises and increasing profits and incomes, realize the visualization of social information, promote information sharing among enterprises, reduce transformation costs, and improve the cooperation ability of society, government and enterprises. Increase the visualization of enterprise data and build a data sharing society.

Acknowledgements

This study is funded by the National Social Science Foundation of China (No. 21XJL003).

References

[1] Zeng Delin, CAI Jiawei, Ouyang Taohua. Research on digital transformation: integration framework and future prospects [J]. Foreign Economics and Management, 2021, 43 (05): 63-76. (In Chinese).

[2] He Fan, LIU Hongxia. Evaluation of the performance improvement effect of real enterprises' digital transformation from the perspective of digital economy [J]. Reform, 2019 (04): 137-148. (In Chinese).

[3] Hu Qing. The mechanism and performance of enterprise digital transformation [J]. Zhejiang Journal, 2020 (02): 146-154. (In Chinese).

[4] Guzmdn L, Reverte C. Productivity and Efficiency Changed and Shareholder Value: Evidence from the Spanish Banking Sectoe [J]. Applied Economics, 2008, 40 (15): 2037-2044.

[5] Xu meng. Digital transformation and enterprise innovation [J]. Enterprise economics, 2020, 39 (12): 54-60. (In Chinese).

[6] Zhou Wenhui, Wang Pengcheng, Yang Miao. Digital empowerment promotes mass customization technology innovation [J]. Studies in science of science, 2018, 36 (8): 1516-1523. (In Chinese).

[7] Scuotto V, et al. Amicrofoundational perspective on SMEs'growth in the digitaltransformation era [J]. Journal of Business Research, 2021 (129): 382-392.

[8] Loebbecke C, Picot A. Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda [J]. Journal of Strategic Information Systems, 2015, 24 (3): 149-157.

[9] Hoenig D, Henkel J, 2015, "Quality Signals? The Role of Patents, Alliances, and Team Experience in Venture Capital Financing", Research Policy, Vol. 44, pp. 1049-1064.

[10] Wang Qiufei, Xu Xin, Qin Shuang. Research on the Relationship between executive incentive, R&D Investment and Enterprise Performance: Based on the data of software and information technology Industry [J]. Technology and innovation Management, 2020, 41 (02): 178-188. (In Chinese).

[11] Fu YING, Xu Qi, Lin Song. The impact of process digitization on innovation performance: the moderating role of organizational inertia [J]. Research and Development Management, 201, 33 (1): 78-89. (In Chinese).

[12] Li Haijian, Tian Yuexin, Li Wenjie, Internet Thinking and Traditional Enterprise Reengineering, China Industrial Economics, No. 10, 2014. (In Chinese).

[13] Pan Qingquan, Lu Xiaowei. The impact of innovation investment and executive overconfidence on enterprise performance [J]. Science and Technology Progress and Countermeasures, 2017, 34 (01): 98-103. (In Chinese).

[14] Wu Fei, Hu Huizhi, Lin Huiyan, Ren Xiaoyi. Enterprise digital transformation and capital market performance: Empirical evidence from stock liquidity [J]. Management World, 201, 37 (07): 130-144+10. (In Chinese).

[15] Robert S. Kaplan, David P. NORTON. Comprehensive Scorecard -- a revolutionary Evaluation and management tool [M]. Wang Bingfei, Wen Xinnian, Yin Hongyi, trans. Beijing: Xinhua Publishing House, 1998: 20-38.

[16] Zhu Bixin. Research on Performance Evaluation of Central Enterprises based on EVA Theory [D]. Hefei: Doctoral dissertation of University of Science and Technology of China, 2011. (In Chinese).

[17] QI Yudong, CAI Chengwei. Research on the multiple impacts of digitalization on the performance of manufacturing enterprises and its mechanism [J]. Learning and Exploration, 2020 (07): 108-119. (In Chinese).