The Moderating Effect of Digitalization on Diversification and Performance of Enterprises

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Abstract: Digital transformation has become an important strategic means for many enterprises to solve the problem of redundant resources and improve efficiency. In order to explore whether digital transformation can improve the performance of diversified enterprises, this paper collected a total of 6238 valid data from Chinese A-share listed companies from 2010 to 2020, made an empirical analysis with the level of enterprise digitalization as the adjusting variable, and drew the following conclusions: the degree of enterprise diversification is negatively related to enterprise performance, and the enterprise's hasty diversification will damage enterprise performance; The level of enterprise digitalization plays a negative role in regulating the relationship between enterprise diversification and enterprise performance. The improvement of enterprise digitalization can significantly curb the corresponding drawbacks of enterprise diversification, which is beneficial to the improvement of enterprise performance.

Keywords: Diversified Operation, Digital Transformation, Enterprise Performance.

1 INTRODUCTION

In recent years, with the development of artificial intelligence technology, blockchain technology, cloud computing technology, big data technology and other digital technologies, the original production and operation mode of enterprises has changed, and more and more enterprises have been attracted and promoted to enter the path of digital transformation. According to the White Paper on the Development of China's Digital Economy (2022) released by the China Academy of Information and Communication Research, since 2012, China's digital economy has maintained a growth rate of 15.9%. In 2021, the scale of China's digital economy will reach 45.5 trillion yuan, with a nominal year-on-year growth of 16.2%. Digitalization has become a major boost to China's economic development.

For enterprises, diversification can effectively reduce business risks and improve business performance. However, in recent years, more and more enterprises have proved from practice that diversified operation may not bring ideal performance, on the contrary, enterprises may fall into operational difficulties. This difference in the actual situation has aroused the attention of scholars. According to the principal-agent theory, when an enterprise adopts a diversification strategy, the number of managers needed to be managed will gradually increase, which increases the difficulty of the company's management and operation. At the

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same time, each manager may make opportunistic mistakes out of their own development plans, which will damage the overall interests of the enterprise, and ultimately the actual performance of the enterprise will decline. Therefore, it is extremely urgent to solve the problems brought about by the diversification of enterprises.

So, can enterprises improve their digital level and carry out digital transformation effectively solve the problems brought about by diversified operation, and then increase their efficiency? With such a problem, based on the exploration of the relationship between enterprise diversification and enterprise performance, this paper considers whether the variable of enterprise digitalization plays a good role in regulating this relationship, whether it can strengthen the positive effect of diversification on enterprise performance, and better promote enterprise development.

2 LITERATURE REVIEW AND HYPOTHESIS PRESENTATION

2.1 Diversification and enterprise performance

Diversification Strategy refers to a development Strategy in which an enterprise operates two or more products or services with different basic economic purposes at the same time [6]. Since Rumelt raised the question of "specialization" or "Diversification" for enterprise operation in 1974, the research on this aspect has become a key topic for scholars to discuss. However, no matter at home or abroad, many scholars have not reached a unified conclusion on the merits of corporate diversification [7]. Whether China's listed companies diversify and the degree of diversification are affected by various internal and external factors [8]. Such as internal and external corporate governance mechanism [9], government intervention, etc. [10]. Of course, different scholars have different views on enterprise diversification, but generally it can be divided into three categories: diversification has neutral characteristics, diversification is conducive to enterprise performance, and diversification reduces enterprise performance.

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Diversification can affect the profitability of enterprises [11]. Diversification has a positive effect on the value of enterprises. Diversification can improve the value of enterprises [8]. At the same time, diversification can also reduce the risk of enterprise operation [21], optimize the level of cash holdings [13], ease resource constraints [14], and ultimately improve enterprise income.

Compared with the view that diversification can bring more benefits and hold a moderate position on diversification, this paper believes that blind diversification is detrimental to the development of enterprises. Diversification decision-making behavior and enterprise performance are negatively correlated, which will lead to the discount of company value [9]. Although the traditional view is that enterprise diversification can disperse the risk of enterprise operation, Wu Guoding and Zhang Huili (2015) have shown through empirical research that diversification can not effectively disperse the financial risk of enterprises, and pointed out that many European and American enterprises have closed down under the background of the financial crisis, which is inseparable from diversification expansion. Wang Zhiqiang and Ren Zhenchao (2021) also confirmed through research that enterprise diversification will indeed reduce the solvency of enterprises. Anish et al.

At present, entrepreneurs have gradually become more rational about the possible "trap" of diversification [22], and returning to the main business has gradually become a new business trend [23]. Therefore, this paper proposes the following assumptions:

Hypothesis 1: There is a negative relationship between diversification level and enterprise performance.

2.2 Digital Transformation and Enterprise Performance

Enterprise digitalization is a process of organizational change [27]. It means that enterprises make comprehensive use of digital technology to continuously adjust the structure and operation of the organization in terms of value chain, business process and product and service innovation, so as to promote enterprises to increase income, improve business, replace or transform business processes, and create a digital business environment with digital information as the core [24]. With the development of informatization and digitalization, more and more enterprises have got rid of the original business model. Digital office, digital marketing and digital production and operation have gradually become the status quo of modern enterprises' daily operation.

Xie Lijuan (2019) supported the digital transformation of the retail industry and believed that the digital transformation could significantly improve the circulation efficiency of enterprises and improve their performance. Liu Donghui et al. (2022) believed that enterprises can accurately predict customer demand through big data and other digital technologies, effectively solve the supply and demand problem, and then improve enterprise performance. Qi Yudong and Cai Chengwei (2020) believe that digital transformation can solve the "long arm jurisdiction" effect caused by the development and growth of enterprises through online opening, sharing, connection, collaboration and other ways, so as to manage and operate enterprises more efficiently and improve the performance of enterprises.

It is a general trend for enterprises to carry out digital transformation, and it can effectively improve the operation and management capabilities of enterprises in many aspects, so as to improve enterprise performance and industry competitiveness. Therefore, the following assumptions are proposed in this paper:

Hypothesis 2: The digital level plays a negative role in regulating the relationship between corporate diversification and corporate performance.

3 METHODS

3.1 Sample selection and data collection

The data of listed companies in this paper mainly comes from the CSMAR (Guotai'an) database, and is sorted out in the following ways: (1) First, download the data of listed companies from the CNRDS database from 2010 to 2020; (2) Eliminate the financial and insurance industry; (3) Remove the incomplete samples of related variables. (4) Excluding the enterprises that were PT, ST, * ST and delisted during the study period, the data of these enterprises may be abnormal. After relevant sorting, 6238 valid sample observations were obtained.

3.2 Variable definition and measurement

(1) Interpreted variable

Corporate Performance (ROA). This paper refers to the common practice of previous scholars [1-3], and selects the return on total assets (ROA) in the enterprise financial indicators to measure (net profit/average balance of total assets).

(2) Explanatory variable

Degree of diversification (EI). This paper uses entropy index [18] to measure the degree of enterprise diversification. The calculation method is: entropy index (EI)=Σ P_i * In ($1/P_i$). P_i is the ith main business income/total business income of the enterprise.

(3) Regulating variable

Digitization level (Di). This paper draws on the current common practice of scholars such as Wu Fei (2021) and Wang Molin (2022) to collect the frequency of keywords such as artificial intelligence technology, blockchain technology, cloud computing technology, big data technology, and digital technology applications from the annual reports of listed companies as indicators of the enterprise's digital level (Di).

Table 1 Digital keywords (from Wu Fei et al. (2021))

Variable	Key word	Content
Digital level	artificial intelligence technology	Artificial intelligence, business intelligence, image understanding, investment decision support system, intelligent data analysis, intelligent robot, machine learning, deep learning, semantic search, biometrics, face recognition, voice recognition, identity verification, automatic driving, natural language processing
	Blockchain technology	Blockchain, digital currency, distributed computing, differential privacy technology, smart financial contract
	Cloud computing technology	Cloud computing, stream computing, graph computing, memory computing, multi-party security computing, brain like computing, green computing, cognitive computing, fusion architecture, 100 million level concurrency, EB level storage, the Internet of Things, and information physics systems

	Big data technology	Big data, data mining, text mining, data visualization, heterogeneous data, credit reporting, augmented reality, mixed reality, virtual reality
	Digital technology application	Mobile Internet, Industrial Internet, Mobile Internet, Internet Medical, E-commerce, Mobile Payment, Third Party Payment, NFC Payment, Smart Energy, B2B, B2C, C2B, C2C, O2O, Internet Connection, Smart Wearing, Smart Agriculture, Smart Transportation, Smart Medical, Smart Customer Service, Smart Home, Smart Investment Advisor, Smart Culture and Tourism, Smart Environmental Protection, Smart Grid, Smart Marketing, Digital Marketing, Unmanned Retail, Internet Finance Digital finance, Fintech, financial technology, quantitative finance, open banking

(4) Control variable

In addition to the main variables, this paper also selects enterprise size, asset liability ratio (Lev), total asset turnover ratio (ATO), cash flow ratio (Cf), and operating income growth rate (Gro) as control variables. At the same time, this paper also sets year and industry as dummy variables.

Table 2 Variable Definition and Measurement

Variable Type	Variable name	Variable symbol	Variable definition and measurement
Dependent variable	Enterprise performance	ROA	Net profit/average balance of total assets
Independent variable	Diversification level	EI	(EI)=ΣPi * In (1/Pi), Pi is the ith main business income/total business income of the enterprise
Regulating variable	Digital level	Di	Collect the total frequency of keywords such as artificial intelligence technology, blockchain technology, cloud computing technology, big data technology, and digital technology in the annual reports of listed companies
Control variable	Enterprise scale	Size	The natural logarithm of the total assets of the enterprise
	Debt level	Lev	Total liabilities at the end of the year/total assets at the end of the year
	Turnover rate of total assets	ATO	Operating income/total average assets
	Cash flow ratio	Cf	Net cash flow from operating activities/total assets
	Growth ability	Growth	Operating income of the current year/operating income of the previous year - 1

	Annual dummy variable	Year	Build a total of 10 annual dummy variables from 2011 to 2020. When it is the observation year, it is assigned a value of 1, otherwise it is assigned a value of 0
	Industry dummy variable	Industry	Use the CSR industry code set by the CSRC for setting

3.3 Hypothetical model

The relationship between enterprise diversification and enterprise performance has not been verified, so the model (1) is established as follows:

$$ROA_{i,t}=\beta0+\beta1EI_{i,t}+\beta2Size_{i,t}+\beta3Lev_{i,t}+\beta4ATO_{i,t}+\beta5Cf_{i,t}+\beta6Gro_{i,t}+\sum Year+\sum Industry+\varepsilon_{i,t} \quad (1)$$

The moderating effect of digital level on diversification and corporate performance has not been verified, so models (2) and (3) are established as follows:

$$ROA_{i,t}=\beta0+\beta1EI_{i,t}+\beta2Di_{i,t}+\beta3Size_{i,t}+\beta4Lev_{i,t}+\beta5ATO_{i,t}+\beta6Cf_{i,t}+\beta7Gro_{i,t}+\sum Year+\sum Industry+\varepsilon_{i,t} \quad (2)$$

$$ROA_{i,t}=\beta0+\beta1EI_{i,t}+\beta2Di_{i,t}+\beta3EI_{i,t}*Di_{i,t}+\beta4Size_{i,t}+\beta5Lev_{i,t}+\beta6ATO_{i,t}+\beta7Cf_{i,t}+\beta8Gro_{i,t}+\sum Year+\sum Industry+\varepsilon_{i,t} \quad (3)$$

4 RESULTS

4.1 Descriptive statistics and correlation analysis

This paper uses Stata software to conduct descriptive statistics and VIF analysis on related variables, and the statistical results are shown in Table 3. It can be seen from the table that the average digital level (Di) is 1.584, and the variance is 1.437. Generally speaking, the digital level of listed companies in China is uneven, with large differences, and the overall level is low, which is still in the early stage of transformation. In addition, the VIF value of each variable is less than 0.5, so there is no obvious correlation.

Table 3 Descriptive Statistics and Correlation Analysis of Main Variables

V	N	mean	sd	min	max	VIF	1/VIF
ROA	6238	0.034	0.082	-0.415	0.244	-	-
EI	6238	0.374	0.441	0	2.117	1.05	0.954
Di	6238	1.584	1.437	0	5.753	1.02	0.981
Size	6238	22.22	1.194	19.716	26.395	1.37	0.728
Lev	6238	0.411	0.194	0.035	0.99	1.46	0.683
ATO	6238	0.627	0.387	0.044	2.777	1.11	0.897
Cf	6238	0.048	0.064	-0.224	0.258	1.1	0.905
Gro	6238	0.208	0.494	-0.732	4.806	1.03	0.968

4.2 Correlation analysis

Under the preliminary exploration of correlation, we can know that the coefficient between enterprise diversification (EI) and enterprise performance (ROA) is -0.114, and is significantly correlated at the level of 0.01. On the surface, with the continuous improvement of diversification, the performance of enterprises gradually declines, and diversification has a negative impact on enterprise performance, which is consistent with our hypothesis 1. The coefficient between digitalization level (Di) and enterprise performance is -0.032, and there is a negative correlation between digitalization and performance, which is contrary to our preliminary assumption, but the final result should refer to regression analysis.

Table 4 Correlation Analysis

	ROA	Int	Di	Size	Lev	ATO	Cf	Gro
ROA	1							
EI	-0.114***	1						
Di	-0.032**	0.062***	1					
Size	0.028**	0.151***	0.021*	1				
Lev	-0.318***	0.120***	-0.037***	0.493***	1			
ATO	0.194***	-0.073***	0.068***	0.126***	0.185***	1		
Cf	0.350***	-0.103***	-0.041***	0.022*	-0.194***	0.133***	1	
Gro	0.257***	0.001	0.049***	0.053***	0.001	0.159***	-0.002	1

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.3 Regression analysis

It can be seen from the regression results of model (1) that there is a negative correlation between enterprise diversification level (EI) and enterprise performance (ROA), and there is a significant correlation at the level of 0.01. On the surface, with the improvement of enterprise diversification, enterprise performance is damaged. Hypothesis 1 is tenable. According to model (3), the coefficient of EI * Di, the product of diversification and digitalization, is -0.003, and is significantly correlated at the level of 0.05, indicating that digitalization negatively regulates the relationship between diversification and enterprise performance. With the improvement of enterprise digitalization, the enterprise has made great progress in information communication, personnel management, marketing and other aspects, effectively solving the problems of miscellaneous multi-party management, poor communication and other problems caused by diversified operation, and ultimately reducing the phenomenon of

performance decline caused by the adoption of diversification strategy and even making the performance gradually rise. Hypothesis 2 is established.

Table 5 Regression Analysis

variable	ROA		
	（1）	（2）	（3）
EI	-0.011***	-0.011***	-0.006**
	(-5.531)	(-5.378)	(-2.067)
Di		-0.002***	-0.001
		(-3.098)	(-0.977)
EI*Di			-0.003**
			(-2.191)
Size	0.014***	0.014***	0.014***
	(16.281)	(16.352)	(16.275)
Lev	-0.162***	-0.163***	-0.164***
	(-30.476)	(-30.654)	(-30.724)
ATO	0.036***	0.036***	0.036***
	(15.290)	(15.538)	(15.294)
Cf	0.320***	0.317***	0.316***
	(22.786)	(22.511)	(22.454)
Gro	0.034***	0.035***	0.035***
	(19.481)	(19.634)	(19.668)
Constant	8.031***	7.414***	7.386***
	(9.337)	(8.402)	(8.372)
Year	Control	Control	Control
Industry	Control	Control	Control
Observations	6,238	6,238	6,238
R^2	0.321	0.322	0.323
Adj-R^2	0.321	0.321	0.322

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5 CONCLUSION

Digital transformation has become an important means for many enterprises to increase production and efficiency, especially for diversified enterprises. Through the collection of keywords and relevant data of digital transformation of listed companies, the empirical study confirms that diversification is harmful to enterprise performance, but the improvement of digital level is helpful to improve this situation and improve enterprise performance. This study has certain reference significance for enterprises in digital transformation and waiting.

REFERENCES

[1]Henrich R. Greve. A Behavioral Theory of R&D Expenditures and Innovations: Evidence from Shipbuilding[J]. Academy of Management Journal,2003,46(6).

[2]Wei-Ru Chen. Determinants of Firms' Backward- and Forward-Looking R&D Search Behavior[J]. Organization Science,2008,19(4).
[3]Zhong Xi, Ren Liuyang, Ren Ge. Research on "Defamilialization" of family enterprises: a perspective of innovation expectation gap [J]. Nankai Management Review, 2022,25 (01): 177-190
[4]Wang Molin, Yan Haifeng, Song Yuanyang. Research on the impact of enterprise digitalization on strategic progress [J/OL]. Journal of Management: 1-9 [2022-12-01] http://kns.cnki.net/kcms/detail/42.1725.c.20221122.1344.022.html
[5]Wu Fei, Hu Huizhi, Lin Huiyan, Ren Xiaoyi. Enterprise Digital Transformation and Capital Market Performance - Empirical Evidence from Stock Liquidity [J]. Management World, 2021,37 (07): 130-144+10. DOI: 10.19744/j.cnki.11-1235/f.2021.0097
[6]Hao Xuguang. Several Problems of Diversification [J]. Management World, 2000 (02): 82-85. DOI: 10.19744/j.cnki.11-1235/f.2000.02.012
[7]Chen Xinyuan, Huang Jun. Government Intervention, Diversification and Corporate Performance [J]. Management World, 2007 (01): 92-97. DOI: 10.19744/j.cnki.11-1235/f.2007.01.013
[8]Jiang Fuxiu. Research on Determinants of Diversification of Listed Companies in China [J]. Management World, 2006 (05): 128-135
[9]Wei Feng. Empirical Analysis of the Relationship between Diversification and Corporate Performance -- A Time based Perspective [J]. Journal of Chongqing University (Natural Science Edition), 2007 (07): 161-166
[10]Ma Zhong, Liu Yu. The impact of government intervention and enterprise resources on enterprise diversification [J]. China Soft Science, 2010 (01): 116-127+174
[11]Richard P. Rumelt. Diversification Strategy and Profitability[J]. Strategic Management Journal,1982,3(4).
[12]Seoki Lee,Qu Xiao,Kyung Ho Kang. An Examination of US Hotel Segment Strategy: Diversified, Concentrated or Balanced? [J]. Tourism Economics,2011,17(6).
[13]Wang Fusheng, Song Haixu. Ultimate controller, diversification strategy and cash holding level [J]. Management World, 2012 (07): 124-136+169. DOI: 10.19744/j.cnki.11-1235/f.2012.07.012
[14]Wu Haomin, Wang Jie, Maisheng Diversified operation, bank credit and commercial credit provision -- also on the impact of financing constraints and economic cycles [J]. Management Review, 2017, 29 (10): 223-233. DOI: 10.14120/j.cnki.cn11-5057/f.2017.10.019
[15]Wu Guoding, Zhang Huili Does diversification reduce the financial risk of the enterprise——Empirical evidence from Chinese listed companies [J]. Journal of Central University of Finance and Economics, 2015 (08): 94-101
[16]Wang Zhiqiang, Ren Zhenchao. The Impact of Diversification on Enterprise's Debt Repayment Capacity [J]. Statistics and Decision Making, 2021,37 (22): 181-184. DOI: 10.13546/j.cnki.tjyjc.2021.22.040
[17]Purkayastha Anish,Pattnaik Chinmay,Pathak Atul Arun. Agency conflict in diversified business groups and performance of affiliated firms in India: Contingent effect of external constraint and internal governance[J]. European Management Journal,2022,40(2).
[18]Jin Xiaobin, Chen Daiyun, Lu Ying, Lian Mengke. Corporate Characteristics, Market Incentive and Diversification of Listed Companies [J]. Economic Research, 2002 (09): 67-73+95
[19]Ailian Zhang,Shuyao Wang,Bai Liu,Jingyuan Fu. The double-edged sword effect of diversified operation on pre- and post-loan risk in the government-led Chinese commercial banks[J]. North American Journal of Economics and Finance,2020,54(prepublish).

[20]Qiming Li,Wenhuan Wang,Yiping Lou,Ke Cheng,Xiaoguang Yang. Diversification and Corporate Performance: Evidence from China’s Listed Energy Companies[J]. Sustainability,2016,8(10).
[21]Seoki Lee,Qu Xiao,Kyung Ho Kang. An Examination of US Hotel Segment Strategy: Diversified, Concentrated or Balanced? [J]. Tourism Economics,2011,17(6).
[22]Yi Xingjian, Yang Biyun, Nie Zilong. Diversification strategy, core competitiveness framework and equity structure [J]. Nankai Management Review, 2003 (02): 55-59
[23]Yang Xingquan, Zhang Jiyuan. Chain shareholders and enterprise diversification: accelerating expansion or focusing on main business [J]. Modern Finance and Economics (Journal of Tianjin University of Finance and Economics), 2022, 42 (05): 36-55. DOI: 10.19559/j.cnki.12-1387.2022.05.003
[24]Yu Feifei, Cao Jiayu, Du Hongyan. The paradox of digitalization: the double-edged sword effect of enterprise digitalization on innovation performance [J]. Research and Development Management, 2022, 34 (02): 1-12. DOI: 10.13581/j.cnki.rdm.20210035
[25]Qi Yudong, Cai Chengwei. Research on the Multiple Effects of Digitalization on the Performance of Manufacturing Enterprises and Its Mechanism [J]. Learning and Exploration, 2020 (07): 108-119
[26]Xie Lijuan The seventh of the ten hot spots of China's commerce in 2019 - Digitalization to accelerate the improvement of retail efficiency leads the supply chain to form a new driving force for economic growth [J]. Business Economics Research, 2019 (16): 2
[27]Gregory Vial. Understanding digital transformation: A review and a research agenda[J]. Journal of Strategic Information Systems,2019,28(2).
[28]Liu Donghui, Bai Fuping, Dong Kaiyun. Research on the Mechanism of the Impact of Digital Transformation on Enterprise Performance [J]. Finance and Accounting Communication, 2022 (16): 120-124. DOI: 10.16144/j.cnki.issn1002-8072.2022.16.010
[29]Jin Xiaobin, Chen Daiyun, Lu Ying, Lian Mengke. Corporate Characteristics, Market Incentive and Diversification of Listed Companies [J]. Economic Research, 2002 (09): 67-73+95