

# The Impact of Alliance Diversification on Innovation Performance of High-Tech Enterprises: Mediated by Organizational Agility and Internationalization Degree

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## Abstract

**In the context of global economic** integration and increasingly fierce market competition, enterprises have sought innovative resources and expanded market boundaries by building diversified and internationalized alliance networks to enhance their innovation capabilities and market competitiveness. This study has aimed to explore how diversified alliances could impact corporate innovation, focusing on the mediating effects of organizational agility and internationalization. This study has adopted a questionnaire survey method and conducted empirical analysis on the survey data of a large-scale enterprise sample. A total of 570 valid questionnaire responses have been collected, and the formal questionnaire validity rate is 87.69%. The study has found that alliance diversity has been significantly and positively affecting the innovation performance

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of enterprises, and internationalization and organizational agility are playing a chain-mediating role in it. The research results would provide enterprise managers and decision makers with in-depth insights into the impact mechanism of alliance diversity and internationalization on enterprise innovation performance.

**Keywords:** Alliance Diversification, Degree of Internationalization, Enterprise Innovation Performance, Organizational Agility

## Introduction

As global competition continues to intensify and technological changes are advancing at a rapid pace, strategic alliances and corporate internationalization have become one of the sources of obtaining diverse technical knowledge resources and competitive advantages in corporate operations. The diversification and internationalization of a company's alliances are of great significance to the company's expansion of resource use, which is related to the company's survival and is also a key factor in determining whether the company can achieve sustainable development in the future and whether it can maintain its dominant position (Penney et al., 2019). Innovation can occur in products or processes, components or design technologies, through platforms, or through business models. As a tool to accelerate productivity, innovation is conducive to industry leadership (Rajapathirana et al., 2018). While previous studies have explored the impact of alliances on innovation, there is limited understanding of how alliance diversity specifically influences organizational agility and internationalization, and how these factors mediate innovation outcomes. Therefore, research on corporate innovation performance mainly takes innovation performance as an outcome variable to study the problems and causes of corporate independent innovation, so that companies can take targeted measures to optimize the structure and configuration of corporate innovation persistence to adjust the goals and directions of innovation output (Charterina et al., 2016).

## Literature Review

### **2.1 The impact of alliance diversification on innovation performance**

Alliance diversification refers to the sharing and sharing of each other's advantages, learning from each other's strengths and weaknesses, and mutual cooperation through cooperative relationships between two or more companies (Narang et al., 2019). Corporate innovation not only relies on internal knowledge and resources, but also requires external innovation resources and technological knowledge. From the perspective of institutional theory, companies with dispersed R&D activities may not be able to effectively protect their intellectual property rights due to different systems in different countries (Jaelani et al., 2020). With the increase in the dispersion of R&D within the alliance, companies accumulate more and more rich alliance cooperation experience, and companies gradually obtain more heterogeneous innovation resources and advanced technological knowledge from other companies in the alliance. The implicit or non-coded innovation resources and knowledge resources obtained by companies enable them to obtain more innovation benefits. When the alliance diversification reaches a certain level, the alliance diversification will ultimately promote the increase of corporate innovation performance (Hong, 2019).

H1: Alliance diversification has a positive impact on innovation performance;

H1a: Alliance functional diversification has a positive impact on innovation performance;

H1b: Alliance technological diversification has a positive impact on innovation performance.

### **2.2 The mediating role of internationalization degree in the relationship between alliance diversity and organizational innovation performance**

Internationalization Process is a core issue in the study of multinational enterprises and internationalization in the field of international business and strategic management (Cheung, 2020). A diversified alliance portfolio helps

companies obtain diversified resources and capabilities from partners in different countries and regions, including technology, markets, brands, channels, etc. The acquisition and integration of these resources can accelerate the internationalization process of enterprises and enhance their competitiveness in the global market (Akcigit & Kerr, 2018). Secondly, alliance diversity promotes cross-cultural and cross-domain knowledge transfer and learning. A diversified alliance portfolio helps companies diversify risks in the internationalization process. When problems arise in a market or partner, companies can make up for losses or find new opportunities through other alliance relationships (Lynch and Jin, 2016). This risk diversification mechanism helps companies advance their internationalization strategies more steadily:

H2: Alliance diversification has a positive impact on the degree of internationalization;

H2a: Alliance functional diversification has a positive impact on the degree of internationalization;

H2b: Alliance technological diversification has a positive impact on the degree of internationalization.

Research on the degree of internationalization of enterprises mainly focuses on the different levels and aspects of enterprises in the process of implementing transnational business and internationalization business strategies, aiming to gain a deeper understanding of the influencing factors, characteristics and impact of the degree of internationalization on enterprise performance and development (Wu & Vahlne, 2020). Feng et al. (2020) believe that a moderate degree of internationalization can bring more market opportunities and resources, promote enterprise innovation and competitive advantages, and thus improve enterprise performance. The impact of the degree of internationalization on corporate strategy and organizational structure is another important research direction (Papanastassiou et al., 2020).

H3: The degree of internationalization has a positive impact on innovation performance;

H4: The degree of internationalization plays a mediating role in the relationship between alliance diversity and organizational innovation performance.

### **2.3 The impact of organizational agility on the relationship between alliance diversity and organizational innovation performance**

One of the purposes of alliance diversification is to help enterprises quickly screen, effectively acquire and refine external knowledge and market information, so as to help enterprises flexibly respond to the rapidly changing market environment. Medeiros and Medeiros (2022) pointed out that alliance diversification can help enterprises cope with the risk of information overload and help enterprises improve the efficiency of decision-making. The improvement of decision-making efficiency will naturally enhance the agility of enterprise organizations. The diversification of enterprise alliances can enable enterprises to better perceive and respond to business opportunities and challenges. Alliance diversification helps enterprises use resources to reconstruct and predict the impact of various opportunities and challenges on enterprises and their competition (Boonmatat, 2019).

H5: Alliance diversification has a positive impact on the organizational agility of enterprises;

H5a: Alliance functional diversification has a positive impact on the organizational agility of enterprises.

H5b: Alliance technology diversification has a positive impact on the organizational agility of enterprises.

In the field of strategic management, facing the ever-changing environment and the increasing uncertainty risks in the operation process of enterprises, how to obtain and maintain the inherent competitive advantages of enterprises is a major problem that enterprises need to consider and solve. The innovation performance of an enterprise depends on its performance in the face of environmental fluctuations and market opportunities, which is specifically manifested in the optimal allocation of its own resources (Medeiros, 2022). From the perspective of dynamic capability theory, organizational agility, as a strategic competitive capability of an enterprise,

is a full reflection of the ability of an enterprise to perceive, understand, respond, utilize and create changes and opportunities in the internal and external environment (Gerster et al., 2021). The dynamic and changeable characteristics of the market environment put forward higher requirements on the rapid response ability of enterprises. The most effective means is to identify and adapt to customer needs in a complex environment, take the lead in bringing innovative products that meet customer needs to the market, and try to form economies of scale through large-scale products (Hanifah et al., 2019).

H6: Organizational agility has a positive impact on innovation performance;

H7: Organizational agility plays a mediating role between alliance diversity and organizational innovation performance.

#### **2.4 The chain mediating effect of internationalization degree and organizational agility on the relationship between internationalization degree and organizational innovation performance**

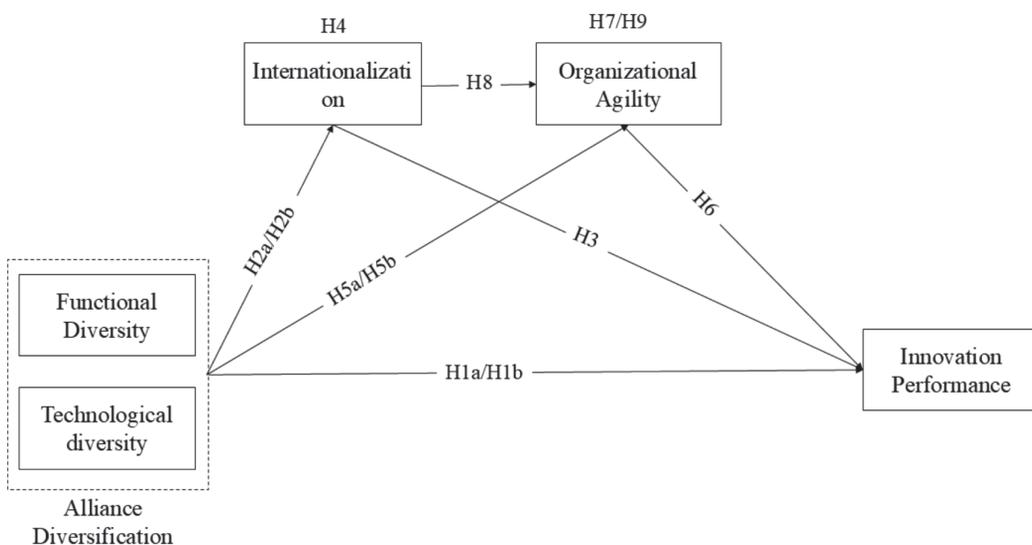
Based on the resource-based view theory, enterprises can obtain a large amount of resources and information. After joining the international market, it is more convenient for enterprises to obtain local information and knowledge. They can obtain the relevant information needed by enterprises through exchanges, trade fairs, local trade unions or industry associations, reducing the impact of information shortage on enterprises (Muge et al., 2021). At the same time, the resources obtained by enterprises in the international market are also heterogeneous, which are not exposed to the domestic market. Tacit knowledge such as skills and information is mainly transmitted by people, and there are obstacles to transmission through ordinary channels. Only by in-depth contact with relevant people with tacit knowledge can information be obtained to the greatest extent. The deepening of the internationalization of enterprises is conducive to enterprises discovering market opportunities before competitors. Improve the insight of enterprises into the market, discover market opportunities early, and thus improve the speed of market response (Lewnes, 2021).

H8: The degree of internationalization has a positive impact on the organizational agility of the firm.

In the process of internationalization, enterprises need to cope with the diverse demands and uncertainties of the market environment from different countries and regions. Organizational agility can help enterprises better cope with these challenges (Appelbaum et al., 2019). Specifically, organizational agility can help enterprises better cope with the complexity and uncertainty in the process of internationalization and promote the exchange of knowledge and experience between different countries and regions (Wei et al., 2022). Through cooperation and learning with different international partners, enterprises can absorb diverse perspectives and innovative resources, thereby promoting the collision and integration of innovative thinking. Enterprises with higher agility are more likely to quickly adjust their organizational structure and management model to adapt to the requirements of different partners and maintain the stability and effective operation of the alliance (Mirković et al., 2019).

H9: The degree of internationalization and organizational agility play a chain mediating role between alliance diversity and organizational innovation performance.

In summary, the research model of this paper is shown in Figure 1:



**Figure 1** Research model

## Methodology

### 3.1 Questionnaire distribution and collection

This study employs a cross-sectional survey design to capture the impact of alliance diversification on corporate innovation performance. A questionnaire survey was selected as the primary data collection method due to its efficiency in gathering large-scale data from diverse industries. This study distributed 21 questionnaires in Beijing, 101 in Shanghai, 48 in Shenzhen, 29 in Tianjin, and 451 in Zhejiang Province, with a total of 650 questionnaires distributed. A total of 650 formal questionnaires were distributed in this study. After eliminating invalid questionnaires with missing values, wrong answers or random answers, 570 valid questionnaires were available for analysis, and the effectiveness of the formal questionnaire was 87.69%. The sample includes 570 Chinese enterprises, covering multiple industries and having good representativeness. In terms of enterprise scale, small and medium-sized enterprises account for a large proportion, with 19.30% of enterprises having less than 50 employees and 81.05% of enterprises having less than 1,000 employees. In terms of enterprise nature, private enterprises and joint-stock enterprises account for a large proportion. Enterprises with different years of internationalization are represented, especially those with less than 3 years of internationalization, accounting for 18.60%.

## Results

With alliance diversification as the independent variable, innovation performance as the dependent variable, and internationalization degree and organizational agility as the mediators, a mediation model was established for analysis. According to the model fitting index results,  $\chi^2=953.311$ ,  $\chi^2/df=1.306$ , which are less than 5, indicating good fit; CFI=0.986, TLI=0.985, both greater than 0.9, indicating ideal fit; RMSEA=0.023, less than 0.08, indicating that the hypothesized model has an acceptable fit; SRMR=0.025, less than 0.08, which is in line with the indicator evaluation criteria recommended by Hu and Bentler (1995) and Hair et al. (2010), indicating that the hypothesized model has a good fit.

Table 1 summarizes the hypothesis path analysis. The effect of alliance function diversification on innovation performance is not significant ( $\beta = 0.069, p > 0.05$ ). The effect of alliance technology diversification on innovation performance is not significant ( $\beta = 0.074, p > 0.05$ ). The positive relationship between alliance diversification and innovation performance ( $\beta = 0.283, p < 0.05$ ) suggests that companies with more diverse alliances are likely to experience higher levels of innovation. Organizational agility has a significant positive impact on innovation performance ( $\beta = 0.318, p < 0.05$ ). The diversification of alliance functions has a significant positive impact on the degree of internationalization ( $\beta = 0.38, p < 0.05$ ). The diversification of alliance technology has a significant positive impact on the degree of internationalization ( $\beta = 0.312, p < 0.05$ ). The diversification of alliance functions has a significant positive impact on organizational agility ( $\beta = 0.161, p < 0.05$ ). Alliance technology diversification has a significant positive impact on organizational agility ( $\beta = 0.203, p < 0.05$ ). The degree of internationalization has a significant positive impact on organizational agility ( $\beta = 0.521, p < 0.05$ ). From the perspective of  $R^2$  value, alliance diversification and degree of internationalization jointly explain 57.8% of the variation in organizational agility, with a high explanatory power; alliance diversification, degree of internationalization and organizational agility jointly explain 42.1% of the variation in innovation performance, which also has a good explanatory power. This shows that the theoretical model constructed in this study has a strong explanatory power and predictive power, and better reveals the key antecedent variables and their mechanisms that affect organizational agility and innovation performance.

**Table 1** Direct effects hypothetical path analysis table

Hypothetical Path	Estimate	S.E.	t	P	R <sup>2</sup>
Alliance functional diversification---> innovation performance	0.069	0.053	1.290	0.197	
Alliance technology diversification---> innovation performance	0.074	0.061	1.218	0.223	0.421
Internationalization degree---> innovation performance	0.283	0.082	3.438	0.001	
Organizational agility---> innovation performance	0.318	0.106	2.990	0.003	
Alliance functional diversification---> internationalization degree	0.380	0.053	7.170	0.000	0.374
Alliance technology diversification---> internationalization degree	0.312	0.054	5.748	0.000	
Alliance functional diversification---> organizational agility	0.161	0.068	2.354	0.019	
Alliance technology diversification---> organizational agility	0.203	0.072	2.821	0.005	0.578
Internationalization degree---> organizational agility	0.521	0.075	6.963	0.000	

This study further examines the mediating effects of organizational agility and internationalization between alliance diversification and innovation performance. The Bootstrap method was used to estimate the size and significance of the indirect effect, and the following important findings were obtained. Alliance functional diversification has a significant indirect effect on innovation performance through internationalization ( $\beta = 0.107$ , 95%CI = [0.040, 0.183]), and the hypothesis is supported by the data. Alliance functional diversification has a significant indirect effect on innovation performance through organizational agility ( $\beta = 0.051$ , 95%CI = [0.009, 0.122]). Alliance functional diversification also has a significant chain indirect effect on innovation performance through internationalization and organizational agility ( $\beta = 0.063$ , 95%CI = [0.027, 0.129]). Alliance technological diversification has a significant indirect effect on innovation performance through the degree of

internationalization ( $\beta = 0.088$ , 95%CI = [0.038, 0.153]), and the hypothesis is supported by the data. Alliance technological diversification has a significant indirect effect on innovation performance through organizational agility ( $\beta = 0.065$ , 95%CI = [0.018, 0.160]). Alliance technological diversification also has a significant chain indirect effect on innovation performance through the degree of internationalization and organizational agility ( $\beta = 0.052$ , 95%CI = [0.018, 0.116]). Therefore, organizational agility and degree of internationalization play a significant mediating role between alliance diversification and innovation performance.

## Discussion

This study deeply explores the multi-dimensional impact of alliance diversification (including functional diversification and technological diversification) on corporate innovation performance, internationalization and organizational agility, and reveals the complex relationship between these variables. When discussing the verification results of these hypotheses, we can further explore the logic and potential impact behind them.

First, the positive impact of alliance diversity has been verified in multiple dimensions, which emphasizes that enterprises should pay attention to diversity and complementarity when building partnerships. This study found that alliance diversity is not only an important way for enterprises to improve their innovation performance, but also a key factor in promoting their internationalization process and improving organizational agility (Hanifah et al., 2019). This confirms that by building a diverse alliance network, enterprises can integrate resources and knowledge from different fields, thereby stimulating new ideas and solutions and promoting the improvement of innovation capabilities (Medeiros, 2022). Functionally diversified and technologically diverse alliances not only bring diversified resources and capabilities to enterprises, but also promote cross-domain knowledge exchange and integration, thereby stimulating new innovation points. This diverse alliance network helps enterprises break traditional boundaries, explore new market opportunities, and enhance overall competitiveness.

Second, the role of internationalization as a mediating variable cannot be ignored. It is not only a bridge for alliance diversity to affect innovation performance, but also an important part of enterprises to achieve global strategy (Gerster et al., 2021). Through internationalization, enterprises can access broader markets, more advanced technologies, and richer management experience, all of which help promote innovation and development (Boonmatat, 2019). At the same time, internationalization also requires enterprises to have higher organizational agility to quickly adapt to the market environment of different countries and regions.

The importance of organizational agility has been fully demonstrated in the study. It is not only a key ability for enterprises to cope with market changes and seize opportunities, but also an important guarantee for achieving continuous innovation. Alliance diversification provides enterprises with an opportunity to improve organizational agility by promoting resource integration and knowledge exchange (Papanastassiou et al., 2020). The improvement of organizational agility further enhances the innovation ability and market competitiveness of enterprises.

Finally, the discovery of the chain mediation effect reveals the complex mechanism by which alliance diversification affects innovation performance. This mechanism not only emphasizes the important role of internationalization and organizational agility, but also reminds us that when formulating corporate strategies, we should fully consider the interaction and synergy between various variables. Only in this way can enterprises use alliance resources more effectively and achieve innovation-driven development (Wu & Vahlne, 2020). This chain mediation path provides important theoretical support and practical guidance for how enterprises can achieve innovation-driven development through alliance strategies (Lynch and Jin, 2016).

In summary, the results of this study provide us with new perspectives and insights for our in-depth understanding of the relationship between alliance diversification, internationalization, organizational agility and innovation performance. These findings not only enrich the research content of relevant theories, but also provide strong support for enterprises to make effective strategic decisions in

practice. It is worth noting that the limitation of this study is its reliance on self-reported data, which may introduce response bias. Future research could use longitudinal data to confirm these findings over time.

## **Conclusion**

Both functional diversification and technological diversification of alliances have a positive impact on innovation performance. The degree of internationalization not only has a direct positive effect on innovation performance, but also plays an important mediating role between alliance diversity and innovation performance. Organizational agility is also positively affected by alliance diversification. Both functional diversification and technological diversification have significantly improved the organizational agility of enterprises, enabling enterprises to respond to market changes more quickly, seize opportunities, and avoid risks. Organizational agility not only directly promotes innovation performance, but also plays a mediating role between alliance diversity and innovation performance, further strengthening the role of alliance diversity in promoting innovation performance. It is particularly worth mentioning that this study also found the chain mediating effect of internationalization and organizational agility between alliance diversity and innovation performance.

Overall, this study underscores the strategic importance of alliance diversification, agility, and internationalization in driving innovation, providing a roadmap for companies seeking to thrive in today's competitive global market.

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