



Research on The Mechanisms by How Digitalization Drives Corporate Innovation

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Abstract. With the development of digital economy, enterprises nowadays have laid out digital transformation. This study adopts a quantitative research method to analyze the questionnaire data of 159 enterprises using structural equation modeling. The results shows that digitization acts on enterprise innovation through the mediating mechanisms of financing constraints, absorptive capacity, and internal control, which in turn stimulates the innovation vitality and potential of enterprises.

Keywords: Digitalization; Mediating Variables; Firm Innovation; Structural Equation Modeling

1 Introduction

Since the 19th CPC National Congress, the CPC Central Committee has prioritised the development of the digital economy. They have proposed the construction of 'Digital China' and promoted the deep integration of Big Data, Artificial Intelligence and the real economy. This provides new development opportunities for high-quality innovation in China's enterprises. Financing constraints, a significant factor in digitalization, can guide the quality of enterprise innovation. Studies suggest that digital transformation can help small and medium-sized enterprises mitigate financing difficulties and reduce high financing costs, leading to improved investment efficiency and promoting high-quality innovation. Additionally, digitalization can enhance an enterprise's capacity to absorb innovative knowledge, strengthen internal control, and improve management, all of which contribute to enhancing high-quality innovation.

In view of this, this paper adopts Structural Equation Modeling (SEM) to explore the following questions based on Dynamic Capability Theory and Capability Hierarchy Perspective: can digitization lead to high-quality innovation in enterprises? How can digitization solve the problems of enterprise transformation and high-quality innovation?

2 Theoretical Assumptions

2.1 Digitization and Enterprise Innovation

Enterprise innovation refers to the process by which an enterprise creates new value and competitive advantages through the introduction of new thinking, technologies, products or services, and business models[1]. Digitalisation has been shown to have a positive impact on corporate innovation in existing studies. Xing and Xu examined the impact of digital transformation on corporate green innovation using a sample of A-share manufacturing companies listed in Shanghai and Shenzhen from 2011-2021[2]. Jia's empirical research found that digital transformation significantly enhances openness to corporate innovation. Appio argued that digital technology enables firms to engage in repetitive and flexible R&D activities, driving new iterations and potential for organizational innovation[3]. Therefore, the following hypotheses are proposed:

H1: Digitization has a positive impact on enterprise innovation.

2.2 Digitization and Mediating Variables

Financing constraint theory mainly explores the difference between internal financing costs and external financing costs, which in turn affects the investment behavior of enterprises [4]. The digital transformation of enterprises urges enterprises to disclose information on corporate social responsibility (CSR) due to the application of big data and information technology in the enterprise [5]. Absorptive capacity refers to an enterprise's ability to identify, absorb, and utilize knowledge from the external environment [6]. Digital transformation improves the enterprise's ability to acquire and integrate external resources, making it easier to acquire and analyze key information. The digitalization of enterprises allows for real-time recording and verification of capital information related to transaction behaviours [7]. Digital transformation enhances the transparency and monitoring capabilities of internal enterprise controls, which can effectively mitigate the issue of overinvestment or underinvestment in businesses.

Those leads to the following hypothesis:

H2a: Digitization has a positive impact on financing constraints.

H2b: Digitization has a positive impact on absorptive capacity.

H2c: Digitization has a positive impact on internal control.

2.3 Intermediary Variables and Enterprise Innovation

Enterprises conducting R&D require a stable input of external resources. Lowering the financing threshold ensures that the funds used for investment in innovation are more sufficient, thereby promoting the digital transformation of enterprises. Digital transformation enables the precise matching of resources and capabilities. With enhanced enterprise absorption capacity, it is easier for enterprises to find the path to obtain innovative resources, which can lead to the double enhancement of technology and capacity. Digital transformation has led to a change in organizational structure, resulting in re-

duced transaction costs. This change has led to a clearer division of labor among employees, ensuring efficient operation of internal mechanisms, enhancing the utilization of knowledge and technology resources [8], and creating a conducive environment for innovation activities based on utilization.

Those leads to the following hypothesis:

- H3a: Financing constraints have a positive effect on enterprise innovation.
- H3b: Absorptive capacity has a positive effect on enterprise innovation.
- H3c: Internal control has a positive effect on enterprise innovation.

2.4 Mediating Role of Intermediate Variables

Current research has limited discussion on the mechanisms through which digitalisation impacts corporate innovation. Wang and Qin (2019) demonstrate that corporate digital transformation can enhance corporate innovation performance by alleviating financing constraints and reducing agency conflicts [9]. Rajshree and Constance argue that absorptive capacity mediates the relationship between enterprise digital transformation and innovation performance[10]. According to Brynjolfsson and Mcelheran, digital transformation can facilitate resource sharing between stakeholders, enhance information communication efficiency, and enable utilization-based innovation in enterprises. The digital transformation of firms enhances the innovation through financing constraints, absorptive capacity, and internal control. Therefore, the following hypotheses are proposed:

H4: Financing constraints, absorptive capacity, and internal control mediate between digitization and enterprise innovation.

2.5 Conceptual Model

Based on existing research and the assumptions made above, a theoretical model is proposed in Figure 1. The model suggests that digitisation of firms can enhance innovation quality and level by alleviating financing constraints, improving absorptive capacity, and enhancing internal control.

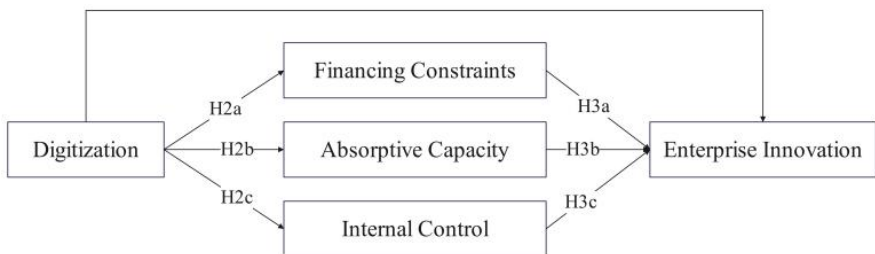


Fig. 1. Theoretical Model

3 Study Design

3.1 Data Collection and Sample Characteristics

This study employs the questionnaire method to collect samples from middle and senior managers of enterprises who possess practical experience in enterprise digital transformation. These managers are the main force of innovation and are capable of comprehensively understanding the relationship and between digitalization and enterprise innovation.

The questionnaires are distributed in two ways: firstly, through field research to middle and senior managers of enterprises cooperating with the school; secondly, through the WeChat public number 'JinBaoXian' to enterprise managers. A total of 183 questionnaires were distributed, and 159 were collected, resulting in an effective recovery rate of 86.9%.

Descriptive statistics are analysed for 159 questionnaires. The sample covers a wide range of industries, with the manufacturing industry accounting for the largest share at 37.1%. Of the sample, 42.8% are owned enterprises and 57.2% are private enterprises. Additionally, 54.1% of the questionnaire respondents have been in their positions for 1-5 years.

3.2 Development of Measurement Model

This study employs Structural Equation Modelling (SEM) to analyse the effect. The questionnaire measures study variables on a 5-point Likert scale, with 1 indicating 'strongly disagree' and 5 indicating 'strongly agree'. Table 1 displays the design of questions corresponding to each latent variable.

Table 1. Scale Design

Variables	Question Items	Reference Source
<i>Digitization(D)</i>	Extent of use of AI technologies	Yang LiHong and Jia Ruyun[4]
	Extent of use of blockchain technology	
	Extent of use of cloud computing technologies	
	Extent of use of big data technologies	
<i>Financing Constraints(FC)</i>	Extent of digital technology applications	Wang Mengtian and so on [5]
	Number of loans successfully obtained	
	Sources of financing approached	
	Frequent issuance of financial statements	
<i>Absorptive Capacity(AC)</i>	Repayment on time after loan	Zhang Yuhan and so on [11]
	Training of employees in scientific research	
	Launching a new product or introducing a new service	
	Employees are willing to share knowledge and experience	
	A specialized technical assessment team	

<i>Internal Control(IC)</i>	Organizational structure of the enterprise	Xu Sixing and so on [12]
	Risk assessment capabilities of the enterprise	
	Control activities of the enterprise	
	Internal reporting and information systems of enterprises	
<i>Enterprise Innovation(EI)</i>	Internal oversight mechanisms in enterprises	Cai Tingting and Zhang Bo[13]
	Percentage of R&D staff	
	R&D expenditure as a percentage	
	Number of patents granted	
	Profit margin	

4 Data analysis and Results

4.1 Reliability and Validity Tests

In this study, SPSS20 and AMOS20 software are used to test the reliability and validity of the model. In terms of reliability, Cronbach's value and CR value are used for testing. In terms of validity, factor loadings and AVE values are used for testing. The results of the reliability and validity tests for each variable are shown in Table 2.

Table 2. Results of reliability and validity tests for each variable

Variant	KMO	Cronbach's α	CR	Factor loading	AVE
<i>D</i>	0.891	0.912	0.926	0.725	0.573
<i>FC</i>	0.742	0.813	0.840	0.711	0.598
<i>AC</i>	0.715	0.825	0.862	0.680	0.560
<i>IC</i>	0.874	0.926	0.891	0.692	0.615
<i>EI</i>	0.934	0.967	0.920	0.733	0.627

As can be seen from Table 2, the KMO values of all variables are above 0.7, indicating that the data are suitable for factor analysis; the Cronbach's values and CR values of all variables are above 0.8, indicating that the model has good reliability; the factor loadings of all variables are above 0.6 and the AVE values are above 0.5, indicating that the model has good validity.

4.2 Structural Equation Model

The study uses AMOS20 software to analyze the relationships between variables. Using the theoretical model in Figure 1 as a structural equation model and the questionnaire data, it finds that the effect of digitization on firm innovation is insignificant (p-value = 0.327, > 0.05), rejecting hypothesis H1.

Based on the results of the above analysis, we revise the theoretical model by deleting the direct influence path of Digitization on Enterprise Innovation, and use AMOS20 software to fit the results, which are shown in Figure 2.

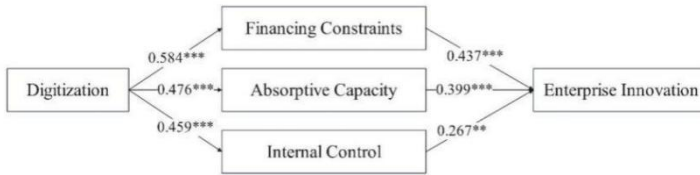


Fig. 2. Structural equation model fitting results

The model is subjected to modified model test and goodness of fit test and the results are obtained as shown in Table 3.

Table 3. Table of modified model test and goodness-of-fit test results

fitness index	χ^2	Df	χ^2/df	GFI	RMS EA	RMR	CFI	NFI	NNFI
Recommended value	-	-	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
result	193.79	68	2.849	0.937	0.066	0.040	0.935	0.958	0.936

The results show that the chi-square degrees of freedom ratio is 2.849, which is between 1-3, the root mean square of the approximation error RMSEA=0.066<0.10, which indicates that the model has a good fit, and the comparative fit index CFI=0.935>0.9. The combination of the various types of indexes indicates that the model has a good overall fit to the measurement data.

4.3 Fitting Results of Each Path

The fitting effect of each major path in the model is analyzed and the results are obtained as shown in Table 4.

Table 4. Fitting results for each path

Factor	→	Analysis Trm	Standardi-zed Path Factor	S.E.	C.R.	P	Assuming support
<i>D</i>	→	<i>FC</i>	0.584	0.091	6.467	***	H2a
<i>D</i>	→	<i>AC</i>	0.476	0.087	6.581	***	H2b
<i>D</i>	→	<i>IC</i>	0.459	0.069	5.397	***	H2c
<i>FC</i>	→	<i>EI</i>	0.437	0.083	5.301	***	H3c
<i>AC</i>	→	<i>EI</i>	0.399	0.095	4.783	***	H3b
<i>IC</i>	→	<i>EI</i>	0.267	0.084	3.998	0.0013	H3c

As shown in Table 4, the revised theoretical model reveals six paths linking five latent variables. The standardized path coefficients of the impact of digitization on financing constraints, absorptive capacity, and internal control are positive with a P-value < 0.05, supporting hypotheses H2a, H2b, and H2c. Similarly, financing constraints, absorptive capacity, and internal control positively influence firm innovation with a p-

value < 0.05 , confirming hypotheses H3a, H3b, and H3c. The direct path test confirms the existence of the mediating effect.

5 Conclusions

The study indicates that digitization has an indirect impact on enterprise innovation through mediators such as financing constraints, absorptive capacity, and internal control.

(1) Relationship between digitization, financing constraints, and enterprise innovation. The data analysis reveals that financing constraints act as a mediator between digitization and enterprise innovation. Enterprises should focus on improving internal controls, enhancing information disclosure, and strengthening investor communication, which will send positive signals to the market and reduce information costs for external investors. Financial institutions should leverage digital technology to enhance service efficiency and facilitate enterprise-investor communication.

(2) Relationship between digitization, absorptive capacity, and enterprise innovation. Data analysis shows that absorptive capacity plays a mediating role between digitization and enterprise innovation. The CAICT's 2021 White Paper outlines the three key elements of digital transformation: digitization of factors, processes, and outputs. Absorptive capacity enhances innovation by enabling companies to effectively assimilate external knowledge and resources during digital transformation, which is a vital part of digitization.

(3) Relationship between digitization, internal control, and enterprise innovation. Data analysis indicates that internal control serves as a mediator between digitalization and business innovation. The MII's Development Plan aids microenterprises in digital transformation, demonstrating how the digital economy enables innovation in manufacturing. Enterprises should focus on policy development, promote new ideas, and enhance interdepartmental collaboration through open systems and information sharing to unlock innovation potential.

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