Digital transformation and investment decisions: A corporate performance perspective

Shiguang Li[a*], Zheng Yang[b], Yixiang Tian[c]

School of Management and Economics, University of Electronic Science and Technology of China, Chengdu, China

[a*]francoislysg@outlook.com
[b]yangzheng@uestc.edu.cn
[c]tianyx@uestc.edu.cn

Abstract. This research aimed to investigate whether digital transformation affects firms' investment decisions and the mediation effect of investment decisions between digital transformation and corporate performance. We divide the investment decisions into research and development (R&D) investment and financial investment. Our results conclude that digital transformation increases R&D investment and financial investment. However, the effects of R&D investment and financial investment on corporate performance are different. R&D investment improves corporate performance while the financial investment inhibits corporate performance. Our research provides more detailed guidance for enterprise digital transformation.

Keywords: Digital transformation, investment decision, corporate performance

1 Introduction

As one of the three core financial decisions of an enterprise, investment decision-making has always been a hot research topic in the field of corporate finance. Digital transformation changes business processes, technology applications and firms' productivity. However, there is still a lack of research on how digital transformation affects investment decisions and further effects on performance.

Current literature on digital transformation is mostly case studies, focusing on some specific applications of digital technology in a certain scenario. Fintech enterprises and banks use digital footprint such as shopping data and information of registering on a Web site to predict consumer default [1]. Liu et al. [6] improved the usefulness of home robots through the application of perception technology. Enterprises use digital technology to extract consumer needs from user-generated content [9]. Digital transformation allows enterprises to collect and analyze unstructured data, which can be the primary support for data-driven decision-making.

Investment decisions are determined by investment opportunities and market sentiments. When enterprises find that some consumers needs have not been met by ex-

L. Moutinho et al. (eds.), *Proceedings of the 2023 International Conference on Management Innovation and Economy Development (MIED 2023)*, Advances in Economics, Business and Management Research 260,
https://doi.org/10.2991/978-94-6463-260-6_19

isting products, they increase R&D investment to develop corresponding products. Based on users' Web browsing information and comment data, digital technology assists in discovering new needs of consumers [2]. Investment opportunities in new markets encourage managers to increase their R&D investment. Abundant data and advanced forecasting methods are also conducive to discovering investment opportunities in financial markets.

Investment decisions in R&D and financial assets are crucial to the future development of enterprises. In this paper, we explore the relation between digital transformation and investment decisions, and further examine the value creation of R&D investment and financial investment under digital transformation.

2 Literature review and hypotheses development

2.1 Digital transformation

Digital transformation provide an important way for enterprises to alleviate the problems of slowing business growth, falling external demand and heightened competition. The development and application of a set of novel and powerful digital technologies leads to a digital transformation [8]. The digital revolution have transformed businesses and provided immense opportunities for entrepreneurs [3].

2.2 Mediation effect of investment decisions between digital transformation and corporate performance

Digital transformation optimizes the R&D investment decisions, and more R&D investment that meets market demand improves corporate performance. Consumer demand is changing faster than in the past. Enterprises capture online shopping data, online community comments, and data from sensor and processor in real time to analyze consumer behavior [4]. Digital technology enables faster discovery of the consumers' demand, which makes the research and development of new products in line with the market trend. R&D investment create value for enterprises though these products that are popular with users. Virtualization of product development and product iterations reduces the difficulty of developing new products [5]. Digital transformation reduces the risk of R&D failure, which enables R&D investment actually improve corporate performance. Therefore, we hypothesis:

H1: Digital transformation increases R&D investment.

H2: Digital transformation increases R&D investment to improve corporate performance.

Financial investment decision is also an important driver of corporate performance. Digital transformation makes it simple to monitor market-changes and online sentiment. Managers are overconfident when they have more information and better forecasting techniques than others. Managers take a risk and invest more financial assets in order to obtain higher returns. However, managers without professional investment training are prone to mistakes in the selection of financial asset targets and investment buying points. Especially in China's immature capital market, even professional in-

vestors often suffer investment losses. In addition, using widespread online disinformation to make financial investments can also result in losses. Non-professional investors may misjudge and overestimate the advantages of digital technologies [7] in financial investment. Therefore, we hypothesis:

H3: Digital transformation increases financial investment.

H4: Digital transformation raises financial investment, which inhibits corporate performance.

2.3 Digital transformation and corporate performance

Digital transformation affects corporate performance by expanding R&D investment and financial investment. However, the impact of digital transformation on corporate performance is unclear. With the help of digital technology, more efficient, low-risk, and market-oriented R&D investments improve corporate performance. In contrast, managers may suffer losses from financial investments due to their inability to judge the authenticity of online information and overconfidence in their investment abilities. The effects of digital transformation on performance need to be further tested.

3 Methodology

3.1 Data

We use the explanatory variable data for period 2007-2020 and explained variable data for period 2008-2021. Firm-level data are mainly from the China Stock Market & Accounting Research (CSMAR) database and supplemented from Wind. The GDP growth rate is from the National Bureau of Statistics of China. All the continuous variables are winsorized at the 1st and 99th percentiles.

Abnormal data are removed according to following procedures. First, the financial and real estate companies are excluded. Second, we delete the observations in initial public offerings (IPO) year. Third, the ST, ST* and PT observations are also excluded. Fourth, we delete the samples with no variables. There are 28430 firm-year observations in our final sample.

3.2 Empirical specification

To study the relationship between digital transformation and investment decisions, we estimate the following regression model:

$$Investment = \alpha_0 + \alpha_1 Digital + \alpha_2 Control + Year + Industry + \varepsilon \quad (1)$$

The variable *Investment* in model (1) is a firm's investment decision, that is, R&D investment or financial investment. We use *RD_Inv* to represent the amount of R&D investment, while the *Finan_Inv* represents the amount of financial investment. The variable *Digital* is the enterprise digitalization index in [10], which is constructed by text analysis methods. The *Control* represents a vector of factors that may affect the

investment decisions of enterprises. Control variables include firm size (*Size*), financial leverage (*Leverage*), cash flow (*Cash*), concentration of ownership (*TOP1*), board independence (*Inde_Board*), and the growth rate of state GDP (*GDP*). We include year fixed effects *Year* to control for time-varying factors and industry dummy variable *Industry* to absorb industry-specific time-invariant factors.

To test the mediation effect of investment decisions between digital transformation and corporate performance, we construct model (2) and model (3) with the same explanatory variable and control variables as model (1):

$$Mediator = \alpha_0 + \alpha_1 Digital + \alpha_2 Control + Year + Industry + \varepsilon \quad (2)$$

$$Performance = \alpha_0 + \alpha_1 Digital + \alpha_2 Mediator + \alpha_3 Control + Year + Industry + \varepsilon \quad (3)$$

The Mediator in models (2) and (3) is a mediator variable, that is, R&D investment or financial investment.

To further test whether digital transformation promote corporate performance, we estimate the following model:

$$Performance = \alpha_0 + \alpha_1 Digital + \alpha_2 Control + Year + Industry + \varepsilon \quad (4)$$

3.3 Variables and Descriptive statistics

The explanations of variables from model (1) to model (4) are shown in Table 1.

Table 1. Digital transformation and investment decisions

Variable name	Variable symbol	Variable definitions
R&D investment	RD_Inv	The ratio of R&D investment to total assets
Financial investment	Finan_Inv	(Cash and equivalents + transaction financial assets + derivative financial assets + buying and selling financial assets + other current assets + financial assets available for sale + held-to-maturity investment + real estate investment + issuing loans and advances)/total assets
Corporate Performance	Performance	The growth rate of firm's operating income, which is adjusted by subtracting the industry average
Enterprise digitalization index	Digital	The number of digitization-related keywords in each annual report scaled by the number of sentences in this annual report
Firm size	Size	The logarithm of the number of employees plus 1
Financial leverage	Leverage	Total liabilities scaled by total assets
Cash flow	Cash	Net cash flow scaled by total assets
Concentration of ownership	TOP1	The shareholding ratio of the largest shareholder
board independence	Inde_Board	The proportion of independent directors on a firm's board of directors
growth rate of state GDP	GDP	The growth rate of state GDP

The descriptive statistics of all variables are presented in Table 2.

Table 2. Descriptive statistics

Variables	N	Mean	Std
RD_Inv	28430	1.7781	1.9092
Finan_Inv	28430	20.9511	13.9928
Performance	28430	-5.7523	33.5048
Digital	28430	0.1909	0.3135
Size	28430	7.6817	1.2518
Leverage	28430	43.2294	20.5487
Cash	28430	4.7713	7.0059
TOP1	28430	0.3423	0.1470
Inde_Board	28430	0.3737	0.0534
GDP	28430	0.0986	0.0614

4 Results

4.1 Digital transformation and investment decisions

Columns (1) and (3) of Table 3 shows the results of model (1). The coefficients of Digital are positive and significant at 1% level. The hypotheses H1 and H3 are supported, which indicates that enterprises with high level digitization invest more in R&D and financial assets.

Table 3. Digital transformation and investment decisions

	(1)	(2)	(3)	(4)
Variables	**RD_Inv**	**Performance**	**Finan_Inv**	**Performance**
Digital	0.7978***	1.4999*	0.9197***	2.3934***
	(16.9970)	(1.7498)	(2.9634)	(2.8286)
RD_Inv		1.0214***		
		(7.6931)		
Finan_inv				-0.0855***
				(-4.8854)
Size	0.1223***	-1.1405***	-1.0749***	-1.1075***
	(15.4535)	(-5.2133)	(-13.2756)	(-5.0418)
Leverage	-0.0120***	-0.0566***	-0.1611***	-0.0826***
	(-24.8824)	(-4.1540)	(-31.7223)	(-5.8717)
Cash	0.0209***	-0.1567***	0.2499***	-0.1140***
	(14.9329)	(-4.5146)	(18.8133)	(-3.2668)
TOP1	-0.2358***	1.5656	4.7986***	1.7350
	(-3.9507)	(1.1805)	(8.8606)	(1.3044)
Inde_Board	-0.0545	8.1001**	-0.4290	8.0078**
	(-0.3372)	(2.1973)	(-0.3059)	(2.1691)
GDP	0.7289***	7.9062	1.8028	8.8048*
	(3.8021)	(1.5357)	(1.0133)	(1.7045)
Constant	0.6436***	6.6138**	31.1631***	9.9356***
	(6.3967)	(2.2886)	(30.4751)	(3.3976)
Year Effect	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes
N	28430	28430	28430	28430
Adjusted R^2	0.4305	0.0941	0.2009	0.0932

4.2 Mediation effect of investment decisions between digital transformation and corporate performance

The results of model (2) and model (3) are presented in Table 3. As shown in Table 3, digital transformation increases R&D investment and financial investment. In column (2) of Table 3, the coefficient of RD_Inv is positively significant. The results of columns (1) and (2) of Table 3 indicate that digital transformation increases R&D investment to improve corporate performance. The hypothesis H2 is supported.

In column (4) of Table 3, the coefficient of *Finan_inv* is negative and significant. The results of columns (3) and (4) of Table 3 suggest that digital transformation increases financial investment, which lead to a decline in corporate performance. The hypothesis H4 is supported.

4.3 Digital transformation and corporate performance

In sections 4.1 and 4.2, we find that the effects of digital transformation on corporate performance can be different. We use model (4) to further test the impact of digital transformation on corporate performance.

Table 4 shows the results of model (4). The coefficient of Digital is positive and significant, suggesting that digital transformation improve the corporate performance.

Table 4. Digital transformation and corporate performance

	(1)
Variables	**Performance**
Digital	2.3147***
	(2.7367)
Size	-1.0156***
	(-4.6196)
Leverage	-0.0688***
	(-5.0855)
Cash	-0.1353***
	(-3.9154)
TOP1	1.3247
	(0.9982)
Inde_Board	8.0445**
	(2.1787)
GDP	8.6506*
	(1.6744)
Constant	7.2711**
	(2.5196)
Year Effect	Yes
Industry Effect	Yes
N	28430
Adjusted R^2	0.0922

5 Conclusion

The social environment and economic environment have undergone tremendous changes, which forced enterprises to find new approaches to accommodate these changes and address obstacles. Digital transformation provides new opportunities for enterprises to respond to these changes. Digital transformation assists enterprises discover new market opportunities and increase R&D investment to improve corporate performance. However, investing in financial assets inhibits corporate performance due to lack of professional investment experience. Overall, digital transformation improves corporate performance. Finally, the potential value creation of digital transformation can be further stimulated if managers do not blindly invest in financial assets.

References

1. Berg, T., Burg, V., Gombovic, A., Puri, M. (2020) On the rise of FinTechs: credit scoring using digital footprints. Rev. Financ. Stud., 33: 2845-2897. https://doi.org/10.1093/rfs/hhz099.
2. Evgeniou, T., Pontil, M., Toubia, O. (2007) A convex optimization approach to modeling consumer heterogeneity in conjoint estimation. Mark. Sci., 26: 805-818. https://doi.org/10.1287/mksc.1070.0291.
3. Feliciano-Cestero, M. M., Ameen, N., Kotabe, M., Paul, J., Signoret., M. (2023) Is digital transformation threatened? A systematic literature review of the factors influencing firms' digital transformation and internationalization. J. Bus. Res., 157. https://doi.org/10.1016/j.jbusres.2022.113546.
4. Ferreira, K. J., Lee, B. H. A., Simchi-Levi, D. (2015) Analytics for an online retailer: Demand forecasting and price optimization. Manuf. & Serv. Oper. Manage., 18: 69–88. https://doi.org/10.1287/msom.2015.0561.
5. Kusiak, A. (2017) Smart manufacturing must embrace big data. Nature, 544: 23-25. https://doi.org/10.1038/544023a.
6. Liu, Y. X., Gupta, A., Abbeel, P., Levine, S. (2018) Imitation from observation: Learning to imitate behaviors from raw video via context translation. In: 2018 IEEE Int. Conf. Robot. Autom. Brisbane. https://doi.org/10.48550/arXiv.1707.03374.
7. Nambisan, S., Lyytinen, K., Majchrzak, A., Song, M. (2017) Digital innovation management: Reinventing innovation management research in a digital world. MIS Q., 41: 223-238. https://doi.org/10.25300/MISQ/2017/41:1.03.
8. Nasiri, M., Ukko, J., Saunila, M., Rantala, T. (2020) Managing the digital supply chain: The role of smart technologies. Technovation, 96-97. https://doi.org/10.1016/j.technovation.2020.102121.
9. Timoshenko, A., Hauser., J. R. (2019) Identifying customer needs from user-generated content. Mark. Sci., 38: 1-20. https://doi.org/10.1287/mksc.2018.1123.
10. Wu, F., Hu, H., Lin, H., Ren, X. (2021) Enterprise digital transformation and capital market performance--empirical evidence of stock liquidity. Manage. World, 37 (07): 130-144. https://doi.org/10.19744/j.cnki.11-1235/f.2021.0097.