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The impact mechanism of network diversity on innovation performance in the manufacturing industry: The roles of entrepreneurial strategy, relational embedding, and government support

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Abstract: This study investigates the impact of network diversity on innovation performance, examining the mediating role of entrepreneurial strategy in the relationship between network heterogeneity and innovation performance. It also explores the moderating effect of relational embeddedness on the link between network diversity and innovation performance, as well as the moderating effect of government support on the relationship between entrepreneurial strategy and innovation performance. A total of 488 manufacturing enterprises were selected as the research sample. Data were collected via online questionnaires distributed through WeChat and other group channels, with five questionnaires issued to each enterprise. In total, 2,440 questionnaires were distributed, and 1,842 valid responses were collected. The results reveal that network heterogeneity has a significant positive effect on innovation performance; network heterogeneity also positively influences entrepreneurial strategy; entrepreneurial strategy exerts a significant positive impact on innovation performance; entrepreneurial strategy plays a significant mediating role between network heterogeneity and innovation performance; relational embeddedness significantly moderates the relationship between network heterogeneity and innovation performance; and government support significantly moderates the relationship between entrepreneurial strategy and innovation performance.

Keywords: *Entrepreneurial strategy, Government support, Innovation performance, Network diversity, Relational embeddedness.*

1. Introduction

1.1. Research Background and Motivation

Innovation has become the driving force behind enterprise growth and national economic development [1]. With the progression of economic globalization, the core of business competition has shifted from pricing to innovation capability, which now stands as a critical source of competitive advantage. However, in the face of growing innovation risks and challenges, reliance on traditional, closed innovation practices is no longer adequate to address accelerating technological convergence and rapidly changing market demands [2]. It is increasingly difficult for firms to achieve effective innovation based solely on their internal resources and capabilities, making the integration of external resources through collaborative research and development a vital strategic option [3, 4]. Today's inter-firm networks, built upon partnerships, are highly complex and play multiple roles in corporate governance and strategic decision-making [5].

Collaborative networks offer enterprises access to valuable external innovation resources and knowledge, and the influence of network characteristics on innovation performance has attracted extensive scholarly attention. Firstly, numerous studies have examined the effects of network position from a structural perspective. For example, prior research has demonstrated that network centrality can both enhance and hinder innovation performance [6-8], prompting further reflection on the

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mechanisms linking network position and innovation outcomes. Secondly, other scholars have considered relational characteristics within networks. Li et al. [9] suggested an inverted U-shaped relationship between collaboration depth and innovation performance in industry-academia partnerships, while Zhang et al. [10] identified a similar pattern in relation to collaboration breadth. Thirdly, some studies have revealed that the impact of collaborative networks on innovation performance can vary depending on partner types and stages of collaboration [11].

However, network diversity may not directly enhance innovation performance; rather, its effects are often realized through strategic adjustments [12]. Enterprises may convert the knowledge acquired from diverse networks into innovation outcomes by adopting open innovation strategies, exploring new markets, or pursuing differentiation strategies [13]. When firms access varied resources, knowledge, and technologies through diverse networks, strategic alignment ensures these resources are more effectively leveraged to improve innovation performance [14].

Moreover, strong social ties can reduce the uncertainty and information asymmetry associated with network diversity, enabling firms to obtain more reliable and comprehensive innovation resources [15]. Relational embeddedness, by shaping firms' interaction patterns with diverse network members, amplifies the positive impact of network diversity on innovation performance, allowing firms to integrate resources more efficiently within complex and dynamic environments, thereby achieving superior innovation outcomes.

Although firm strategies may provide a direction and framework for improving innovation performance, when resources are constrained or market uncertainty is high, enterprises may struggle to realize innovation goals relying solely on internal efforts [16]. In such circumstances, government support plays a pivotal role. Policy incentives and technological assistance can mitigate innovation risks and help firms overcome technological and market barriers [17]. Moreover, government policies on market access and sectoral guidelines can foster a more favorable external environment for enterprise innovation by reducing competitive pressure and uncertainty. This form of external support enhances the effectiveness of entrepreneurial strategies, accelerating the translation of innovation initiatives into tangible outcomes and improving overall innovation performance [18].

In summary, this study explores the influence of network diversity on innovation performance, the mediating role of entrepreneurial strategy between network heterogeneity and innovation performance, the moderating role of relational embeddedness between network diversity and innovation performance, and the moderating role of government support between entrepreneurial strategy and innovation performance. By integrating analyses of both mediating and moderating effects, this research offers theoretical insights and practical guidance for enterprises seeking to enhance innovation performance within complex network environments.

1.2. Research Questions

1. Does network diversity affect a firm's innovation performance?
2. Does network diversity influence entrepreneurial strategy?
3. Does entrepreneurial strategy affect a firm's innovation performance?
4. Does entrepreneurial strategy mediate the relationship between network diversity and innovation performance?
5. Does relational embeddedness moderate the relationship between network diversity and innovation performance?
6. Does the government support moderating the relationship between entrepreneurial strategy and innovation performance?

2. Literature Review

2.1. Main Effect Hypothesis

Extensive network relationships are instrumental in fostering knowledge creation, stimulating innovative activities, and enhancing innovation performance [19, 20]. The significance of social

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networks has been widely acknowledged within the context of open innovation [21]. In order to achieve and sustain open innovation, firms, including new ventures, can draw upon a broad range of external participants and knowledge sources to access novel ideas [22-24]. Building networks with a variety of partners is beneficial, as it provides firms with complementary capabilities and diverse forms of support, including expertise, emotional encouragement, financial resources, and technical assistance. Du Plessis [25] argued that inter-organizational collaboration plays a pivotal role in facilitating knowledge sharing, which, in turn, positively affects a firm's innovation capacity.

Ahuja [26] further observed that stronger ties within a network promote trust and cooperation, while exposure to diverse viewpoints enables members to think more critically, make informed decisions, and mitigate innovation risks [12]. Greater network diversity allows for the transmission of a broader range of knowledge and information essential for innovation, Yang and Wang [27]. Phelps [28] examined the relationship between network diversity and exploratory innovation, finding that diversity increases the novelty of knowledge accessible through networks, thus influencing exploratory innovation. On this basis, it is proposed that heterogeneous social networks constitute a vital driver of innovation performance. Accordingly, the following hypothesis is formulated:

H_1: Network diversity has a significant positive effect on innovation performance.

2.2. Mediation Effect Hypothesis

Through diversified networks, firms are able to acquire a wealth of external knowledge, technologies, and market information, which lays a solid foundation for innovation [29]. The variety of perspectives and experiences brought by diverse partners provides firms with alternative solutions, thereby supporting innovation outcomes [12]. Entrepreneurial strategy, as the overarching plan devised to realize long-term development objectives, plays a crucial guiding role in resource allocation, organizational culture, and innovation orientation [13]. The external resources and information derived from network diversity expand firms' strategic options. By integrating these diverse resources, firms are better positioned to formulate flexible and innovation-oriented strategies [14]. Network diversity enhances a firm's ability to anticipate market changes and technological advancements, identify emerging opportunities, and incorporate them within strategic frameworks.

During strategy formulation, firms can learn from the successes and market insights of diverse network partners to craft strategic decisions aligned with innovation imperatives [30]. Through such strategies, firms are able to allocate financial, human, and technological resources more effectively to research and development, product development, and innovation projects, ensuring these initiatives receive sufficient support and ultimately improving innovation outcomes [31]. Furthermore, an entrepreneurial strategy helps firms to adapt to shifts in external markets. By analyzing market trends and competitive dynamics, firms can identify new technologies and demands in a timely manner, adjust innovation priorities accordingly, and align their innovation activities with market needs, thereby enhancing innovation performance [13].

In summary, network diversity not only directly enhances innovation performance but also indirectly promotes sustained innovation through its influence on entrepreneurial strategy as a mediating factor. Effective strategic planning enables firms to transform the diverse resources and information brought by network diversity into tangible innovation outcomes, thereby achieving higher levels of innovation performance. Accordingly, the following hypotheses are proposed:

H_2: Network diversity has a significant positive effect on entrepreneurial strategy.

H_3: Entrepreneurial strategy has a significant positive effect on innovation performance.

H_4: Entrepreneurial strategy mediates the relationship between network diversity and innovation performance.

2.3. Moderation Effect Hypotheses

The relational embeddedness perspective, encompassing both internal and external relational embeddedness, has been increasingly acknowledged in the literature [32]. Internally, strong relationships foster trust and cohesion among members, encouraging sanctions against self-serving

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behavior [33]. Within firms, effective interaction and collaboration among members promote innovation and help address organizational challenges [34]. High levels of internal relational embeddedness create a supportive, trusting, and cooperative environment conducive to innovation. Moreover, firms' capabilities for innovation diffusion facilitate the efficient internal flow and dissemination of crucial resources such as knowledge, information, and experience. This enables firms to devise creative recombination solutions and enhance recombination outcomes, thus improving overall performance, particularly in new ventures [35].

Externally, relational embeddedness explains how firms exist within a complex social network and how the nature of their relationships with other organizations determines the extent to which they can access, integrate, and allocate resources, thereby influencing firm behavior. Both the quantity and structure of ties within collaborative social networks can improve innovation outcomes [26, 36]. Prior research has highlighted how social capital is embedded within network relationships [37], underscoring the importance of inter-firm cooperation and networking in driving innovation [15]. Collaborative relationships build social capital within networks, strengthening mutual trust and relationships and positively affecting innovation development. Social capital also reduces transaction costs between network members and minimizes costs related to research, information-seeking, decision-making, governance, and implementation, thereby facilitating innovation. Accordingly, the following hypothesis is proposed:

H_5: Relational embeddedness moderates the relationship between network diversity and innovation performance.

Innovation inherently involves high levels of risk and uncertainty. In pursuing innovation-oriented strategies, firms often face challenges such as limited financial resources, technological barriers, and market unpredictability [16]. At such times, government support, including R&D tax incentives, innovation grants, dedicated funding schemes, and technology loans, can significantly alleviate the resource constraints encountered by firms during the innovation process [17]. This external support boosts firms' confidence in their innovation strategies and encourages sustained investment in high-risk domains, thereby improving innovation performance [18].

Beyond financial and policy support, governments can enhance firms' capacity to execute entrepreneurial strategies by providing innovation platforms, research centers, and science parks that facilitate access to advanced technologies and specialized expertise [38]. Government-led university-industry collaboration mechanisms further enable firms to incorporate cutting-edge technologies and theoretical insights into their innovation strategies, increasing both success rates and efficiency [39]. These resources enrich firms' technological reserves and intellectual capital, equipping them to outperform competitors in dynamic markets.

Additionally, governmental policies in areas such as institutional development, intellectual property protection, and market regulation foster a fair, open, and sustainable innovation environment [40]. A sound innovation ecosystem reduces market barriers and legal risks associated with innovation activities and stimulates firms to pursue more strategic innovation initiatives. Strong intellectual property protections, in particular, bolster firms' confidence in the commercialization of innovations, ensuring they can reap the full benefits of their efforts [41]. Based on this, the following hypothesis is proposed:

H_6: Government support moderates the relationship between entrepreneurial strategy and innovation performance.

2.4. Theoretical Framework

Based on the discussions above, the theoretical model of this study is presented in Figure 1.

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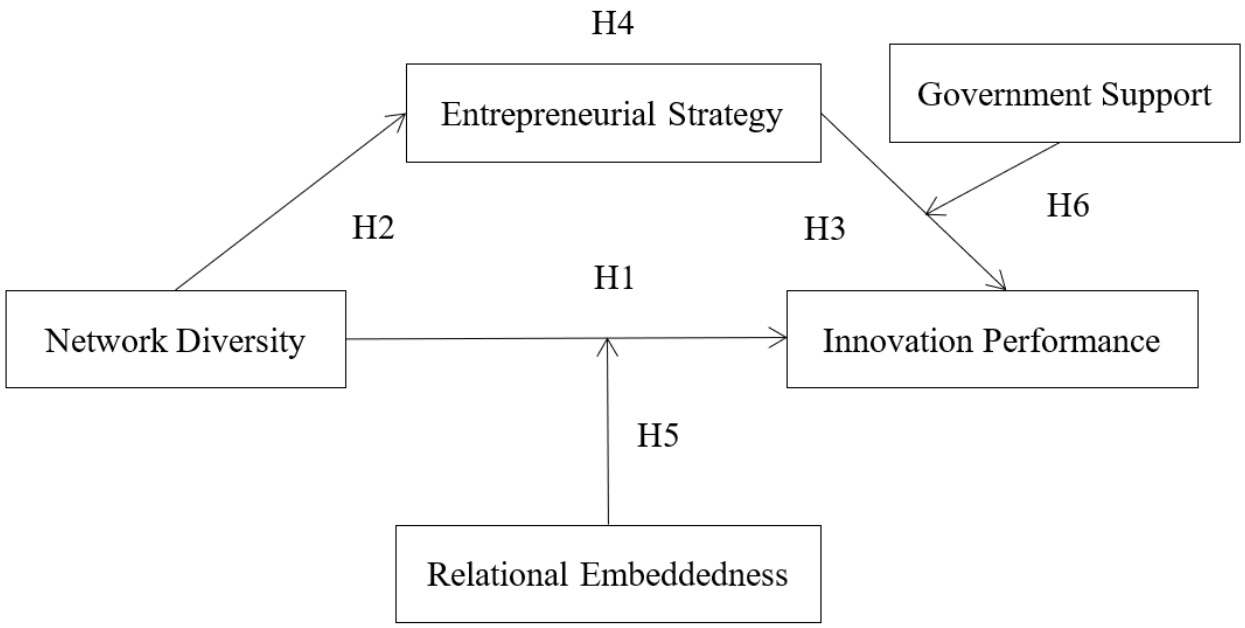

Figure 1.
Theoretical Framework.

3. Research Design

3.1. Sample Selection

This study selected a total of 488 core manufacturing enterprises as the research sample through a process of screening and verification. Data collection was conducted via online questionnaires, primarily distributed through WeChat, QQ groups, email, and internal corporate communication platforms such as company WeChat groups and work chat groups. The questionnaires were disseminated either by internal corporate managers or directly by the research team to the employees. A purposive invitation method was adopted for questionnaire distribution; specifically, initial contact was established with corporate executives or human resources departments to explain the research purpose and requirements, and to request their assistance in distributing the questionnaires to relevant internal employees.

For the distribution process, online questionnaires were employed, and distribution was conducted via WeChat and other group-based communication channels. Five questionnaires were distributed to each enterprise, totaling 2,440 questionnaires. The decision to distribute five questionnaires per enterprise was intended to avoid the potential bias that could result from relying on a single respondent's subjective views. Multiple respondents from each enterprise help mitigate this bias and enhance the scientific validity and reliability of the data. Furthermore, considering the internal diversity of positions, functions, and departments within core manufacturing enterprises, distributing several questionnaires to each enterprise helps to capture the perspectives of employees at different levels and roles, thereby improving the representativeness of the data.

This study also set a minimum requirement for valid responses per enterprise, namely, at least two valid questionnaires. For enterprises that failed to meet this minimum threshold, a second round of contact was made through the original communication channels (such as WeChat, QQ groups, and email) to follow up, clarify any incomplete submissions, and redistribute questionnaires where necessary. This process was intended to ensure that the final sample size and data quality met the requirements of the research. Ultimately, 1,842 valid questionnaires were collected.

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3.2. Measurement Instruments

3.2.1. Measurement of Network Diversity

This study adopted the scale developed by Ye et al. [42], consisting of nine items, five of which measure external knowledge diversity, and four of which measure internal knowledge diversity. The scale is designed to more accurately reflect the characteristics of internal and external knowledge diversity within a firm's platform network. A five-point Likert scale was employed, where "1" indicates "completely inconsistent" and "5" indicates "completely consistent." The Cronbach's alpha value for this scale was 0.883. The model fit indices were as follows: $\chi^2/df = 2.000$ (less than 3), GFI = 0.997, AGFI = 0.989 (both greater than 0.9), with IFI, CFI, and TLI all exceeding 0.9, and RMSEA = 0.023 (less than 0.1). According to standard model fit criteria, the model fit indices met the required standards.

3.2.2. Measurement of Innovation Performance

The measurement of innovation performance was based on the scale developed by Chen et al. [43], consisting of five items. This scale has been widely adopted in previous studies and demonstrated good reliability, with a Cronbach's alpha coefficient of 0.90. A five-point Likert scale was also used. In this study, the Cronbach's alpha value for innovation performance was 0.878. The model fit indices were as follows: $\chi^2/df = 4.575$ (greater than 3 but less than 5, within an acceptable range), GFI = 0.995, AGFI = 0.985 (both greater than 0.9), IFI, CFI, and TLI all exceeding 0.9, and RMSEA = 0.044 (less than 0.1). The model fit indicators thus met the established criteria.

3.2.3. Measurement of Entrepreneurial Strategy

Wen and Chen [44] analyzed the impact of entrepreneurial learning on competitive advantage from an entrepreneurial strategy perspective, categorizing new entrepreneurial strategies into two dimensions: exploratory and exploitative strategies, with six items each. A five-point Likert scale was employed, with "1" indicating "strongly disagree" and "5" indicating "strongly agree." The Cronbach's alpha value for entrepreneurial strategy was 0.910. The model fit indices were as follows: $\chi^2/df = 2.466$ (less than 3), GFI = 0.988, AGFI = 0.982 (both greater than 0.9), IFI, CFI, and TLI all greater than 0.9, and RMSEA = 0.028 (less than 0.1), indicating that the model fit indices met the required standards.

3.2.4. Measurement of Relational Embeddedness

Xu et al. [45] classified relational embeddedness into three dimensions: trust (4 items), information sharing (4 items), and joint problem-solving (3 items). A five-point Likert scale was used, with higher scores indicating stronger relational embeddedness. The Cronbach's alpha value for relational embeddedness was 0.886. The model fit indices were as follows: $\chi^2/df = 2.731$ (less than 3), GFI = 0.989, AGFI = 0.982 (both greater than 0.9), IFI, CFI, and TLI all greater than 0.9, and RMSEA = 0.031 (less than 0.1), suggesting that the model fit indices satisfied the established standards.

3.2.5. Measurement of Government Support

This study adopted the government support scale developed by Wang et al. [46], which comprises five items. A five-point Likert scale was used, where "1" indicates "strongly disagree" and "5" indicates "strongly agree." The Cronbach's alpha value for government support was 0.855. The model fit indices were as follows: $\chi^2/df = 4.340$ (greater than 3 but less than 5, within an acceptable range), GFI = 0.995, AGFI = 0.986 (both greater than 0.9), IFI, CFI, and TLI all exceeding 0.9, and RMSEA = 0.043 (less than 0.1). The model fit indicators thus met the prescribed standards.

3.2.6. Measurement of Control Variables

The control variables included firm age, ownership type, firm size, region, and industry. These variables were measured through the questionnaire survey to ensure the accuracy and reliability of the data.

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3.3. Data Analysis Methods

This study utilized SPSS and AMOS software for data analysis, employing reliability analysis, confirmatory factor analysis, descriptive analysis, Harman's single-factor test, correlation analysis, and regression analysis.

4. Research Results

4.1. Sample Structure Analysis

A total of 2,440 questionnaires were distributed in this study, with 1,842 valid responses recovered. Invalid questionnaires were identified based on three criteria. First, responses completed in less than five minutes were considered invalid. Second, responses exhibiting obvious patterned responses, such as selecting the same option for all questions (e.g., all "1" or all "5") or following a mechanical pattern (e.g., "1, 2, 3, 4, 5" in a cycle), were regarded as indicative of inattentive answering and thus invalid. Third, the questionnaire included reverse-coded items to assess respondents' attentiveness. Failure to answer these items as instructed was taken as evidence of careless responding, leading to the questionnaire being classified as invalid. The distribution of responses is presented below. See Table 1.

Table 1.
Sample Structure Analysis (n = 1842).

Category	Option	Frequency	Percentage (%)
1. Firm Age	Less than 5 years	650	35.29
	6–10 years	475	25.79
	11–20 years	375	20.36
	Over 20 years	342	18.57
2. Firm Size	Fewer than 100 employees	782	42.45
	101–300 employees	281	15.26
	301–500 employees	208	11.29
	501–1000 employees	159	8.63
	Over 1000 employees	412	22.37
3. Ownership Type	State-owned (controlling) enterprises	694	37.68
	Privately-owned enterprises	900	48.86
	Sino-foreign joint ventures	102	5.54
	Other types	146	7.93
4. Region	Eastern region	475	25.79
	Western region	439	23.83
	Southern region	416	22.58
	Northern region	438	23.78
	Central region	74	4.02
5. Industry	High-tech industries	936	50.81
	Medium-high-tech industries	263	14.28
	Medium-low-tech industries	483	26.22
	Low-tech industries	160	8.69
Total		1842	100

Note: Data sourced from this study.

4.2. Common Method Bias

This study employed Harman's single-factor test for common method bias. All variables were subjected to exploratory factor analysis without rotation. The results showed that the first principal component accounted for 28.198% of the total variance, which is below the recommended threshold of 40%, indicating that common method bias is not a concern in this study.

4.3. Descriptive Statistics and Correlation Analysis

When there is a relationship between variables without establishing causality, such associations are referred to as correlations. In this study, Pearson correlation analysis was conducted to examine the relationships between the variables. As shown in Table 2, all correlation coefficients were positive and

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statistically significant, indicating that innovation performance is positively correlated with network diversity, entrepreneurial strategy, relational embeddedness, and government support.

Table 2.
Correlation Analysis.

Variable	M	SD	ND	IP	ES	RE	GS
ND	3.247	0.753	1				
IP	3.298	0.858	0.541***	1			
ES	3.190	0.773	0.593***	0.516***	1		
RE	3.202	0.738	0.408***	0.352***	0.306***	1	
GS	3.247	0.835	0.156***	0.181***	0.283***	0.250***	1

Note: *** $p < 0.001$
Data sourced from this study.
ND = Network Diversity; IP = Innovation Performance; ES = Entrepreneurial Strategy; RE = Relational Embedding; GS = Government Support.

4.4. Regression Analysis

Firstly, in Model 1, the β value of network diversity on innovation performance was 0.536, with a t-value of 27.249 and a significance level of less than 0.001, indicating a statistically significant positive effect. This result suggests that network diversity exerts a significant positive influence on innovation performance.

Secondly, in Model 2, the β value of network diversity on entrepreneurial strategy was 0.605, with a t-value of 31.239 and a significance level of less than 0.001, also indicating a statistically significant positive effect. This finding demonstrates that network diversity significantly and positively affects entrepreneurial strategy.

Finally, as shown in Model 3, the β value of network diversity on innovation performance was 0.360, with a t-value of 15.430 and a significance level of less than 0.001, reaching statistical significance. Meanwhile, the β value of entrepreneurial strategy on innovation performance was 0.299, with a t-value of 12.801 and a significance level of less than 0.001, also achieving statistical significance. Furthermore, compared with the β value of network diversity on innovation performance in Model 1, the β value in Model 3 was noticeably reduced. This indicates that entrepreneurial strategy plays a partial mediating role in the relationship between network diversity and innovation performance. See Table 3.

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Table 3.
Mediation Analysis Results.

	Model 1 IP			Model 2 ES			Model 3 IP		
	B (***t***)	**SE**	***β***	***B*** (***t***)	**SE**	***β***	***B*** (***t***)	**SE**	***β***
Constant	1.168*** (11.362)	0.103	-	1.095*** (12.345)	0.089	-	0.805*** (7.847)	0.103	-
FA	-0.007 (-.475)	0.015	-0.009	-0.002 (-.170)	0.013	-0.003	-0.006 (-0.445)	0.014	-0.008
FS	0.028** (2.656)	0.010	0.052	0.016 (1.797)	0.009	0.034	0.022* (2.232)	0.010	0.042
FO	0.029 (1.439)	0.020	0.028	0.016 (0.928)	0.017	0.017	0.023 (1.224)	0.019	0.023
Region	-0.002 (-0.163)	0.014	-0.003	0.017 (1.403)	0.012	0.026	-0.008 (-0.589)	0.013	-0.011
Industry	0.022 (1.390)	0.016	0.027	0.011 (.808)	0.014	0.015	0.019 (1.209)	0.015	0.023
ND	0.612*** (27.249)	0.022	0.536	0.605*** (31.239)	0.019	0.590	0.411*** (15.430)	0.027	0.360
ES							0.332*** (12.801)	0.026	0.299
R^2	0.297			0.354			0.355		
Adj. R^2	0.295			0.352			0.352		
F	129.101***			167.351***			143.887***		

Note:* p < 0.050; ** p < 0.010; *** p < 0.001.
Data sourced from this study.
ND = Network Diversity; IP = Innovation Performance; ES = Entrepreneurial Strategy; FA = Firm Age; FS = Firm Size; FO = Firm Ownership.

4.5. Moderation Test

In order to examine the moderating effect of relational embeddedness on the relationship between network diversity and innovation performance, the following analysis was conducted. Model 2 introduced the moderating variable (relational embeddedness) based on Model 1, while Model 3 incorporated the interaction term between network diversity and relational embeddedness to explore how the moderating variable affects the relationship between network diversity and innovation performance at different levels.

As shown in the table below, the interaction term between network diversity and relational embeddedness was found to be statistically significant (t = 7.346, p < 0.001). This result indicates that, under the moderating effect of relational embeddedness, the impact of network diversity on innovation performance varies significantly. Specifically, the positive influence of network diversity on innovation performance becomes more pronounced as the level of relational embeddedness increases. See Table 4.

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Table 4.
Moderating Effect Analysis Results 1.

	Model 1 IP			**Model 2 IP**			**Model 3 IP**		
	B **(*t*)**	**SE**	***β***	***B*** **(*t*)**	**SE**	***β***	***B*** **(*t*)**	**SE**	***β***
Constant	3.154*** (42.023)	0.075	-	3.141*** (42.481)	0.074	-	3.107*** (42.532)	0.073	-
FA	-0.007 (-0.475)	0.015	-0.009	-0.007 (-0.451)	0.015	-0.009	-0.004 (-0.291)	0.015	-0.006
FS	0.028** (2.656)	0.010	0.052	0.031** (2.963)	0.010	0.057	0.029** (2.905)	0.010	0.056
FO	0.029 (1.439)	0.020	0.028	0.030 (1.516)	0.020	0.029	0.025 (1.276)	0.019	0.024
Region	-0.002 (-0.163)	0.014	-0.003	-0.002 (-0.149)	0.014	-0.003	0 (-0.007)	0.013	0
Industry	0.022 (1.390)	0.016	0.027	0.023 (1.491)	0.016	0.029	0.022 (1.433)	0.016	0.027
ND	0.612*** (27.249)	0.022	0.536	0.536*** (22.133)	0.024	0.470	0.585*** (23.594)	0.025	0.513
RI				0.187*** (7.602)	0.025	0.161	0.229*** (9.184)	0.025	0.197
ND × RI							0.168*** (7.346)	0.023	0.155
R^2	0.297			0.318			0.338		
Adj. R^2	0.295			0.316			0.335		
F	*F*=129.101, *p*=0.000			*F*=122.339, *p*=0.000			*F*=116.884, *p*=0.000		

Note: * p < 0.050; ** p < 0.010; *** p < 0.001
Data sourced from this study.
ND = Network Diversity; IP = Innovation Performance; RI = Relationship Embedding; FA = Firm Age; FS = Firm Size; FO = Firm Ownership.

To investigate the moderating effect of government support on the relationship between entrepreneurial strategy and innovation performance, the analysis presented in the table below was conducted. Model 2 introduced the moderating variable (government support) based on Model 1, while Model 3 added the interaction term between entrepreneurial strategy and government support to examine how this moderating effect varies across different levels.

The results indicate that the interaction term between entrepreneurial strategy and government support is significant (t = 8.650, p < 0.001). This suggests that the impact of entrepreneurial strategy on innovation performance differs significantly depending on the level of government support. Specifically, the positive effect of entrepreneurial strategy on innovation performance becomes stronger when government support is higher. As shown in Table 5.

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Table 5.
Moderating Effect Analysis Results 2.

	Model 1 IP			Model 2 IP			Model 3 IP		
	B (***t***)	**SE**	***β***	***B*** (***t***)	**SE**	***β***	***B*** (***t***)	**SE**	***β***
Constant	3.197*** (41.776)	0.077	-	3.192*** (41.732)	0.076	-	3.195*** (42.606)	0.075	-
FA	-0.005 (-0.35)	0.015	-0.007	-0.006 (-0.394)	0.015	-0.008	-0.010 (-0.681)	0.015	-0.013
FS	0.030** (2.788)	0.011	0.056	0.031** (2.908)	0.011	0.058	0.029** (2.790)	0.010	0.055
FO	0.009 (0.468)	0.020	0.009	0.010 (0.499)	0.020	0.010	-0.002 (-0.081)	0.020	-0.002
Region	-0.010 (-0.697)	0.014	-0.014	-0.010 (-0.702)	0.014	-0.014	-0.011 (-0.779)	0.014	-0.015
Industry	0.024 (1.459)	0.016	0.029	0.025 (1.522)	0.016	0.030	0.026 (1.601)	0.016	0.031
ES	0.568*** (25.498)	0.022	0.511	0.554*** (23.846)	0.023	0.499	0.602*** (25.675)	0.023	0.542
GS				0.044* (2.053)	0.021	0.043	0.061** (2.878)	0.021	0.059
ES × GS							0.180*** (8.650)	0.021	0.177
R^2	0.271			0.272			0.301		
Adj. R^2	0.268			0.270			0.298		
F	*F*=113.522, *p*=0.000			*F*=98.077, *p*=0.000			*F*=98.625, *p*=0.000		

Note: * p < 0.050; ** p < 0.010; *** p < 0.001.
Data sourced from this study.
ES = Entrepreneurial Strategy; IP = Innovation Performance; GS = Government Support; FA = Firm Age; FS = Firm Size; FO = Firm Ownership.

5. Research Conclusions

This chapter, through the construction of a theoretical model, has systematically explored the interrelationships among network diversity, entrepreneurial strategy, relational embeddedness, government support, and innovation performance. Regression analyses revealed that: H1: Network diversity has a significant positive effect on innovation performance, which is supported. H2: Network diversity has a significant positive effect on entrepreneurial strategy, which is supported. H3: Entrepreneurial strategy has a significant positive effect on innovation performance, which is supported. H4: Entrepreneurial strategy plays a significant mediating role in the relationship between network diversity and innovation performance, which is supported. H5: Relational embeddedness significantly moderates the relationship between network diversity and innovation performance, which is supported. H6: Government support significantly moderates the relationship between entrepreneurial strategy and innovation performance, which is supported. Accordingly, all hypotheses proposed in this study have been confirmed.

6. Research Recommendations

First, strengthen the innovation orientation of corporate strategy and promote the effective utilization of network resources. Based on the research findings, entrepreneurial strategy plays a pivotal role in enhancing innovation performance, particularly in environments characterized by high network diversity. To improve innovation performance, firms should explicitly position innovation as a core component of their strategic direction. It is essential for firms to define clear innovation objectives that align closely with the diversified external resources available to them. Specifically, enterprises should build close collaborative relationships with technology providers, research institutions, and industry

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experts, integrating external resources with internal innovation capabilities to ensure the achievement of strategic goals. In parallel, firms should focus on optimizing the integration of innovation resources within their strategic frameworks, allocating technical, knowledge-based, and market resources from multiple domains in a scientifically structured manner. Moreover, enterprises ought to increase their investment in R&D and innovation projects, with particular emphasis on strategic investment in critical technologies and emerging frontiers. By establishing innovation funds and supporting employee-led innovation initiatives, firms can achieve technological breakthroughs and the commercialization of innovative outcomes through external network support. In addition, cultivating an innovation-oriented organizational culture is vital; firms should implement regular innovation training, performance incentives, and other mechanisms to enhance employees' creativity and vitality, thereby contributing to the overall advancement of organizational innovation capacity.

Second, optimize government policy support to provide enterprises with greater access to innovation resources. Given the significant moderating role of government support on corporate innovation performance, it is recommended that governments intensify policy measures aimed at fostering innovation-friendly environments and provide more targeted support mechanisms. Governments should design innovation-led policy frameworks, encourage enterprises to increase R&D investments, and offer fiscal subsidies, tax incentives, and other forms of support. Establishing shared innovation platforms is also crucial for promoting collaboration among enterprises, research institutions, and technology providers. These platforms facilitate the sharing of resources across technology, markets, and talent, enabling enterprises to utilize external resources more efficiently and enhance their innovation capacity. Additionally, governments should strengthen intellectual property (IP) protection to boost firms' confidence in pursuing technological innovation. By developing sound legal and regulatory frameworks for IP protection and offering streamlined and efficient IP application and enforcement mechanisms, governments can provide reliable safeguards for enterprises in the innovation process. It is important to note, however, that while policy support offers multiple advantages for enterprise innovation, governments must focus on cross-departmental coordination to avoid fragmented and inconsistent policy implementation. Enhancing inter-departmental collaboration will allow governments to integrate various innovation resources effectively and provide enterprises with more comprehensive support, ultimately advancing the development of a robust innovation ecosystem.

Third, enhance relational embeddedness to promote the effective integration of enterprise networks and drive innovation. In the context of contemporary market competition, enterprises that establish stable relational networks are better positioned to leverage external resources and improve their innovation performance. It is essential for firms to recognize that strong relational embeddedness not only enhances innovation outcomes but also improves their capacity to access diversified network resources. Firms should prioritize long-term cooperation with key strategic partners, focusing on the depth rather than solely the immediate economic benefits of such collaborations. Stable, long-term partnerships help to build mutual trust, reduce information asymmetry and uncertainty, and facilitate both technological innovation and market expansion. At the same time, enterprises should expand the breadth and depth of their innovation networks by strengthening cross-sector and cross-regional collaborations. For example, firms could develop strategic relationships with leading enterprises in other industries and technology companies, enabling the sharing of resources and information, and promoting both technological and market-based cooperation. Such collaborations not only provide external technological support but also stimulate new innovation ideas and drive breakthroughs in key technologies. Moreover, firms should improve knowledge-sharing and technology transfer mechanisms through internal knowledge-sharing platforms, technical exchange forums, and other initiatives to foster employee collaboration and innovation, while drawing upon the expertise and experience of external partners to enhance their own innovation capacities. By reinforcing relational embeddedness, enterprises can more effectively integrate external resources, support the smooth implementation of innovation projects, and improve their innovation performance.

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Fourth, strengthen inter-departmental collaboration and promote innovation partnerships between the government and enterprises. To improve overall innovation performance, effective collaboration between the government and enterprises is essential. Governments can not only provide innovation support through policy guidance but also help enterprises reduce innovation costs and enhance resource acquisition efficiency by optimizing the innovation environment. Strategic alignment between government and enterprises is crucial for facilitating innovation partnerships. Governments should engage regularly with enterprises through consultation forums and policy discussions to understand the challenges and needs encountered in the innovation process, and subsequently adjust policy measures in accordance with real-world conditions to ensure that policies effectively address enterprise innovation requirements. Furthermore, governments should establish public innovation platforms, such as innovation incubators and accelerators, to provide enterprises with more diversified innovation resources, assist in overcoming technological bottlenecks, and accelerate the commercialization of innovative outcomes. Through these platforms, firms can obtain financial, technological, and market support, while also forming productive collaborative networks with other enterprises, research institutions, and government departments to jointly promote innovation. In addition, governments should increase their support for innovation-oriented enterprises by setting up dedicated innovation funds and offering tax incentives to reduce innovation costs and encourage greater investment in technology development and product innovation. Cross-departmental policy coordination and execution are also critical for fostering effective government-enterprise cooperation. Government departments must strengthen collaboration to ensure smooth policy implementation and maximize the effectiveness of innovation initiatives. Through coordinated inter-departmental efforts, governments can create a more stable and favorable innovation environment for enterprises, promote the construction of a comprehensive innovation ecosystem, and ultimately improve overall social innovation performance.

7. Research Limitations and Future Directions

This study has certain limitations in terms of sample selection and data acquisition. Although efforts were made to enhance the representativeness and scope of the study through a large sample size, the research focused solely on companies within the manufacturing sector. As a result, the external validity of the findings may be limited. Future research could broaden the diversity of the sample by including firms from different market sectors to further validate the generalizability and robustness of the findings. Additionally, future studies may consider cross-national comparative research to explore how cultural, market, and environmental differences across countries and regions influence the studied variables, thereby enhancing the comprehensiveness of the research.

This study did not examine in depth the moderating role of external environmental factors in the relationship between network diversity and innovation performance. Factors such as market competition, industry development trends, and technological change may significantly influence how firms leverage network diversity. Future research could incorporate these external environmental factors into the analytical framework to explore how they affect firms' strategic decisions and innovation performance under varying conditions. This would contribute to the enrichment of theoretical models on innovation performance and offer more adaptable strategic recommendations in the face of environmental uncertainty.

Institutional Review Board Statement:

This study was conducted in accordance with Articles 20 and 21 of Section 3.2.2 in the National Policy and Guidelines for Human Research 2015 issued by the National Research Council of Thailand (NRCT). Throughout the research process, investigators strictly protected participants' personal information and privacy, ensuring all participation was based on voluntary principles.

This study was verified by the Ethics Committee of Dhurakij Pundit University, Thailand, which, based on the guidelines for research in behavioral sciences, social sciences, and humanities issued by the Thailand National Research and Innovation Office (NRIO) (Document No. 6309. FB 6.1/1/2564, Clause

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3, 18 March 2021), determined that the research project falls under the exempt category of humanities and social sciences research and does not require a full ethical review.

Transparency:

The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Copyright:

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