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## **Abstract**

Faced with the significant opportunities of a new round of technological revolution and industrial transformation, the path and antecedents of enterprise innovation performance are also undergoing significant changes. Based on the theory of dynamic capabilities, this article combines with the reality of enterprise digital transformation and upgrading, and constructs a theoretical model of "entrepreneurship, digital capability and innovation performance" for enterprises embedded in digital contexts. Simultaneously introducing environmental dynamism and strategic flexibility as moderating variables, this study explores the contingency effects of these two key internal and external characteristics on the relationship between entrepreneurship, digital capability, and innovation performance. Through research and empirical analysis of 510 internet and manufacturing enterprises in representative cities in China, this article draws the following specific conclusions: First, entrepreneurship plays an important positive role in promoting innovation performance of enterprises; Second, the digital capability of enterprises is an important positive intermediary bridge between entrepreneurship and innovation performance; Third, environmental dynamism positively regulates the promoting effect of entrepreneurship on innovation performance; Fourthly, strategic flexibility positively regulates the enhancing effect of digital capabilities on innovation performance of enterprises.

**Keywords:** Entrepreneurship, Digital Capabilities, Enterprise Innovation Performance, Environmental Dynamism, Strategic Flexibility

## **1. Introduction**

### **1.1 Background and Importance of the Problem**

Innovation is the primary driving force for development, and it is also an important means for enterprises to enhance competitiveness, achieve survival and sustainable development (Teece, 2018; Chen Hong et al., 2019). Entrepreneurs are important organizers of economic activities and the backbone of innovation and entrepreneurship. Entrepreneurship has become the spiritual driving

force for promoting enterprise growth and healthy development, playing an important role in enterprise innovation, enterprise transformation, social responsibility, regional economic growth, and other aspects (Li Lan et al., 2022). Based on a new stage of development, the digital economy has spawned a series of new formats, technologies, and models, breaking traditional time and space limitations and promoting cross-border allocation of factors such as funds, technology, and talent. These changes provide good opportunities for entrepreneurs to utilize digital technologies such as the Internet, big data, cloud computing, and blockchain. The connotation and role of entrepreneurship have become increasingly complex and varied, and its impact on enterprise innovation performance has become more diverse.

The possible theoretical contributions of this article are mainly reflected as follows: first, at the micro level, this article focuses on the new changes in entrepreneurship in the digital context, revealing how enterprises can leverage entrepreneurship and dynamically build digital capabilities, thereby empowering the internal impact mechanism of enterprise innovation performance. This article opens up the mechanism black box of the causal relationship between entrepreneurial spirit and enterprise innovation performance in the context of digitalization, deepening the theoretical exploration of studying enterprise innovation from the perspective of endogenous motives of enterprises, and to some extent filling the gaps in existing literature. Second, we attempt to incorporate research on the boundary conditions and contingency effects of environmental dynamism and strategic flexibility on the construction of digital capabilities and innovation performance of enterprises, analyzing the process of enhancing digital construction capabilities of entrepreneurship in complex and ever-changing environments, and breaking through the "digital paradox" to achieve enterprise innovation. This provides new clues for exploring the impact of entrepreneurship and digital capabilities on innovation performance, and enriches the theoretical research on digital capabilities and innovation management.

## 1.2 Research Question

Has the impact of entrepreneurship on enterprise innovation performance changed in the digital context? Is the construction of digital capabilities in enterprises an intermediary bridge between entrepreneurship and innovation performance? Will factors such as the dynamism of the external environment and internal strategic flexibility disrupt the existing innovation order of enterprises, or will they bring new development opportunities to enterprise innovation? The answers to these questions have become important topics of theoretical exploration and management practice, and also provide useful insights for guiding enterprises to break through the digital dilemma, fully unleash entrepreneurship, and to seize new digital technology opportunities, demonstrate the innovative empowerment effect of digital technology, and promote the deep integration and development of the digital economy and the real economy.

## 1.3 Research Objective

This study is based on the theory of dynamic capabilities and constructs a theoretical model of "entrepreneurship, digital capabilities and innovation performance" for enterprises embedded in digital contexts. By collecting questionnaire data from 510 internet and manufacturing enterprises in representative regions of China, this study conducts empirical research on the intrinsic interaction between the three, and introduces environmental dynamism and strategic flexibility as moderating variables to reveal the mechanisms and boundary conditions of entrepreneurship, digital capability, and innovation performance.

## 2. Literature Review

### 2.1 Related Concepts and Theories

#### 2.1.1 Entrepreneurship and Innovation Performance

Scholars explore the process of the impact of entrepreneurial spirit on enterprise innovation performance from different perspectives. For example, from the perspective of organizational structure, Green et al. (2008) believe that entrepreneurship is an effective factor in promoting the development of enterprises and plays a positive role in the healthy development of enterprises, especially in the organizational structure of developmental structures. From the perspective of organizational culture and strategy, Shahzad et al. (2016) believe that entrepreneurship is not only a spiritual force, but also a guiding force in the organization. It can be organically combined with the enterprise through organizational culture and strategy, and exert a strong guiding force. Gao Hui (2017) found that the selection and implementation of entrepreneurship strategies can have a positive impact on innovation performance. Chen Hongwei (2017) and others found through practical research on the elements of enterprise innovation that entrepreneurship plays an important role, and the core of enterprise innovation elements is in line with the spirit of seeking novelty and change, entrepreneurship influences the physical organizational structure through organizational structure and culture, and plays a positive and important role in the innovation performance of enterprises. Niemann et al. (2020) found that entrepreneurship has a positive impact on the environment and innovation performance. Sun Bing et al. (2022) found through empirical research that entrepreneurship not only directly promotes the diffusion of technological innovation, but also indirectly promotes the diffusion of technological innovation by strengthening knowledge sharing. But based on the new stage of development, the entrepreneurship faces new digital situations. How can its dimensions and measurement methods keep up with the times? Is there any new change in the impact process and mechanism of entrepreneurship on enterprise innovation performance in the digital context? These issues deserve further attention and research.

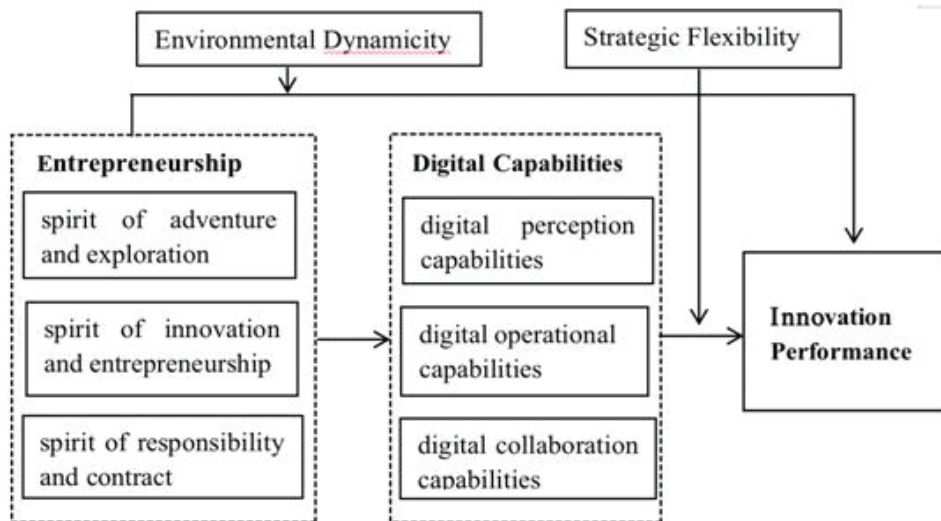
#### 2.1.2 Enterprise Digital Capability and Innovation Performance

Digitization is a new stage in the information age, in previous literature on innovation performance, a considerable part of its research logic was conducted in the information system environment. Therefore, when scholars study the impact of enterprise digitization, digital transformation, and digital capabilities on innovation performance, they are similar to the "IT (Information Technology) paradox" phenomenon in previous views, and often have different perspectives. For example, Tumbas et al. (2017) believe that the development of enterprises is significantly driven by digitalization, which promotes individuals to have flexible and agile characteristics when transitioning between different work modes, and has a great impact on enterprise innovation. Hou Guangwen (2022) selected strategic emerging industries as research samples and found that under the background of digital transformation, the digital collaborative ability of enterprises can significantly improve innovation performance. Tindara et al. (2021) found from the perspective of dynamic capability theory that digital functions such as perception, capture, integration, and interaction possessed by internet companies are beneficial for optimizing knowledge management methods and promoting external participation in open innovation, ultimately improving organizational innovation performance and transforming it into a competitive advantage. At the same time, some scholars have proposed different research perspectives. For example, Li and Jia (2018) used multiple regression methods to empirically study and found that the impact of digital technology on overall performance of enterprises is not significant. Hajli et al. (2015) used panel regression method to study and found that the improvement of digitalization level may only lead to

an improvement in the performance of some enterprises, while the performance of another group of enterprises may decrease as a result. The main reason for the decline is the high cost consumption in the process of digitalization improvement. Zhou Qing (2019) found that the internal learning cost of enterprises is higher after the improvement of digital level. Both Zhu Bin (2108) and Kwit H (2019) found in their research that the impact of digitalization level on firm performance and innovation performance may be an inverted "U" shape, and there is a boundary in the driving effect of enhancing digitalization level on innovation performance. In summary, from the existing literature, there are relatively few studies directly studying the digital capabilities and innovation performance. Scholars also have different views on the impact of enterprise digitization, digital transformation, and innovation performance. Therefore, it is meaningful to measure and explore the digital capabilities of enterprises from the perspective of dynamic capability theory, and further clarify the role of digital capabilities in entrepreneurial spirit and innovation performance.

## 2.2 Conceptual Framework

Based on the resource-based theory and dynamic capability theory, this article analyzes the relationships between entrepreneurship, enterprise digitalization capability, innovation performance, environmental dynamicity, and strategic flexibility. The conceptual model of this article is shown in Figure 1.



**Figure 1** Conceptual Framework

## 2.3 Research Hypothesis

### 2.3.1 Entrepreneurship and Innovation Performance

Entrepreneurship has always been a key production factor for sustainable innovation and development of enterprises (Niemann, 2020). As an important part of enterprise resource composition, its ability to explore and identify opportunities enables enterprises to obtain sustained competitive advantages (Shane, 2000). Entrepreneurial exploration of opportunities helps identify and seize business opportunities for technological innovation. First, Entrepreneurial pursuit towards their own success tend to support and utilize new perspectives and methods, develop new products,

technologies, and equipment. Knight (1921) believed that adventurers view a business as a platform and use it to take on certain risks, while those who are content with the status quo or hesitant will only receive predetermined benefits. Second, Entrepreneurship is essentially the spirit of innovation (Drucker, 1985). Entrepreneurial innovative spirit can lead the innovation practice of enterprises and cultivate the innovation culture of enterprises. Innovation spirit can also be transformed into the innovation driving force of enterprises, and then into the innovation behavior of enterprises (Lumpkin&Dess, 1996). The innovation drive of entrepreneurs comes from the pursuit of excess profits(Schuppert, 1934), and the entrepreneurial innovative spirit promotes technological innovation in enterprises to achieve price advantages and product differentiation, thereby creating excess profits. Similarly, the entrepreneurial enthusiasm of entrepreneurs enables them to persistently engage in innovative work full of setbacks (Drucker, 1985). Entrepreneurship provides new opportunities for value creation for enterprises to explore new market areas and transform development models, leading competitors in product development, gaining competitive advantages, and improving innovation performance (Covin&Miles, 1999). Third, Enterprise innovation decision-making is often related to the strategic leadership and social responsibility abilities of entrepreneurs (Vossen, 1998). The emergence of innovative decision-making in enterprises requires significant risks and uncertainties. If the enterprise has a spirit of social responsibility, it indicates that entrepreneurs will reduce information asymmetry in order to timely and truthfully disclose enterprise information, maintain trust relationships among shareholders, and more likely protect shareholder interests, alleviate financing pressure, and have a positive impact on enterprise innovation. On the other hand, the sense of social responsibility of entrepreneurs will encourage them to invest more in public welfare undertakings. In order to achieve reputation, enterprises may produce higher quality products based on social and customer needs, and enterprises may choose to innovate to meet the production of higher quality products.

Based on the above analysis, we propose the following research hypotheses:

H1: Entrepreneurship has a positive impact on enterprise innovation performance.

- H1a: Entrepreneur's spirit of adventure and exploration has a positive impact on enterprise innovation performance.
- H1b: Entrepreneur's spirit of innovation and entrepreneurship has a positive impact on enterprise innovation performance.
- H1c: Entrepreneur's spirit of responsibility and contract has a positive impact on enterprise innovation performance.

### 2.3.2 *The Mediating Effect of Enterprise Digital Capabilities*

The new wave of innovation triggered by digitalization is sweeping across the world. Digital capabilities, as a higher-order enterprise capability evolved from dynamic capabilities (Annarelli et al., 2021), are the concretization of dynamic capabilities in digital contexts, including digital perception, operational capabilities, and resource coordination capabilities. They can guide enterprises to adapt to dynamic and complex internal and external environmental changes, further expanding the depth and breadth of enterprise value creation (Leo et al., 2021). The entrepreneurship has the characteristic of dynamic evolution (Li Lan et al., 2019). In the digital age, the entrepreneurship will help enterprises continuously perceive external opportunities, and identify the value of digital innovation, then use digital technology to carry out research and development, production, and management services. At the same time, it can coordinate the sharing and integration



of various resources, promote the formation and development of enterprise digital perception ability, operational ability, and digital resource collaboration ability. By leveraging the digital capabilities of enterprises, they can create and seize innovation opportunities in digital transformation, continuously improving the success rate and conversion rate of innovation.

Therefore, this article proposes the following hypothesis:

H2: Entrepreneurship can further stimulate the formation of digital capabilities in enterprises, thereby promoting the improvement of innovation performance.

Specifically, the first path is that entrepreneurship will enhance innovation performance by positively promoting a company's digital perception ability. When enterprises are in a digital environment and face diverse needs, entrepreneurs with a spirit of adventure and exploration pursue their own success and progress, which enables them to engage in risky activities under the premise of uncertain future profits and innovation value (Nambisan, 2017). With the help of digital technologies such as big data and blockchain, they form a certain market insight, and then use their keen insight to promote the formation of digital opportunity recognition and perception ability. This helps to make more accurate predictions about the development trend of innovation demand. Second, the innovative and entrepreneurial spirit of entrepreneurs is influenced by the social attributes of digital technology. Through internet platforms, entrepreneurs with extensive and diverse social relationships and higher social status can access more business resources and opportunities, which is conducive to enhancing the ability of enterprises to identify digital opportunities and value (Larson, 1992). On this basis, by quickly searching for exploratory knowledge that aligns with the development positioning, new value positioning and new ways of value creation can be proposed, thereby opening up new innovative growth points for enterprises. Finally, based on agency theory, with the gathering of the entrepreneurial responsibility and contract spirit, enterprises are driven to abide by the contract as agents within the enterprise, taking into account the short-term and long-term interests of shareholders. This change will guide enterprises to allocate more resources for technological innovation and expanded reproduction (Yu Jingfan, 2022), promoting their perception of market opportunities in economic and technological development such as big data. On the other hand, it will also help enterprises seize market opportunities and form innovative competitive advantages. Based on the above analysis, we propose the following assumptions:

- H2a: Entrepreneur's spirit of adventure and exploration can further stimulate the formation of the digital perception ability in enterprises, thereby promoting the improvement of innovation performance.
- H2b: Entrepreneur's spirit of innovation and entrepreneurship can further stimulate the formation of the digital perception ability in enterprises, thereby promoting the improvement of innovation performance.
- H2c: Entrepreneur's spirit of responsibility and contract can further stimulate the formation of the digital perception ability in enterprises, thereby promoting the improvement of innovation performance.

The second path is that entrepreneurship will enhance innovation performance by positively promoting the digital operational capabilities of enterprises. The entrepreneur's spirit of adventure and exploration, as an important production factor in the development of digitalization in enterprises (Xiong et al., 2017), can promote enterprises to creatively utilize digital technologies such as big data and artificial intelligence to gain insights into digital opportunities, and continuously form and



practice the ability to formulate digital solutions such as research and development, production, channels, marketing, management, and services. Second, digital technology and resources have brought about changes in resources, markets, and scenarios for innovative activities. The entrepreneur's spirit of innovation and entrepreneurship, as an internal driving element of innovative activities, can guide enterprises to improve the accuracy of R&D decisions by leveraging high-quality data obtained from the data element market and combining artificial intelligence technology and corresponding algorithms and computing power. On the one hand, this will guide enterprises to shift their innovation motivation towards strategic profitability. On the other hand, enterprises will also achieve growth and transformation towards digital operation capabilities such as digital management and services in exploring new market areas and transforming development models. Finally, the entrepreneur's spirit of responsibility and contract drives entrepreneurs to adhere to the concept of honest operation and win-win cooperation to participate in external collaboration (He Ling, 2022), and build management and service capabilities such as research and development, production, and marketing in the digital ecosystem. The digital operation capability built by enterprises can break through the limitations of information barriers and information asymmetry through data elements, accurately control product development and technology upgrading stages, and achieve full communication and coordination in research and development cooperation through the flow and sharing of data elements inside and outside the enterprise. It can be foreseen that the development cycle of enterprises will be shortened, risks will be reduced, and the success rate and conversion rate of innovation will be further improved, ultimately achieving cost reduction, quality improvement, and efficiency enhancement for enterprises, promoting the implementation and implementation of innovation. Therefore, based on the above analysis, we propose the following assumptions:

- H2d: Entrepreneur's spirit of adventure and exploration can further stimulate the formation of the digital operational ability in enterprises, thereby promoting the improvement of innovation performance.
- H2e: Entrepreneur's spirit of innovation and entrepreneurship can further stimulate the formation of the digital operational ability in enterprises, thereby promoting the improvement of innovation performance.
- H2f: Entrepreneur's spirit of responsibility and contract can further stimulate the formation of the digital operational ability in enterprises, thereby promoting the improvement of innovation performance.

The third path is that entrepreneurship will enhance innovation performance by positively promoting the digital collaborative capabilities of enterprises. The entrepreneur's spirit of adventure and exploration encourages companies to pay more attention to the rational allocation of scarce resources, guiding them to coordinate scarce resources and make judgmental decisions in the process of digital development (Casson, 1995). Once the good environment and atmosphere for integrating and sharing digital resources are formed, the ability of enterprises to share, co build, and co govern digital resources will be significantly improved. Secondly, the innovative and entrepreneurial spirit of entrepreneurs is influenced by the social attributes of digital technology. Utilizing digital platforms to create easy resource allocation (Nambisan, 2017) and data value can improve accessible interaction channels, while enhancing asset flexibility (Austio et al., 2018) and the efficiency of organizational resource deployment (Chen Dongmei et al., 2020). Finally, the spirit of entrepreneurial responsibility and contract can help companies continuously expand their social network when expanding external social activities. On the one hand, it will break down existing organizational and technological boundaries, and on the other hand, it will help utilize digital

technology to acquire, allocate, integrate, and reconstruct resources, learning digital resource synergy capabilities for the enterprise (Laursen and Salter, 2006). The collaborative ability of digital resources can not only provide timely and accurate data support, achieve precise allocation and rational allocation of resources, but also help enterprises quickly share and integrate internal and external innovation resources in the open innovation ecosystem, accelerate product and technology research and development cycles, and enhance innovation competitiveness. Therefore, based on the above analysis, we propose the following assumptions:

- H2g: Entrepreneur's spirit of adventure and exploration can further stimulate the formation of the digital collaborative ability in enterprises, thereby promoting the improvement of innovation performance.
- H2h: Entrepreneur's spirit of innovation and entrepreneurship can further stimulate the formation of the digital collaborative ability in enterprises, thereby promoting the improvement of innovation performance.
- H2i: Entrepreneur's spirit of responsibility and contract can further stimulate the formation of the digital collaborative ability in enterprises, thereby promoting the improvement of innovation performance.

### *2.3.3 The Moderating Effect of Environmental Dynamism on the Relationship between Entrepreneurship and Innovation Performance*

The characteristics of the enterprise environment vary across different industries, and the most relevant of these characteristics is environmental dynamism. The dynamic changes in the environment force enterprises to face unstructured problems. Only through agile actions can enterprises seize fleeting opportunities. Therefore, dynamically adapting to the environment is the key to sustainable development of enterprises (Teece, 2018). When the degree of change and unpredictability in the external environment are high, the connection between entrepreneurial spirit and corporate innovation performance will strengthen. Firstly, when facing highly complex and dynamic external environments, entrepreneurs are sensitive to the environment and inspired by their own exploratory and adventurous spirit. They not only actively pay attention to new technologies such as cloud computing and blockchain that have emerged in the external environment, but also pay special attention to digital technology as a new production factor. At the same time, with practical awareness and experience in complex and unknown environments, enterprises with the spirit of adventure and exploration are more able to actively balance the uncertainty of the external environment, balance various contradictions, and present effective leadership behavior, promoting innovation in the enterprise (Liu Xiaoyang, 2023). Menguc et al. (2010) also found that the moderating effect of environmental dynamicity on innovation varies among different enterprises, with only forward-looking enterprise environmental dynamicity having a positive impact on innovation. Secondly, high environmental dynamism implies significant or breakthrough development in the market and technology, which can provide a more fertile "soil" for entrepreneurs to unleash their innovative and entrepreneurial spirit, and also enable enterprises to persistently engage in innovative work full of setbacks (Drucker, 1985). Finally, when the environmental dynamicity are high, enterprises need to bear greater risks and uncertainties in their innovation decisions. At this time, enterprises with a sense of responsibility and contract spirit will disclose enterprise information more timely and truthfully to reduce information asymmetry. It will help to maintain the trust relationship between shareholders and external social networks, and on the other hand, it can have a positive impact on enterprise innovation by alleviating financing pressure. Therefore, based on the above analysis and discussion, we propose the following assumptions:

- H3: Environmental dynamicity positively regulates the relationship between entrepreneurship and innovation performance.
- H3a: Environmental dynamicity positively regulates the relationship between entrepreneurial adventurous exploration spirit and innovation performance.
- H3b: Environmental dynamicity positively regulates the relationship between entrepreneurial innovation and entrepreneurial spirit and innovation performance.
- H3c: Environmental dynamism positively regulates the relationship between entrepreneurial responsibility contract spirit and innovation performance.

### **2.3.4 The Moderating Effect of Strategic Flexibility on the Relationship between Enterprise Digital Capabilities and Innovation Performance**

Enterprise innovation activities are a systematic project that requires coordination and allocation of internal and external resources, as well as adaptive adjustments to strategic direction, organizational structure, and other aspects. The digital capability of enterprises helps to identify the direction of digital technology transformation and industrial policy orientation, as well as to propose new value positioning and new ways of value creation, ultimately achieving the breadth and depth of innovation (Yi Jiabin et al., 2021). However, digitalization has also brought pressure to enterprises, bringing many destructive changes, and the dilemma of "digital paradox" often occurs. In the process of digital construction and practice, enterprises are inevitably affected by path dependence. An excessively high level of digitalization can easily form an insurmountable gap with the existing resource conditions and capability foundation of the enterprise, resulting in the organization not being able to continue supporting the deep implementation of enterprise digitalization, nor being able to adjust internal activities to dynamically adapt to changes in the external environment. Ultimately, it may lead to a situation where the innovation performance of enterprises does not improve but instead decreases (Yu Feifei, 2022). However, when a company's strategic flexibility is strong, it will be beneficial for the company to quickly transform and match the perceived opportunities and threats of the digital economy environment with existing resources, thereby forming dynamic adaptation with the environment and promoting enterprise innovation (Hu Pan, 2017). With the increase of strategic flexibility, the potential application scope of external digital environment insight and internal digital transformation management evaluation capabilities of enterprises can be expanded. Enterprises can quickly and low-cost convert the use of digital resources, enhance their ability to locate, identify, and deploy resources, and accelerate adaptive response speed. So when enterprises solve problems, they will have more flexibility and creativity, and can also accelerate the reconstruction of business model innovation or promote new product innovation (Cheng et al., 2022). At the same time, when strong strategic flexibility is embedded in the digital operation process of an organization, enterprises can continuously change and adjust the use of organizational resources when formulating digital solutions such as research and development, production, channels, marketing, management, and services. They can respond to customer preferences, competitor actions, and other unpredictable market changes by creating a combination of strategic options, thereby promoting business model innovation or new product innovation. (Yi Jiabin et al., 2023). Based on this, we propose the following assumptions:

- H4: Strategic flexibility positively regulates the relationship between enterprise's digital capabilities and innovation performance.

- H4a: Strategic flexibility positively regulates the relationship between enterprise's digital perception capabilities and innovation performance.
- H4b: Strategic flexibility positively regulates the relationship between enterprise's digital operational capabilities and innovation performance of enterprises.
- H4c: Strategic flexibility positively regulates the relationship between enterprise's digital collaboration capability and innovation performance.

### **3. Research Methodology**

#### **3.1 Research Design**

The research design for this study is grounded in a quantitative approach aiming to explore the relationships between entrepreneurship, enterprise digital capabilities, environmental dynamicity, strategic flexibility, and enterprise innovation performance. Utilizing established scales from prior literature, the study measures entrepreneurship across dimensions of adventure, innovation, and responsibility. Enterprise digital capabilities are assessed through three dimensions: perception, operation, and resource coordination. Environmental dynamicity is evaluated across customer, industry, competitor, and technological dimensions. Strategic flexibility is gauged using measures of resource and coordination flexibility. Control variables including regional marketization, enterprise size, age, ownership form, and digital transformation readiness are incorporated to mitigate potential confounding factors. Data collection involves structured questionnaires employing Likert scales, and statistical analysis methods will be used to test hypotheses regarding the impact of these variables on innovation performance.

#### **3.2 Population and Sample**

On the basis of completing the preliminary survey, a total of 1260 questionnaires were distributed to 630 companies (one for senior management and one for technical personnel). After collecting questionnaires from 562 companies and removing invalid sample data from 52 companies, such as incomplete filling, mismatched answer items with job requirements, and inconsistent basic information of two questionnaires for the same company, a complete sample data of 510 companies was obtained, with an effective response rate of 80.95%. The sample size can meet the requirements of a large sample for empirical research.

#### **3.3 Research Instruments**

This study mainly draws on mature scales both domestically and internationally, and measures variables based on the actual situation of enterprises in the digital context. The specific questionnaire items can be found in the appendix. The questionnaire items are arranged using a 5-point Likert scale, with 1 representing "very inconsistent" and 5 representing "very consistent".

##### **1) Enterprise Innovation Performance**

This article defines enterprise innovation performance as the efforts and achievements made by enterprises in innovation. Objective financial indicators are difficult to fully reflect the connotation of enterprise innovation. Therefore, this study is based on the background of innovation practice in Chinese enterprises, combined with the research of RitterQian et al. (2004), Xihong et al.

(2010) and Peng Hua (2022), and uses mature scales to measure enterprise innovation performance. The scale measurement includes 5 items in total.

## 2) Entrepreneurship

In this study, the measurement of entrepreneurship was mainly based on the 9-item measurement scale proposed by Covin and Slevin (1989), and combined with relevant research by scholars such as Mao Lianghu (2016), Xia Han (2020), Peng Guohong (2011), and Yu Donghua (2022), measuring it from three dimensions: the spirit of adventure and exploration, the spirit of innovation and entrepreneurship, and the spirit of responsibility and contract.

## 3) Enterprise Digital Capabilities

This article defines the digital capabilities as a multi-dimensional and systematic ability encompassing digital perception capabilities, digital operation capabilities, and digital resource coordination capabilities. Focusing on the process mechanism of enterprise innovation performance from identifying opportunities, applying opportunities to value creation and realization, this article primarily references the research results of Warner et al. (2019), Lenka et al. (2017), Wang Qiang et al. (2020), and Yi Jiabin et al. (2022), and measures the enterprise digital capabilities from three dimensions: digital perception capabilities, digital operation capabilities, and digital resource coordination capabilities, with a total of 12 items.

## 4) Environmental Dynamicity

This study draws upon scale research conducted by Miller et al. (1986), Xi Lei (2021), and Peng Hua et al. (2022) to evaluate dynamics across four dimensions: customers, industry, competitors, and technological change.

## 5) Strategic Flexibility

This article focuses on the concepts of resource flexibility and coordination flexibility, and refers to the scale research of Zhou and Wu (2010), Song Jing (2022), and Jiang Liqin (2020) to measure strategic flexibility through six items.

For the control variables, considering regional factors and the heterogeneity characteristics of companies that may affect the regression results of the study, this research considered the setting of control variables. Based on the research context and needs, this study selected a total of five control variables from both the market level and enterprise level. The control variable selected at the market level is the degree of regional marketization; the control variable selected at the enterprise level is the size of the enterprise, the age of the enterprise, the form of ownership of the enterprise, and the willingness to undergo digital transformation.

### 3.4 Data Collection

When selecting samples for the questionnaire survey, considering that internet enterprises and manufacturing enterprises are the two key entities in the innovation ecosystem of the digital era, this study selects internet enterprises and manufacturing enterprises that are more active in innovation activities and actively engaged in digital transformation as the sample objects. In order to reduce the possibility of homologous errors, this study collected data from independent sources and selected senior managers of the company as the subjects for investigating entrepreneurship, digital capabilities, strategic flexibility, and environmental dynamics. Experienced technical personnel filled out the Enterprise Innovation Performance Scale. Based on data from the top 100 internet companies and advanced manufacturing cities in 2021, the research area will be selected in representative areas such as Beijing, Shanghai, Guangzhou, Shenzhen, Nanjing, Hangzhou, and Chengdu. Then the

questionnaires were distributed to 90 enterprises in each city. Multiple forms of surveys were conducted through enterprise interviews, online and offline questionnaires, to investigate senior management and technical personnel with certain work experience. During the investigation process, monitor the collection quantity in real time and promptly answer any existing questions.

### 3.5 Statistics Used for Data Analysis

This study used SPSS software and SPSS AMOS analysis by using the confirmatory factor analysis (CFA).

## 4. Data Analysis and Findings

### 4.1 Introduction

This study used SPSS software to test the internal consistency coefficients of 9 variables. As shown in Table 1, the Cronbach's  $\alpha$  of all 9 main research variables were greater than 0.7, indicating that the scale passed the evaluation of internal consistency and stability. This article continued to use AMOS analysis software for confirmatory factor analysis, and the absolute values of the standardized load series for each variable were all greater than 0.6, and the results were significant. The combined reliability CR of all variable scales is greater than 0.7, and the AVE value is greater than 0.5, indicating that the scale in this study has good convergent validity. At the same time, the MSV value and ASV value are both lower than the AVE value, indicating that the scale has certain discriminant validity.

**Table 1** Reliability and Validity Test Data of the Scale

Variables	Items	Standard Load	Cronbach's $\alpha$	CR	AVE	MSV	ASV
Spirit of Adventure and Exploration	Q11	0.736	0.797	0.798	0.568	0.162	0.305
	Q12	0.764					
	Q13	0.760					
Spirit of Innovation and Entrepreneurship	Q21	0.690	0.770	0.772	0.532	0.181	0.288
	Q22	0.794					
	Q23	0.700					
Spirit of Responsibility and Contract	Q31	0.795	0.808	0.808	0.584	0.210	0.330
	Q32	0.733					
	Q33	0.763					
Innovation Performance	Q41	0.703	0.845	0.845	0.523	0.261	0.369
	Q42	0.744					
	Q43	0.698					
	Q44	0.736					
	Q45	0.733					
Digital Perception Capabilities	Q51	0.708	0.815	0.816	0.526	0.147	0.283
	Q52	0.770					
	Q53	0.736					
	Q54	0.684					



Digital Operational Capabilities	Q61	0.739	0.832	0.833	0.556	0.261	0.282
	Q62	0.742					
	Q63	0.698					
	Q64	0.801					
Digital Collaboration Capabilities	Q71	0.692	0.820	0.821	0.534	0.163	0.277
	Q72	0.727					
	Q73	0.762					
	Q74	0.742					
Environmental Dynamism	Q81	0.707	0.809	0.810	0.516	0.051	0.156
	Q82	0.758					
	Q83	0.686					
	Q84	0.719					
Strategic Flexibility	Q91	0.750	0.842	0.870	0.527	0.053	0.166
	Q92	0.760					
	Q93	0.680					
	Q94	0.759					
	Q95	0.706					
	Q96	0.697					

## 4.2 Data Analysis of the Quantitative Data

### 4.2.1 Descriptive Statistical Analysis

As shown in Table 2, the mean values of each variable are within a reasonable range, close to the median, and the data distribution is relatively symmetrical. The standard deviation of each variable is less than 1, and the sample values are close to the mean, with little dispersion in the mean. From the skewness and kurtosis indicators of each variable, it can be seen that the absolute values of skewness and kurtosis of the study variable are both less than 2. Combined with Kline's (1998) suggestion of the skewness principle of normal distribution, it can be considered that the sample data of this study variable meets the requirements of normal distribution and is suitable for regression analysis.

**Table 2** Descriptive Statistical Analysis Results

Variables	Mean	Median	Standard Deviation	Skewness	Kurtosis
Spirit of Adventure and Exploration	3.711	4	0.938	-0.826	0.302
Spirit of Innovation and Entrepreneurship	3.928	4	0.853	-1.072	1.108
Spirit of Responsibility and Contract	3.711	4	0.968	-0.850	0.211
Innovation Performance	3.785	4	0.834	-0.884	0.464
Digital Perception Capabilities	3.860	4	0.833	-0.905	0.628
Digital Operational capabilities	3.827	4	0.870	-0.929	0.743



Digital Collaboration capabilities	3.807	4	0.839	-0.746	0.329
Environmental Dynamicity	4.202	4.250	0.635	-1.335	1.871
Strategic Flexibility	4.045	4.167	0.722	-1.213	1.441
Marketization Degree	7.753	7.97	0.801	-0.982	-0.506
Size	2.200	2	0.909	0.259	-0.790
Age	3.180	3	0.919	0.172	-0.900
Ownership	0.200	0	0.399	1.520	0.311
Transformation Willingness	0.770	1	0.418	-1.318	-0.265

#### 4.2.2 Variable Correlation Analysis

Based on the correlation coefficient table among various variables, it was found that the three dimensions of entrepreneurship (spirit of adventure and exploration; spirit of innovation and entrepreneurship; spirit of responsibility and contract) are significantly positively correlated with the dependent variable of enterprise innovation performance at the 0.01 level ( $r=0.327$ ,  $r=0.342$ ,  $r=0.380$ ), which preliminarily verifies the hypotheses H1a, H1b, and H1c in this article. Through Pearson correlation coefficient analysis, it can be seen that the main variables studied in this article have significant correlations, and the Pearson correlation coefficients are all less than 0.5. There is no high degree of multicollinearity problem, which lays a good foundation for the following regression hypothesis testing.

#### 4.2.3 Hypothesis Testing Analysis

This study used SPSS software to conduct a hierarchical regression analysis on the relationship between entrepreneurship, enterprise digital capabilities, and enterprise innovation performance. Bootstrap method is used to test the mediating effect. In the analysis of moderating effects, the method of constructing interaction terms is used to test whether environmental dynamism and strategic flexibility have a contingency effect on the impact of entrepreneurship, digital capabilities, and enterprise innovation performance.

##### 1) Main Effect Testing and Analysis

The results of using hierarchical regression are shown in Table 3. Model 1 reflects the results with only five control variables included in the first layer of the model, while Model 2, Model 3, and Model 4 reflect the regression results with entrepreneur's spirit of adventure and exploration, entrepreneur's spirit of innovation and entrepreneurship, entrepreneur's spirit of responsibility and contract included in the second layer of the model. In Model 2, the regression coefficient of the entrepreneur's spirit of adventure and exploration on innovation performance is 0.288, and it is significantly correlated at the 0.001 level, indicating that when the entrepreneur's spirit of adventure and exploration increases by 1%, the enterprise innovation performance positively increases by 0.288%. The entrepreneur's spirit of adventure and exploration has a significant positive impact on the innovation performance. Similarly, it can be concluded that both the entrepreneur's spirit of innovation and entrepreneurship, and the entrepreneur's spirit of responsibility and contract have a significant positive impact on the innovation performance. Therefore, the hypotheses H1, H1a, H1b, and H1c in this paper are confirmed.

**Table 3** Regression Results of Entrepreneurship on Enterprise Innovation Performance

Variables		Enterprise Innovation Performance			
		M1	M2	M3	M4
Control Variables	Marketization Degree	-0.022	-0.019	-0.039	-0.063
	Size	0.074	0.067	0.042	0.035
	Age	-0.053	-0.029	-0.03	-0.019
	Ownership	0.218*	0.157	0.184*	0.138
	Transformation Willingness	0.178*	0.207*	0.158	0.152
Independent Variables	Spirit of Adventure and Exploration		0.288***		
	Spirit of Innovation and Entrepreneurship			0.326***	
	Spirit of Responsibility and Contract				0.322***
Model Metrics	R <sup>2</sup>	0.024	0.127	0.132	0.158
	Adj R <sup>2</sup>	0.014	0.117	0.122	0.148
	F	2.450	12.190	12.798	15.759
	VIFmax	1.150			

Note: \*\*\* represents  $p < 0.001$ , \*\* represents  $p < 0.01$ , and \* represents  $p < 0.05$ .

## 2) Mediation Effect Testing and Analysis

Given the higher applicability and sensitivity of the Bootstrap method, this study employs it to test the mediating effect. Bootstrap is set to 5000, with a confidence level set at 95%. The test results are shown in Table 4. Among them, the total effect of entrepreneur's spirit of adventure and exploration on innovation performance is 0.288. The indirect effect value of digital perception abilities in this process is 0.059, with a BootLLCI value of 0.031 and a BootULCI value of 0.095. Since 0 is not included in the middle, digital perception abilities play a partial mediating role between entrepreneur's spirit of adventure and exploration and innovation performance. Similarly, it can be concluded that the 9 mediating paths proposed in this study are all valid. The hypotheses H2a, H2b, H2c, H2d, H2e, H2f, H2g, H2h, and H2i are confirmed.

**Table 4** Test Results of Mediating Effects

Mediation Pathway	Total Effect	Indirect Effect	95% Confidence Interval	
			LLCI	ULCI
Spirit of Adventure and Exploration => Digital Perception Capabilities => Innovation Performance	0.288	0.059	0.031	0.095
Spirit of Innovation and Entrepreneurship => Digital Perception Capabilities => Innovation Performance	0.326	0.055	0.027	0.089
Spirit of Responsibility and Contract => Digital Perception Capabilities => Innovation Performance	0.322	0.056	0.029	0.090
Spirit of Adventure and Exploration => Digital Operational Capabilities => Innovation Performance	0.288	0.081	0.043	0.122
Spirit of Innovation and Entrepreneurship => Digital Perception Capabilities => Innovation Performance	0.326	0.101	0.059	0.149

Spirit of Responsibility and Contract => Digital Operational Capabilities => Innovation Performance	0.322	0.085	0.050	0.124
Spirit of Adventure and Exploration => Digital Collaboration Capabilities => Innovation Performance	0.288	0.058	0.029	0.095
Spirit of Innovation and Entrepreneurship => Digital Collaboration Capabilities => Innovation Performance	0.326	0.059	0.028	0.096
Spirit of Responsibility and Contract => Digital Collaboration Capabilities => Innovation Performance	0.322	0.060	0.031	0.095

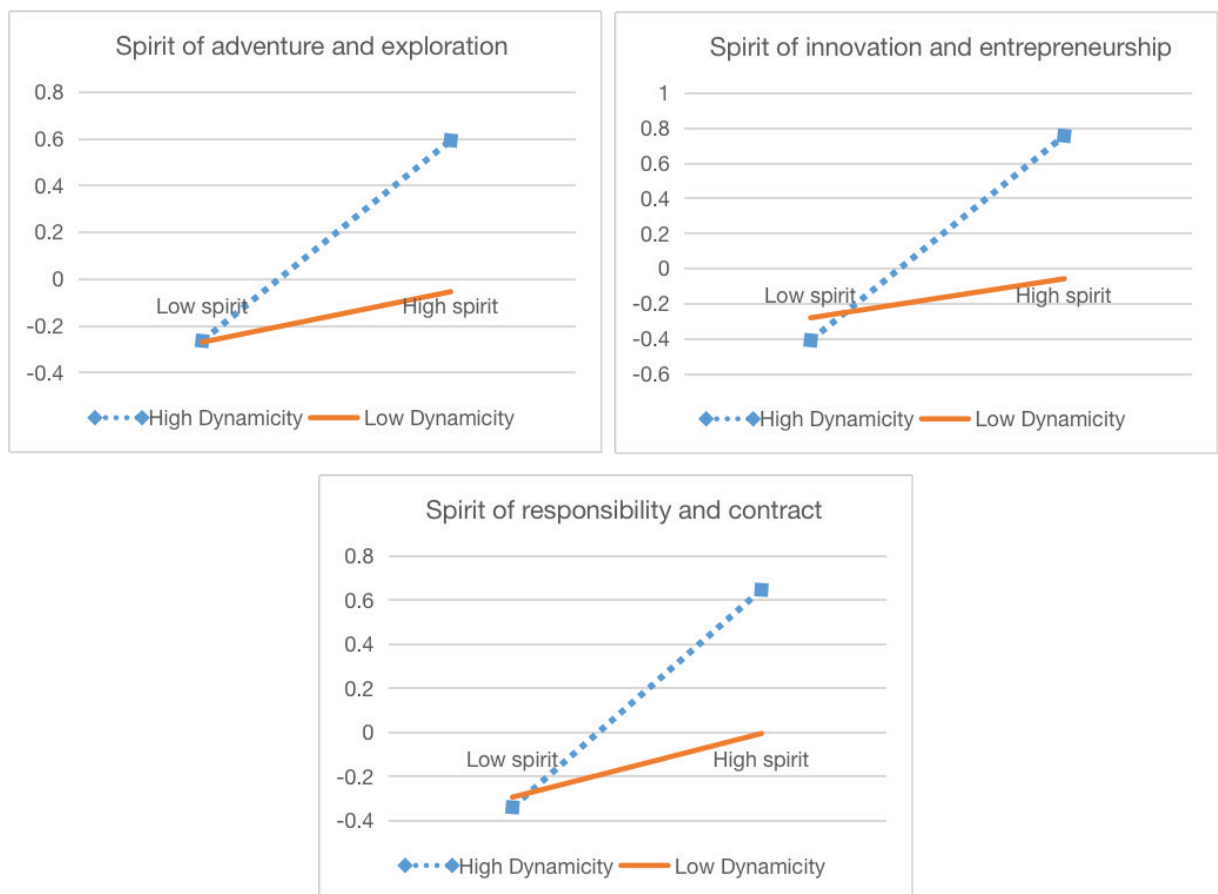
### 3) Testing and Analysis of the Moderating Effect of Environmental Dynamicity

As shown in Table 5, Models 1 to 3 are the hierarchical regression analysis results of adding environmental dynamicity and the interaction term between the spirit of adventure and exploration and environmental dynamism to the regression results of the spirit of adventure and exploration on enterprise innovation performance. In Model 2, the regression coefficients of the spirit of adventure and exploration and environmental dynamicity are both significantly positive. In Model 3, the regression coefficients of the spirit of adventure and exploration and environmental dynamics are still both significantly positive, and the regression coefficient of the interaction term  $\beta=0.135$  ( $P<0.05$ ), indicating that environmental dynamicity positively moderates the relationship between the spirit of adventure and exploration and innovation performance. This confirms the hypothesis H3a in this paper. Similarly, it can be concluded that environmental dynamicity positively regulate the relationship between the spirit of innovation and entrepreneurship and enterprise innovation performance, which assumes that H3b is supported. The dynamic nature of the environment positively regulates the relationship between the spirit of responsibility and contract and enterprise innovation performance, which assumes that H3c is supported. Furthermore, through the moderating effect diagram shown in Figure 2, it is demonstrated that the moderating effect of environmental dynamicity on the relationship between various dimensions of entrepreneurship and innovation performance is somewhat robust.

**Table 5** Regression Results of the Moderating Effect of Environmental Dynamicity

Variable	Enterprise Innovation Performance								
	M1	M2	M3	M4	M5	M6	M7	M8	M9
<b>Control Variables</b>									
Marketization Degree	-0.019	-0.022	-0.015	-0.039	-0.043	-0.041	-0.063	-0.064	-0.063
Size	0.067	0.051	0.045	0.042	0.023	0.017	0.035	0.02	0.021
Age	-0.029	-0.026	-0.024	-0.03	-0.025	-0.027	-0.019	-0.016	-0.012
Ownership	0.157	0.15	0.145	0.184*	0.172	0.166	0.138	0.13	0.133
Transformation Willingness	0.207*	0.221**	0.216**	0.158	0.177*	0.173*	0.152	0.168*	0.173*
<b>Independent Variables</b>									
Spirit of Adventure and Exploration	0.288***	0.275***	0.274***						
Spirit of Innovation and Entrepreneurship				0.326***	0.320***	0.320***			
Spirit of Responsibility and contract							0.322***	0.311***	0.311***
<b>Moderating Variables</b>									
Environmental Dynamicity		0.147**	0.170**		0.181***	0.192***		0.146**	0.161**

Spirit of Adventure and Exploration $\times$ E.D			0.135*						
Spirit of Innovation and Entrepreneurship $\times$ E.D						0.254***			
Spirit of Responsibility and Contract $\times$ E.D									0.139*
<b>Model Metrics</b>									
R <sup>2</sup>	0.127	0.139	0.149	0.132	0.151	0.175	0.158	0.170	0.180
Adj.R <sup>2</sup>	0.117	0.127	0.136	0.122	0.139	0.162	0.148	0.158	0.167
F	12.190	11.568	10.986	12.798	12.733	13.303	15.759	14.695	13.721
VIFmax	1.151								



**Figure 2** Moderating Effect Diagram of Environmental Dynamicity

#### 4) Testing and Analysis of the Moderating Effect of Strategic Flexibility

As shown in Table 6, Models 1 to 3 are the hierarchical regression analysis results of adding strategic flexibility, the interaction terms of enterprise digital perception ability and the strategic flexibility on the basis of the regression results of enterprise digital perception ability on enterprise innovation performance. In M2 and M3, the regression coefficients of enterprise digital perception ability and strategic flexibility are both positive and significant, and the regression coefficient of this

interaction term is also significant  $\beta = 0.250$  ( $P < 0.001$ ), which indicating that strategic flexibility positively moderates the relationship between a company's digital perception ability and innovation performance. This confirms the hypothesis H4a proposed in this paper. Similarly, it can be concluded that strategic flexibility positively moderates the relationship between enterprise digital operation ability and enterprise innovation performance, confirming the hypothesis H4b in this paper. Strategic flexibility positively moderates the relationship between enterprise digital resource collaboration ability and enterprise innovation performance, confirming the hypothesis H4c in this paper.

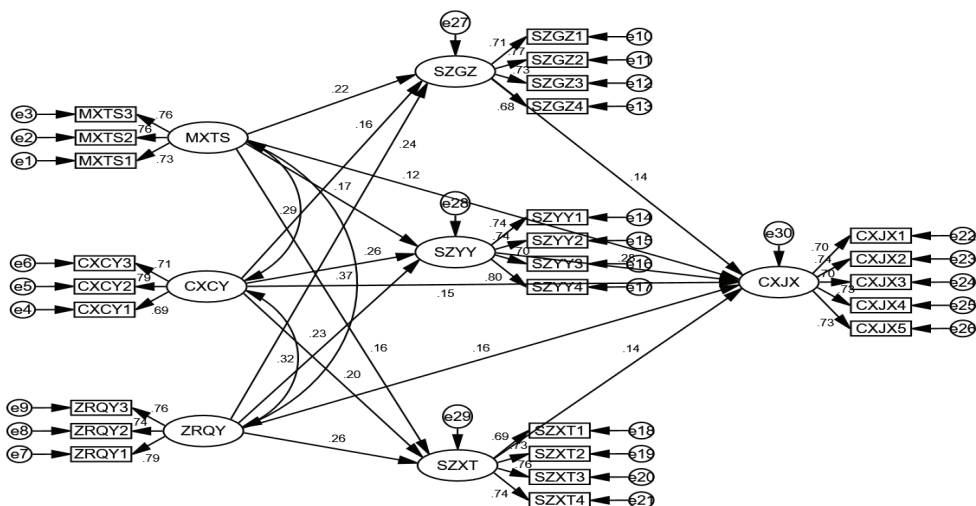
**Table 6** Regression Results of the Moderating Effect of Strategic Flexibility

Variable	Enterprise Innovation Performance								
	M1	M2	M3	M4	M5	M6	M7	M8	M9
<b>Control Variables</b>									
Marketization Degree	-0.024	-0.025	-0.02	-0.033	-0.034	-0.032	-0.035	-0.035	-0.028
Size	0.039	0.028	0.01	0.042	0.029	0.026	0.029	0.02	0.02
Age	-0.030	-0.025	-0.026	-0.022	-0.015	-0.011	-0.036	-0.031	-0.023
Ownership	0.178	0.178	0.155	0.156	0.154	0.126	0.215*	0.213*	0.192*
Transformation Willingness	0.226**	0.251**	0.242**	0.126	0.159*	0.177*	0.162	0.189*	0.199*
<b>Mediating Variables</b>									
Digital Perception Capabilities	0.312** *	0.301** *	0.302** *						
Digital Operational Capabilities				0.400** *	0.399** *	0.394** *			
Digital Collaboration Capabilities							0.324** *	0.312** *	0.303** *
<b>Moderating Variables</b>									
Strategic Flexibility		0.145**	0.163** *		0.174** *	0.202** *		0.140**	0.178** *
Digital Perception Capabilities $\times$ S.F			0.250** *						
Digital Operational Capabilities $\times$ S.F						0.151**			
Digital Collaboration Capabilities $\times$ S.F									0.189** *
<b>Model Metrics</b>									
R <sup>2</sup>	0.118	0.133	0.167	0.194	0.217	0.230	0.127	0.141	0.162
Adj. R <sup>2</sup>	0.108	0.121	0.154	0.185	0.206	0.218	0.117	0.129	0.149
F	11.240	11.035	12.549	20.240	19.820	18.757	12.203	12.805	12.125
VIFmax	1.157								

#### 5) Robustness Test

The structural equation modeling (SEM) is widely used in social science research, which can reflect the causal relationship between variables through path diagrams and path coefficients. The research content of this paper involves the relationship among three dimensions of entrepreneurship, three dimensions of enterprise digitalization capabilities, and multiple latent variables between innovation performances. Therefore, in the robustness test, the mutual relationship among variables is

further verified and displayed by establishing a structural model. As shown in Figure 3, this paper tests the relationship among them through path analysis of the model. The obtained path coefficients, significance, and other values are organized as shown in Table 7, which further demonstrating the reliability of the hypotheses H1 and H2 proposed in this study.



**Figure 3** Path Diagram of the Structural Equation Model

**Table 7** Path Analysis Results

Path	Estimate	S.E.	C.R.	P
Innovation performance <= Entrepreneurship	0.695	0.492	2.346	0.019
Innovation performance <= Digitalization capabilities	0.046	0.605	0.156	0.026
Digitalization capabilities <= Entrepreneurship	0.155	0.147	6.208	***
Digital perception capabilities <= Spirit of adventure and exploration	0.221	0.053	3.736	***
Digital operational capabilities <= Spirit of adventure and exploration	0.170	0.055	2.974	0.003
Digital collaboration capabilities <= Spirit of adventure and exploration	0.159	0.051	2.730	0.006
Digital perception capabilities <= Spirit of innovation and entrepreneurship	0.157	0.061	2.740	0.006
Digital operational capabilities <= Spirit of innovation and entrepreneurship	0.260	0.065	4.501	***
Digital collaboration capabilities <= Spirit of innovation and entrepreneurship	0.197	0.060	3.381	***
Digital perception capabilities <= Spirit of responsibility and contract	0.244	0.050	4.095	***
Digital operational capabilities <= Spirit of responsibility and contract	0.228	0.052	3.941	***
Digital collaboration capabilities <= Spirit of responsibility and contract	0.256	0.049	4.271	***
Innovation performance <= Digital perception capabilities	0.137	0.052	2.627	0.009
Innovation performance <= Digital operational capabilities	0.281	0.051	5.157	***
Innovation performance <= Digital collaboration capabilities	0.137	0.053	2.645	0.008

Innovation performance <= Spirit of adventure and exploration	0.118	0.049	2.193	0.028
Innovation performance <= Spirit of innovation and entrepreneurship	0.151	0.059	2.746	0.006
Innovation performance <= Spirit of responsibility and contract	0.163	0.048	2.860	0.004

### 4.3 Summary of the Results

This article draws the following specific conclusions: First, entrepreneurship plays an important positive role in promoting innovation performance of enterprises; Second, the digital capability of enterprises is an important positive intermediary bridge between entrepreneurship and innovation performance; Third, environmental dynamism positively regulates the promoting effect of entrepreneurship on innovation performance; Fourthly, strategic flexibility positively regulates the enhancing effect of digital capabilities on innovation performance of enterprises.

## 5. Conclusion, Discussion, and Recommendation

### 5.1 Conclusion

Based on the dynamic capability theory, resource-based theory, and entrepreneurial spirit capital theory, this study elucidates the intrinsic logical relationship between entrepreneurial spirit and corporate innovation performance. It also proposes the hypothesis that the intermediary role of enterprise digitalization capabilities exists between the two, as well as the hypothesis that environmental dynamicity and strategic flexibility have a moderating effect on the aforementioned relationship. After conducting quantitative empirical research, the following conclusions were drawn: Firstly, entrepreneurship plays an important positive role in promoting innovation performance of enterprises; Secondly, the digital capabilities of enterprises is an important positive intermediary bridge between entrepreneurship and innovation performance; Thirdly, environmental dynamicity positively regulates the promoting effect of entrepreneurship on innovation performance; Fourthly, strategic flexibility positively regulates the enhancing effect of digital capabilities on innovation performance of enterprises.

### 5.2 Discussion

The findings of this study underscore the critical role of entrepreneurial spirit in enhancing corporate innovation performance. Entrepreneurship not only directly promotes innovation within firms but also operates through the intermediary mechanism of enterprise digitalization capabilities, amplifying its impact on innovation outcomes. Moreover, the study highlights the moderating effects of environmental dynamicity and strategic flexibility, which enhance the relationship between entrepreneurship, digital capabilities, and innovation performance. These conclusions emphasize the multifaceted nature of fostering innovation within organizations, where entrepreneurial orientation, coupled with robust digitalization strategies and adaptive capabilities, are pivotal in navigating dynamic environments and achieving sustained innovation success. Future research could further explore nuanced interactions and additional contextual factors that influence these dynamics across different organizational settings and industries.



### 5.3 Recommendation

The practical implications of this article primarily focus on the following points.

Firstly, the formation of digital capabilities in enterprises in the era of digital economy is crucial to the enhancement of corporate innovation performance. The government should appropriately lower the threshold for industrial digital transformation and continuously optimize the layout and operational mode of digital infrastructure and other external environments. Chinese enterprises have officially entered the "chain" era of digital transformation, but many enterprises are prone to be constrained by financial constraints and conversion costs during the process of integrating into the whole-factor digital upgrade, transformation, and reconstruction of the industrial chain. Especially for start-up enterprises, they need the government to provide a inclusive, agile, and low-cost "admission ticket" for transformation. The government can balance development and demand, make advanced arrangements for digital infrastructure, mobilize multiple subjects to jointly participate and build, and create the "main engine" of infrastructure. Meanwhile, it can also formulate corresponding support policies to help upstream and downstream enterprises in the industrial chain break through spatial and temporal limitations, deeply integrate, carry out efficient resource allocation, enrich and improve the industrial ecology, and achieve the coordinated development of large, medium, and small enterprises, providing a strong guarantee for the innovative development of physical economy enterprises.

Secondly, as the main bodies of innovation, the enterprises should enhance their awareness of digital application, vigorously develop digital capability construction, and continuously improve their digital perception, digital operation, and digital resource coordination capabilities in order to integrate into the digital ecosystem. Enterprises should reshape their digital thinking, dynamically perceive and gain insights into consumer demand characteristics based on massive big data, increase the channels for innovation opportunities, and seize innovation opportunities. They should also make good plans for fixed assets investment, introduce advanced digital technologies, and strengthen the organic flexible integration of digital technology with R&D, production, and marketing operations to enhance digital operation capabilities. Attention should be paid to the complementary advantages and resource sharing of upstream and downstream enterprises, reducing resource mismatch issues caused by information asymmetry through collaborative digital resource sharing platforms. This can be achieved through collaborative partnerships with universities and research institutions, continuously improving the success rate and conversion rate of innovation.

Thirdly, enterprises should pay attention to the new developments of entrepreneurship in the context of digitalization, cultivating and transmitting entrepreneurship from the perspective of internal and external motivators. In the digital economy era, information dissemination is rapid, and in this new business civilization system, a new digital trust mechanism has been formed between enterprises and society. Therefore, enterprises should not only cultivate innovation and entrepreneurship in the soil of innovation, equality, and interconnectivity in the context of digitalization, but also should fulfill commitments to stakeholders based on internal and external sustainable development motivators. Based on this concept, on one hand, enterprises can voluntarily pay extra time and effort to fulfill transaction contracts, and on the other hand, they can operate with integrity and comply with digital governance norms, allowing the spirit of responsibility contract to take root in corporate culture and spread to the market, enhancing the market's ability to filter enterprises, thereby continuously and effectively driving the realization of enterprise innovation performance.

Fourthly, enterprises should cultivate strategic flexibility that aligns with their digitalization strategy, and smooth out the mechanism transmission pathways driven by internal governance efficacy. During the process of digitalization construction, enterprises are easily influenced by path dependence,

leading to the emergence of a "gap" between existing resource conditions and management capability foundations. At this point, it is imperative to promptly adjust and forge strategic flexibility that aligns with the digitalization strategy, refine the internal governance structure and dynamic organizational framework. They can then implement strategies with an engineering mindset, select strategic evaluation indicators that adapt to the digital context, and establish compliant digital management response mechanisms. Ultimately, this can aid enterprises in surmounting the "digitalization paradox", and achieving an enhancement in internal governance efficacy-driven corporate innovation performance.

## References

- Annarelli, A., Battistella, C., & Nonino, F. (2021). *Literature review on digitalization capabilities: Co-citation analysis of antecedents, conceptualization and consequences*. *Technological Forecasting and Social Change*, 166, 120635.
- Autio, E., Nambisan, S., Thomas, L. D. W., & Wright, M. (2018). *Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems*. *Strategic Entrepreneurship Journal*, 12(1), 72-95.
- Casson, M. (1995). *Entrepreneurship and business culture*. Edward Elgar Publishing.
- Chen, H., Zhang, Y., & Liu, D. (2019). Government subsidies, tax incentives, and corporate innovation performance: An empirical study at different life cycle stages. *Nankai Management Review*, 2(03), 187-200.
- Chen, H., Zhang, Q., & Feng, X. (2017). Research on the Driving Factors of Enterprise Innovation and its Moderating Effect on Innovation Performance. *Jiangxi Social Sciences*, 37(11), 222-230.
- Chen, X., & Yang, Y. (2022). Cracking the Business Model Innovation Reconstructed by Digitalization: The Power of Strategic Flexibility. *Technology Management Research*, 42(16), 111-118.
- Covin, J. G., & Slevin, D. P. (1989). Strategic Management of Small Firms in Hostile and Benign Environments. *Strategic Management Journal*, 10(1), 75-87.
- Drucker, P. F. (1985). Innovation and Entrepreneurship-Practice and Principles. *Social Science Electronic Publishing*, 4(1), 85-96.
- Green, K. M., Covin, J. G., & Slevin, D. P. (2008). Exploring the Relationship Between Strategic Re-activeness and Entrepreneurial Orientation: The Role of Structure-Style Fit. *Journal of Business Venturing*, 23(3), 356-383.
- Hajli, M., Sims, J. M., & Ibragimov, V. (2015). Information Technology Productivity Paradox in the 21st Century. *International Journal of Productivity and Performance Management*, (4), 92-114.

- He, L. (2022). The marketization reform of data elements, entrepreneurship, and the digital transformation of manufacturing industry. *Journal of Hunan University of Science and Technology (Social Sciences Edition)*, 25(06), 65-76.
- Hou, G., & Liu, Q. (2022). Network power and innovation performance: From the perspective of enterprise digitalization capabilities. *Studies in Science of Science*, 40(06), 1143-1152.
- Hu, P., & Yu, B. (2017). Cross-border search, capability reconstruction, and corporate innovation performance: The moderating effect of strategic flexibility. *Research and Development Management*, 29(04), 138-147.
- Jiang, L., & Li, S. (2020). Precipitation of Redundancy, Cross-disciplinary Search, and High-Tech Enterprise Innovation Performance: The Moderating Effect of Strategic Flexibility. *Journal of Technological Progress and Strategy*, 37(22), 73-80.
- Knight, F. H. (1921). *Risk, Uncertainty and Profit*. Boston and New York: Houghton Mifflin Company.
- Kwith, H., et al. (2019). Information Systems Quality Level and Its Impact on the Strategic Flexibility: A Field Study on Tourism and Travel Companies in the Jordanian Capital Amman. *International Journal of Human Resource Studies*, (3), 53-70.
- Lenka, S., Parida, V., & Wincent, J. (2017). Digitalization Capabilities as Enablers of Value Co-Creation in Servitizing Firms. *Psychology & Marketing*, 9(03), 75-88.
- Leo, P., & Silva, M. M. (2021). Impacts of digital transformation firms' competitive advantages: A systematic literature review. *Strategic Change*, 30(5), 421-441.
- Li, L., Zhong, W., Peng, S., Hao, D., & Wang, Y. (2022). The Resilience of Enterprises and Entrepreneurship under the COVID-19 Pandemic Crisis — 2021 Special Survey Report on the Growth and Development of Chinese Entrepreneurs. *Nankai Management Review*, 25(01), 50-64.
- Li, M., & Jia, S. (2018). Resource Orchestration for Innovation: The Dual Role of Information Technology. *Technology Analysis & Strategic Management*, 2018, (10), 30-43.
- Liu, X. (2023). Empirical study on the impact of entrepreneurship on corporate innovation behavior. *Modern Economic Exploration*, (06), 125-132.
- Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the Entrepreneurial Orientation Construct and Linking it to Performance. *Academy of Management Review*, 21(1), 135-172.
- Mao, L., Wang, L., & Fang, L. (2016). Empirical Study on the Impact of Entrepreneurship on Enterprise Performance: Mediating Effect based on Organizational Learning and Organizational Innovation. *East China Economic Management*, 30(05), 148-152.
- Menguc, B., & Auh, S. (2010). Development and return on execution of product innovation capabilities: The role of organizational structure. *Industrial Marketing Management*, 39(5), 820-831.

- Miller, D., & Droge, C. (1986). Psychological and traditional determinants of structure. *Administrative Science Quarterly*, (01), 539-560.
- Nambisan, S. (2017). Digital Entrepreneurship: Toward A Digital Technology Perspective of Entrepreneurship. *Entrepreneurship Theory and Practice*, 41(6), 1029-1055.
- Niemann, C. C., Dickel, P., & Eckardt, G. (2020). The Interplay of Corporate Entrepreneurship, Environmental Orientation, and Performance in Clean-Tech Firms: A Double-Edged Sword. *Business Strategy and the Environment*, 29(1), 180-196.
- Peng, H., He, Z., & Zhang, X. (2022). The impact of entrepreneurship and craftsmanship on enterprise innovation performance. *China Soft Science*, (03), 112-123.
- Qian, X., Yang, Y., & Xu, W. (2010). The Network Position of Enterprises, Absorption Capacity, and Innovation Performance: A Moderating Effect Model. *Management World*, (05), 118-129.
- Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Harvard University Press.
- Shahzad, A. M., Wales, W. J., & Sharfman, M. P. (2016). Casting a Wider Performance Net: The Role of Entrepreneurial Orientation in Boosting Overall Firm Stakeholder Value. *Journal of Management & Organization*, 22(2), 272-290.
- Song, J., & Chen, J. (2022). Research on the Impact of Entrepreneurs' Social Networks on the Digital Construction of Enterprises: The Moderating Effect of Strategic Flexibility. *Studies in Science of Science*, 40(01), 103-112.
- Teece, D. J. (2018). Business model and dynamic capability. *Long Range Planning*, 51(1), 40-49.
- Tindara, A., Anna, C., & Barbara, A. (2021). From Knowledge Ecosystems to Capabilities Ecosystems: When Open Innovation Digital Platforms Lead to Value Co-creation. *Journal of the Knowledge Economy*, 8(32), 1-15.
- Tumbas, S., Berente, N., & Vom Brocke, J. (2017). Digital Capabilities for Buffering Tensions of Structure, Space, and Time During Entrepreneurial Growth. *ICIS*.
- Vossen, R. W. (1998). R&D, Firm size and Branch of Industry. *University of Groningen, SOM Research Report*.
- Warner, K. S. R., & Waeger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, 52(3), 326-349.
- Xi, L., Peng, X., & Li, D. (2021). The influence of informal networks on dual innovation: The mediating role of absorptive capacity and the moderating effect of environmental dynamism. *Technology Management Research*, 41(06), 132-139.
- Xiong, J. (2017). Understanding Entrepreneurship in History: Reflections Based on the Study of Chinese Economic History. *Chinese Economic History Research*, (05), 69-76.

- Yi, J., Zhang, Z., Yang, X., & Wang, Y. (2022). Innovation in Internet Enterprise Organizational Inertia, Digital Capabilities, and Business Models: The Moderating Effect of Enterprise Type. *Nankai Management Review*, (13), 1-27.
- Yu, D., & Wang, M. (2022). The digital economy, entrepreneurship, and high-quality development of manufacturing industry. *Reform*, (7), 61-81.
- Yu, D., & Wang, C. (2022). Government subsidies, industrial chain collaboration, and enterprise digitalization. *Business Management Journal*, (05), 25-37.
- Yu, F., Cao, J., & Du, H. (2022). The Digitalization Paradox: The double-edged sword effect of enterprise digitalization on innovation performance. *Research and Development Management*, 34(02), 1-12.
- Zhou, K. Z., & Wu, F. (2010). Technological Capability, Strategic Flexibility, and Product Innovation. *Strategic Management Journal*, 31(5), 547-561.
- Zhou, Q., Wang, Y., & Yang, W. (2020). Empirical Study on the Impact of Digitalization Level on Innovation Performance: Based on the Panel Data of 73 Counties (Districts, Cities) in Zhejiang Province. *Journal of Scientific Research Management*, 14(07), 120-129.
- Zhu, B., & Du, Q. (2018). Information technology investment, enterprise size, and organizational performance: Based on the data from manufacturing enterprises in Zhejiang. *Dongyue Tribune*, 39(05), 166-175+192.