

# Research on Influencing Factors of Digital Transformation of Enterprises in Jing-Jin-Ji Region (Beijing-Tianjin-Hebei) Based on Principal Component Analysis

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**Abstract.** The process of world economic recovery is tortuous, the uncertainty of the external environment is increasing, and downward pressure on the domestic economy still exists. Digital transformation is an important part of helping high-quality development. As an important economic pillar in the northern region, the Jing-Jin-Ji Region (Beijing-Tianjin-Hebei) faces many challenges in digital transformation. In this paper, by constructing the evaluation model of digital transformation level, four second-level indicators and fifteen third-level indicators are constructed, and then Pearson coefficient correlation analysis is carried out to eliminate explanatory variables that have little influence on the explained variables. In addition, principal component analysis is used to reduce the dimensions of 10 explanatory variables to three principal components. It is found that the per capita GDP, the average wages of information transmission, software and information technology service industry, the average wages of education, scientific research and technology services, and the proportion of the secondary industry are important factors affecting the digital transformation of enterprises. Given the above conclusions, some suggestions are put forward, such as optimizing the industrial structure, strengthening the construction of digital infrastructure, attaching importance to the training of digital talents, and optimizing the industrial structure.

**Keywords:** Digital transformation; Influencing factors; Pearson coefficient correlation; Principal component analysis; Jing-Jin-Ji Region (Beijing-Tianjin-Hebei).

## 1. Introduction

Digital transformation refers to the process in which enterprises use communication information technology to organically combine with businesses in different fields. By 2023, China's digital economy has exceeded 55 trillion yuan, accounting for 40% of GDP. General Secretary Xi Jinping pointed out: "Since the 18th National Congress of the Communist Party of China, the CPC Central Committee has attached great importance to the development of the digital economy and made it a national strategy. The Fifth Plenary Session of the 18th CPC Central Committee proposed to implement the strategy of strengthening the country by network and the national big data strategy, expand the space of network economy, promote the integrated development of the Internet and economy and society, and support various innovations based on the Internet." [1] With the rapid development of the digital economy, the digital transformation of enterprises has become a task that cannot be ignored. In 2024, the number of netizens in China reached 1.079 billion, 61% of artificial intelligence patents in the world came from China, and about 72% of enterprises were undergoing digital transformation, but about 60% of them were confused about the goal of digital construction. The digital transformation of enterprises is of far-reaching significance to China's economic development and can contribute to high-quality economic development. The quantification of digital work content and the deepening of digital construction are imminent, and a large number of enterprises need to improve their understanding of the current digital transformation goals.

This paper aims to build an evaluation model by analyzing the factors related to the digital transformation of enterprises in the Jing-Jin-Ji Region (Beijing-Tianjin-Hebei). Pearson coefficient correlation will be used for correlation analysis to find 15 third-level indicators, and then principal component analysis will be carried out to reduce the 15 third-level indicators to two principal components to find out the most critical factors affecting the digital transformation of enterprises, and to make suggestions for the government.

## 2. Literature Review

### 2.1 Research on Influencing Factors of Enterprise Digital Transformation

Ren Xingmin, and Jing Hao [2] constructed a third-level structure model of digital transformation capability. The results showed that digital transformation capability included four capabilities, such as digital technology capability and digital operation capability, and each capability included multiple secondary capabilities. This study suggested that enterprises should rethink the supporting systems and processes of digital transformation from the perspective of system and process design. Through the method of mechanism test, Wang Yueyun, and He Zhenhua [3] examined the influence of CEO confidence on the digital transformation of enterprises through the element of CEO discretion and found that CEO confidence promoted the digital transformation of enterprises, and this phenomenon was more obvious in non-state-owned enterprises and large enterprises. Brigid Trenerry, and Samuel Chng [4] believed that at the individual level, differences in gender, age, and personality will affect factors such as job satisfaction, productivity, and task performance, and then affect the results of digital transformation of enterprises, while social norms and peer and management support may affect the team results. Ziboud Van Veldhoven, and Jan Vanthienen [5] put forward a framework that included three dimensions: society, commerce, and digital technology. It is believed that the digital transformation of these three dimensions can promote and transform each other through many intermediate processes such as BRAICQ (blockchain, robotics, artificial intelligence, cognition, and quantum computing), business model, and organizational structure, which provides a new perspective for the research of digital transformation.

Using the qualitative research method, Chen Chunhua [6] proposed that the factors affecting the digital transformation ability of enterprises included dual business model, right people, technology penetration, cooperative symbiosis culture, open organization, firm leaders, and so on. It is pointed out that enterprises should combine different capabilities according to their status according to the different degrees of digital penetration in their industries and industries, to keep up with the wave of digital transformation. Liang Jin [7] proposed that professional talents, market competition, IT technology, capital investment, and ideology were the five main factors affecting the digital transformation of the engineering construction industry, and it was suggested that enterprises should set reasonable transformation goals and build a suitable digital transformation environment. Yang Chao [8] found that in the process of digital transformation of automobile enterprises, the support of decision-makers may become the most critical factor for the success of digital transformation of production due to short-term losses and cooperation between departments. It is suggested that enterprises should carry out the digitalization process from top to bottom, reduce the misunderstanding deviation of digitalization at the top level, and establish a scientific decision-making and process mechanism. Through the analytic hierarchy process, Chen Chouyong, and Xu Jinghan [9] proposed that the research and development, investment, and personnel training of digital technology, as well as the application of digital technology at the management level, were important influencing factors for the digital transformation of enterprises. It is suggested that enterprises should strengthen the application of digital technology in production management, increase R&D and investment in digital technology, and strengthen the construction of digital talent teams. Through text analysis, Yi Luxia and Wu Fei [10] depicted the development tendency of enterprises in the field of digital transformation, put forward keywords related to the digital transformation of enterprises, such as “artificial intelligence, big data, cloud computing, blockchain”, and found the promoting relationship between digital transformation of enterprises and the performance of the main business through regression analysis. Through the mechanism research, Wu Fei, and Chang Xi [11] found that the financial expenditure on science and technology significantly drove the digital transformation of enterprises, and this influence was found in improving the support system for promoting the digital transformation of enterprises, improving the information disclosure and transmission mechanism, increasing the training of digital talents, and creating a good digital innovation and financing environment. There are obvious differences in different regions.

## 2.2 Research on the Digital Transformation Trend of Enterprises

Through bibliometrics, Gao Pengbin, and Wu Weiwei [12] analyzed the research on digital transformation and innovation, and found many themes such as “diffusion and adoption of technology and innovation, digital innovation management, digital transformation management”. This study proposed that the current digital transformation was promoting the innovation of business models, which put forward that managers should be familiar with the use of various digital technologies and overcome the application obstacles. By using the methods of data analysis and case study, Seunghyun Kim [13] pointed out that there were some development trends in digital transformation, such as “technology integration, industry integration, and business model change”. It was suggested that enterprises understand the concept of digital transformation, make corresponding transformation plans, cultivate the ability of digital transformation, and actively explore new business models to meet the needs of the digital age. Through theoretical analysis and empirical research, Chaohong Na [14] examined the influence of digital transformation on corporate social responsibility performance and proposed that digital transformation can improve the ability of enterprises to fulfill their social responsibilities, and suggested that enterprises actively promote the effective integration and efficient coordination among business systems in the value chain to realize the social responsibility value matching the value chain. Through the method of network text analysis, Jin Sung Rha, and Hong-Hee Lee [15] found that the current digital transformation of the service industry had the trend of “developing new business model, developing a service-oriented business model and digitizing financial business”. Based on this, this study put forward that service organizations should pursue strategic innovation, realize the application of new business models and “non-contact” technology, and create new value and competitive advantage in the digital age.

By analyzing the characteristics of the digital economy, Shi Dan [16] pointed out that industrial development under the digital economy had the trend of “digital technology leading industrial upgrading and pre-existing ecological environment constraints”. The development of the digital economy and digital technology urges enterprises to make changes. At present, the digital transformation of global enterprises shows the trend of reshaping the innovation system, upgrading the production system, giving birth to new formats, and driving the localization of the industrial chain. Shi Jianxun, and Zhu Jingchi [17] found that in the process of enterprise digital transformation, government-led, digital infrastructure construction, digital technology and artificial intelligence field construction, and digital talent training were several key development directions. Based on the theory of absorptive capacity and regression analysis, Yang Zhuen, and Guo Hai [18] found that the digital transformation of enterprises with high regularity and low regularity was helpful to enterprise performance, while the knowledge stock played a buffering role in the rhythm switching of enterprise digital transformation, and enterprises with digital transformation knowledge and experience can slow down the performance fluctuation during the digital transformation period. Li Haijian, and Li Lingxiao [19] pointed out that the current digital transformation had the trend of “de-physicalization, de-materialization, de-boundary, de-artificiality, de-management, de-unit, de-centralization, de-intermediary, de-ownership and de-certainty”.

## 2.3 Summary

In the current qualitative research, many factors affecting the digital transformation of enterprises have been put forward, involving policies, digital technology, personnel training, and other aspects, but they have not been quantitatively analyzed, which cannot reflect the degree of influence of different factors on the digital transformation of enterprises. However, in some quantitative studies, the influence of different dimensional factors such as technology and profitability on the digital transformation of enterprises is put forward, but the relationship between different angle factors and the degree of influence is not reflected. Based on this, using the method of principal component analysis, 15 third-level indicators are established and reduced to two principal components to reflect the close relationship between different indicators. At the same time, this paper will select the data from 2015 to 2023 to make up for the lack of timeliness of the current research.

### 3. Pearson coefficient correlation

Pearson correlation coefficient is a coefficient used to measure the strength of linear correlation between two variables, X and Y, and its value ranges from -1 to 1, which is the quotient of covariance and standard deviation between two variables, usually expressed by r:

$$r = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^n (X_i - \bar{X})^2 \sum_{i=1}^n (Y_i - \bar{Y})^2}} \quad (1)$$

#### 3.1 Index Construction and Data Source

The first-level indicator is the digital transformation index, and there are three second-level indicators, namely enterprise digital scoring, enterprise internal environment (profitability and willingness to transform), the regional economic environment, regional technical services, and personnel training level, and there are 15 third-level indicators. The indicators are as follows: strategic leadership score, technology-driven score, organizational empowerment score, environmental support score, digital achievement score, management digital technology application word frequency, enterprise’s net profit, proportion of GDP of regional secondary industry, proportion of regional tertiary industry GDP, proportion of enterprises carrying out innovation activities, per capita GDP year-on-year, average wage in the education industry, the average wage in the information technology service industry, average wages in scientific research and technical services, and regional information technology service income.

The index construction is shown in Table 1 below:

Table 1 Construction Table of Enterprise Digital Transformation Indicators

First-level index	Second-level index	Third-level index
Enterprise digital transformation index	Enterprise digital scoring	Strategic leadership score
		Technology-driven score
		Organizational empowerment score
		Environmental support score
		Digital achievement score
	Enterprise internal environment (profitability and willingness to transform)	Management digital technology application word frequency
		Enterprise’s net profit
	Regional economic environment	Proportion of GDP of regional secondary industry
		Proportion of regional tertiary industry GDP
		Proportion of enterprises carrying out innovation activities
		Per capita GDP year-on-year
	Regional technical service and personnel training level	The average wage in the education industry
		The average wage in the information technology service industry
		Average wages in scientific research and technical services

		Regional information technology service income
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The data source of this paper is the China Stock Market & Accounting Research Database (<http://data.csmar.com>), and the data year is from 2015 to 2022.

### 3.2 Empirical Analysis of Pearson Coefficient Correlation

After empirical analysis, the results are shown in Table 2 below:

Table 2 Pearson correlation coefficient

	Explanatory variable	correlation coefficient
X1	Strategic leadership score	0.435
X2	Data-driven score	0.597
X3	Organizational empowerment score	-0.097
X4	Environmental support score	0.006
X5	Digital achievement score	0.923**
X6	Digital application score	0.455
X7	Management digital technology application word frequency	-0.071
X8	Enterprise's net profit	-0.295
X9	Proportion of GDP of regional secondary industry	-0.457
X10	Proportion of GDP of regional tertiary industry	0.029
X11	GDP per capita	-0.437
X12	Year-on-year GDP	0.270
X13	Regional information technology service income	-0.224
X14	The average wage in the education industry	-0.250
X15	The average wage of information technology service industry	-0.532
X16	Average wages in scientific research and technical services	-0.268
X17	Proportion of enterprises carrying out innovation activities	-0.173

Note: \* \* means that the correlation is significant at the level of 0.01 (two-tailed test).

\* means that the correlation is significant at the level of 0.05 (two-tailed test).

The results in Table 2 show that the correlation coefficients of organizational empowerment score, environmental support score, the proportion of GDP of regional tertiary industry, the proportion of enterprises carrying out innovation activities, regional information technology service income, and the proportion of enterprises carrying out innovation activities are less than 0.25, indicating that they have low correlation with the digital transformation of enterprises, so they are excluded. Other variables have moderate or high correlations, so they should be retained for the next principal component analysis.

## 4. Principal Component Analysis

### 4.1 Principle of Principal Component Analysis

Principal component analysis (PCA) is a statistical method for dimensionality reduction. By dimensionality reduction, many different indicators in the original data are reduced to a few indicators that can reflect the characteristics of the original indicators as much as possible, to eliminate the overlap between statistical data, reduce the amount of calculation, and reduce the complexity of the problem. Based on this, this paper chooses the principal component analysis method to reduce the dimension of the influencing factors of enterprise digital transformation, summarize different influencing factors, and make the evaluation system more practical. The following is a brief introduction to principal component analysis.

With the sample data of n years and p index data related to the digital transformation of enterprises, the initial sample matrix can be obtained as follows:

$$x = \begin{pmatrix} x_{11} & \dots & x_{1p} \\ \vdots & \ddots & \vdots \\ a_{n1} & \dots & a_{np} \end{pmatrix} \quad (2)$$

Here, i = (1,2, ..., n) represents the i-th row of the sample matrix, and j = (1,2, ... p) represents the j-th column. The definitions of i and j in the following section are the same as here.

**4.1.1 Calculating the correlation coefficient matrix**

$$R = (r_{ij})_{n \times p} \quad (3)$$

The calculation formula  $r_{ij}$  is:

$$r_{ij} = \frac{1}{n} \sum_{i=1}^n \frac{(x_{ij}-x_i)(x_{ij}-x_j)}{s} \quad (4)$$

Where s represents the variance of the sample.

**4.1.2 Calculating the eigenvalues and eigenvectors of R**

According to the expression  $|R - \lambda I|=0$  of the characteristic equation, the obtained value can be calculated. Here, R represents the correlation coefficient matrix, and I represents the identity matrix. According to the descending arrangement of  $\lambda$ ,  $\lambda_1$ ,  $\lambda_2$ , ...,  $\lambda_n$  can be obtained, and each feature vector  $a_j$  can also be calculated.

**4.1.3 Calculating contribution rate and cumulative contribution rate**

$$e_i = \frac{\lambda_i}{\sum_{i=1}^p \lambda_i} \quad (5)$$

$$E_m = \frac{\sum_{i=1}^m \lambda_i}{\sum_{i=1}^p \lambda_i} \quad (6)$$

**4.1.4 Calculating principal components**

$$Z_m = a_{mj}x_j \quad (7)$$

**4.1.5 Comprehensive analysis**

The number of principal components is judged by the contribution rate of the accumulated variance, and all principal components are generally selected when they are greater than 85%, so as to complete the extraction of principal components. Finally, according to the obtained indicators, the index system of influencing factors of enterprise digital transformation is constructed.

**4.2 Empirical analysis**

Using SPSS27.0.1, through the following steps “analysis-dimensionality reduction-factor”, the results of the principal component analysis are obtained, and the variance explanation table of the principal component is obtained, which is shown in the following Table 3:

Table 3 Interpretation Table of Total Variance

Component	Initial eigenvalue			Extracting the sum of squares of loads		
	Total	Variance percentage	Cumulative %	Total	Variance percentage	Cumulative %
1	4.501	45.014	45.014	4.501	45.014	45.014
2	3.014	30.138	75.152	3.014	30.138	75.152
3	1.485	14.849	90.002	1.485	14.849	90.002
4	.764	7.641	97.642			
5	.152	1.518	99.161			
6	.078	.784	99.944			
7	.006	.056	100.000			
8	3.010E-16	3.010E-15	100.000			
9	-6.616E-17	-6.616E-16	100.000			
10	-8.622E-16	-8.622E-15	100.000			

Extraction method: principal component analysis.

According to the principal component variance explanation table, the first principal component to the fifth principal component explains 99.161% of the total variance, indicating that the first to fifth principal components can represent 99.161% of the total explanatory variable information of the original enterprise's digital transformation and five principal components should be extracted as F1, F2, F3, F4, and F5, in addition to drawing a scree plot, as shown in Figure 1 below:

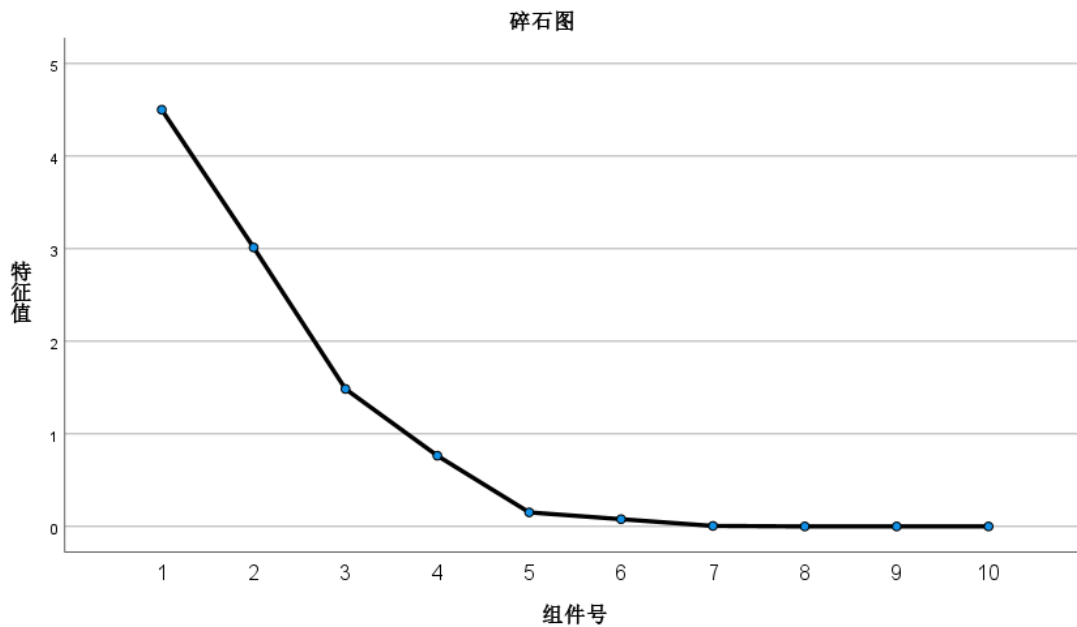


Figure 1 Scree Plot

According to the scree plot, the slope of principal component 1 to principal component 5 is relatively large, and the greater the slope, the more information it contains. The first to fifth principal components should be extracted, and the obtained component score coefficient table is shown in Table 4.

Table 4 Component Matrix a

	Component		
	1	2	3
X1	-.240	.403	.835
X2	-.604	.527	.544
X5	-.319	.475	-.338
X9	-.241	-.926	.258
X11	.968	-.174	.103
X16	.974	-.133	.152
X8	-.240	-.889	-.144
X12	.365	.802	-.422
X14	.943	.067	.252
X16	.975	.073	.121

Extraction method: principal component analysis.

Three components were extracted.

Based on Table 3, three principal component formulas are obtained:

$$F1 = -0.24X1 - 0.604X2 - 0.319X3 - 0.241X4 + 0.968X5 + 0.974X6 - 0.240X7 + 0.365X8 + 0.943X9 + 0.975X10 \quad (8)$$

$$F2 = 0.403X1 + 0.527X2 + 0.475X3 - 0.926X4 - 0.174X5 - 0.133X6 - 0.889X7 + 0.802X8 + 0.067X9 + 0.073X10 \quad (9)$$

$$F3=0.835X1+0.544X2-0.338X3+0.258X4+0.103X5+0.152X6-0.144X7-0.422X8+0.252X9+0.121X10 \quad (10)$$

## 5. Conclusions

(1) The index that has the greatest influence on the digital transformation of enterprises is the digital achievement score. The score of digital achievements reflects the achievements of enterprises in the process of digital transformation, and enterprises with higher digital transformation ability often get higher scores of digital transformation achievements.

(2) Data-driven rating, strategy leadership score, and digital application rating are the major factors influencing the digital transformation ability of enterprises. The values are 0.435, 0.597, and 0.435 respectively.

Compared with other enterprises, enterprises with higher data-driven scores are more likely to have digital talents related to the technology needed for digital transformation, which reduces the cost and risk of digital transformation and thus forms a higher digital transformation capability [20]. In the process of enterprise digital transformation, the strategic leadership score reflects the digital transformation willingness of senior managers of enterprises and then affects the digital transformation ability of enterprises [21]. Enterprises with higher digital application scores may accumulate more knowledge and experience related to digital transformation in the process of digital application, which reduces the cost of enterprises in the process of digital transformation, thus improving the digital transformation ability of enterprises.

(3) Among the factors that affect the digital transformation ability of enterprises, the smaller indicators are the proportion of GDP of regional secondary industry, the per capita GDP, and the average wage of the information technology service industry. The values are -0.457, -0.437, and -0.532 respectively.

In the process of digital transformation, enterprises need the support of information technology services, and the areas with relatively high secondary industries are short of enterprises or talents who can provide information technology services. Enterprises often face cost problems when carrying out digital transformation, and enterprises with higher profitability and lower costs are more likely to complete digital transformation and have higher digital transformation capabilities [6]. The external environment will affect the enterprise's willingness to digital transformation. Areas with higher per capita GDP have higher labor costs. At the same time, a better external economic environment may also make enterprises short-sighted and make enterprises less willing to digital transformation [22].

## 6. Suggestions

### 6.1 Strengthening the Training of Digital Transformation Talents, and Data-driven Acceleration of Digital Transformation

Digital transformation needs related technical talents. In order to promote the digital transformation of enterprises, the government should strengthen the training of digital-related talents, expand the scale of digital talents, solve the problem of employing people in the process of digital transformation, supply outstanding talents for the digital transformation of enterprises, and help the digital transformation of enterprises. Enterprises should establish a reasonable data decision-making mechanism, improve the data-driven score, and optimize the digital transformation ability from within the enterprise.

### 6.2 Optimizing the Digital Application of Enterprises, and Enhancing the Digital Achievement Orientation of Enterprises

Enterprises are faced with the problem of lack of experience in the process of digital transformation. The digital application of enterprises can help enterprises accumulate the technical knowledge needed for digital transformation, help enterprises practice digital transformation and then enhance their

digital transformation ability. Achievement orientation reflects the willingness of enterprise top managers to digital transformation and reflects the layout of the enterprise strategic level, which is helpful to the final landing and realization of enterprise digital transformation and enhances the ability of enterprise digital transformation.

### **6.3 Optimizing the Regional Industrial Structure and Promoting the Construction of Digital Infrastructure**

The digital transformation of enterprises needs the support of the external environment, and relying too much on the secondary industry is not conducive to the development of high-tech industries and information technology service industries. A suitable industrial structure is conducive to the digital transformation of enterprises. Meanwhile, the construction of digital infrastructure can provide a suitable environment for industries related to the digital transformation of enterprises, such as information technology services, and help enhance the digital transformation capability of enterprises.

### **6.4 Avoiding Short-sightedness and Carrying out Digital Transformation in Strong Profitability**

The digital transformation of enterprises needs the support of internal resources and a certain amount of capital investment. It is more conducive to the completion of digital transformation when the profitability of enterprises is relatively strong and the external economic environment is good. Enterprises need to avoid the trap of shortsightedness and prepare for digital transformation when internal resources are relatively abundant.

## **References**

- [1] China Youth Daily. Xi Jinping: Make China's digital economy stronger and better [EB/OL]. [2024.12.20]. [https://news.cyol.com/GB/articles/2022-01/15/content\\_xrjxeivxb.html](https://news.cyol.com/GB/articles/2022-01/15/content_xrjxeivxb.html).
- [2] Ren X, Jing H, Zhang Y. Construction of Digital Transformation Capability of Manufacturing Enterprises[J]. Sustainability, 2023, 15(19):14168.
- [3] Yueyun Wang, Zhenhua He. CEO discretion and enterprise digital transformation[J]. Heliyon, 2024, 10(1): e23468.
- [4] Brigid Trenerry, Samuel Chng. Preparing Workplaces for Digital Transformation: An Integrative Review and Framework of Multi-Level Factors[J]. Frontiers, 2021,12:620-766.
- [5] Van Veldhoven Z, Vanthienen. Digital transformation as an interaction-driven perspective between business, society, and technology[J]. Electron Markets,2022,32:629-644.
- [6] Chen Chunhua. Research on the Construction of Digital Transformation Capability System of Traditional Enterprises [J]. People's Forum Academic Frontier, 2019, (18):6-12.
- [7] Liang Jin. Development Trend of Informatization in Engineering Construction Industry and Digital Transformation of Enterprises [J]. China Survey and Design, 2020, (12):58-62.
- [8] Yang Chao. Research Report on Digital Transformation Trend of China Automobile Enterprises in 2021 [J]. Digital Economy, 2021, (12):60-68.
- [9] Chen Chou-yong, Xu Jing-han. Evaluation system and application of digital transformation capability of manufacturing enterprises [J]. Science and Technology Management Research, 2020,40(11):46-51.
- [10] Yi Luxia, Wu Fei, Xu Siyan. Research on the Performance-driven Effect of Enterprise Digital Transformation [J]. Securities Market Herald, 2021, (08):15-25+69.
- [11] Wu Fei, Chang Xi, Ren Xiaoyi. Government-driven innovation: financial expenditure on science and technology and digital transformation of enterprises [J]. Financial Research, 2021, (01):102-115.
- [12] Gao Pengbin, Wu Weiwei. Discovering Themes and Trends in Digital Transformation and Innovation Research[J]. Journal of Theoretical and Applied Electronic Commerce Research,2022,17(3):1162-1184.
- [13] Kim S, Choi B, Lew YK. Where Is the Age of Digitalization Heading? The Meaning, Characteristics, and Implications of Contemporary Digital Transformation[J]. Sustainability. 2021, 13(16):8909.

- [14] Na Chaohong, Chen Xue. Digital Transformation of Value Chains and CSR Performance[J]. Sustainability, 2022,14:10245.
- [15] Rha Jin Sung, Lee Hong-Hee. Research trends in digital transformation in the service sector: a review based on network text analysis[J]. Service Business,2022,16:77-98.
- [16] Stan. Evolution of industrial development trend under the condition of digital economy [J]. China Industrial Economy, 2022, (11):26-42.
- [17] Shi Jianxun, Zhu Jingchi. Characteristics and trends of global industrial digital transformation and China's response [J]. Economic Horizon, 2022, (11):55-63.
- [18] Yang Zhuen, Guo Hai, Ding Jiebin. The rhythm of digital transformation and enterprise performance: based on absorptive capacity theory [J/OL]. Journal of System Management, 1-24[2024-12-22].
- [19] Li Haijian, Li Lingxiao. Ten development trends of enterprise digital transformation [N]. Economic Information Daily, 2021-09-14(007).
- [20] He Wangjuan. Ceng Cheng, Senior Vice President of Cree International: There is still a shortage of digital high-end talents in emerging industries [N]. Securities Daily, 2024-11-25(B03).
- [21] Qin Xiliang, Tian Hong. Expectation performance gap, managers' decision-making and digital transformation of enterprises [J]. Scientific Decision-Making, 2023, (07):82-98.
- [22] Chen nanxu, Cui kaibin. The influence of the digital business environment on the willingness of digital transformation of small and medium-sized enterprises [J]. Financial Economy, 2024, (08):46-57.