Original Research Article

The influence of dual innovation strategy on technological innovation performance of non-core firms: the moderating effect of network relationship

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Abstract: Innovation is the first productive force, the implementation of innovation-driven development strategy, adhere to the core technology independent innovation non-core enterprises long-term development of the booster. The implementation of innovation-driven development strategy can promote the overall level of scientific and technological innovation. This paper constructs a strategy-network relations-performance model, uses 237 questionnaires from non-core enterprises as samples, and makes an empirical analysis of the choice mechanism of innovation strategy of non-core enterprises, considering the moderating effect of network relations. The results show that both breakthrough innovation strategy and progressive innovation strategy have positive effects on technological innovation performance. In the moderating effect, network density and network strength can significantly regulate the impact of innovation strategy on cooperative innovation performance, and the moderating effect on breakthrough innovation strategy and technological innovation performance is more significant and better than that on progressive innovation and technological innovation performance. Network centrality only has a positive moderating effect on the relationship between breakthrough innovation strategy and cooperative innovation performance. Therefore, when formulating the future development strategy of the company, non-core enterprises should be in the combination of multiple network relations with a more central-network position, high network density and high network strength, non-core enterprises should choose the breakthrough innovation strategy to grasp the development opportunity and carry out the breakthrough qualitative change development. When deviating from the central position of the network, the network density is small or the network strength is low in any of the situations, non-core enterprises should choose progressive innovation accumulate, and carry out progressive quantitative development.

Keywords: Non-core firms ; Network relationship; Innovation strategy

1. The question raised

In recent years, China's innovation level has been continuously improving, and the report of the 20th National Congress of the Party pointed out that the in-depth implementation of the "innovation-driven development strategy, opening up new fields and new tracks for development, and constantly shaping new momentum and new advantages for development." Innovation strategy is often seen as a key factor for companies to continuously improve organizational performance. In the innovation value chain, in the past, most Chinese enterprises paid more attention to the single link such as technology, products and services, less attention to the market and customers, and did not have strategic coordination, resulting in the innovation performance of Chinese enterprises has been difficult to improve. Therefore, it is urgent to pay attention to the choice of innovation strategy. In this context, it is of practical significance to explore how non-core enterprises can improve expected performance through strategic choice. The elements in the system are interdependent, interact and co-evolve, and the behavior can also affect the structure and then the result. Along this line of thinking, this paper

builds a "strategy-network relationship-performance" analysis model to empirically analyze the mechanism of how non-core enterprises improve corporate performance through strategic choice under the moderating effect of network relations, and provide references for non-core enterprises to utilize their own R&D resources, integrate external resources, and carry out R&D activities.

2. Concept definition and literature review

Based on the definition of innovation chain, enterprises that are off-center in the network and have connections with relatively few enterprises are called non-core enterprises[1]. In the collaborative innovation network, non-core enterprises have a single product and weak innovation ability, provide foundry and supporting products for core enterprises and are controlled by core enterprises, generally do not have core technology in the whole industry, and often adopt a following strategy, and often fail to pursue the maximum benefit in product pricing and output production. At the same time, its organizational characteristics exist such problems as lack of R&D funds, single structure and insufficient resources. Innovation strategy is an overall plan made by an enterprise to evaluate internal and external resources, capabilities and knowledge, analyze long-term strategic goals, and implement innovative activities to maintain competitiveness [2]. By providing new and heterogeneous products or services to the market, it can reduce the cost of trial and error under the circumstance of limited resources, and provide strategic guidance for enterprises' innovation performance[3]. Based on the research of Benner et al.[4], this paper classifies innovation strategy into breakthrough innovation strategy and progressive innovation strategy according to the new degree of product innovation inside the enterprise as the radius and the area achieved by innovation. According to the resource-based theory, the process of transforming an enterprise's knowledge source into competitiveness is a process of breakthrough innovation, which focuses on the research and development of new products with obvious technological advantages, high added value and great impact on the market [5]. The breakthrough innovation strategy has higher requirements for knowledge search, information flow and resource integration, and its product innovation is more subversive to the market. Gradual innovation has low risk and is easy to control. It tends to upgrade and transform original products[6] and has less impact on the market. It mainly implements marginal innovation of enterprise products[7], reduces innovation risks in the research and development process of non-core enterprises, and deeply cultivates the existing market position. The heterogeneity of innovation strategies between core firms and non-core firms is also determined to some extent by the differences in resource and knowledge acquisition and the close relationship between competing and cooperative firms. Enterprises need to obtain various resources through network relations, which aim to create a collaborative network, so that each component unit can effectively avoid market transaction costs while avoiding organizational costs, improve innovation ability and maintain enterprise competitiveness[7,8]. The essence of network relationship is organizational behavior, which is generally composed of three elements: nodes, connections and resources[9]. Nodes represent each innovation subject in the network, connections refer to the relationship between nodes, and resources refer to talents, technologies and knowledge needed for innovation. Nodes, connections and resources in innovation networks are characterized by network density, network strength and network centrality. Network density explains the number of innovation agents, network strength explains the interaction quality of the network innovation topic, and network centrality explains the position of innovation agents relative to the network center. Existing studies have described network relationships mainly based on the theoretical framework of structural embeddedness and relational embeddedness. Relational embeddedness believes that connections between enterprises can trigger the possibility of future cooperation, while structural

embeddedness believes that connections between enterprises can encourage the formation of connections with partners[10]. In the innovation network, non-core enterprises cannot find the basis for strategy formulation from themselves, so they need to seek cooperation from external networks to cope with the high-dimensional attack of core enterprises, and they must constantly carry out product and service innovation to bring sustainable competitive advantages. It is necessary to plan the long-term and short-term strategic problems of enterprises with the help of network relations to achieve the goal of improving the competitiveness of enterprises. We should not only face the external market competition environment, but also consider the rationality of the network internal strategy.

Therefore, how to effectively choose and formulate strategies is a prerequisite for the healthy development of non-core enterprises. However, there are few researches on the innovation strategy of non-core enterprises, especially on the matching of network relationship with different strategic needs of non-core enterprises. The existing researches have not fully explored the types of network relationship and innovation strategy in different situations.

In view of this, the marginal contribution of this paper is as follows: In theory, firstly, the network density, network strength and network centrality in network relations are quantitatively analyzed; Secondly, according to the degree of innovation, the strategy is divided into breakthrough innovation strategy and progressive innovation strategy. Thirdly, the influence of different innovation strategies on technological innovation performance is studied. Finally, we integrate the analysis process and compare which innovation strategy non-core enterprises choose can achieve better overall performance under the moderating effect of network relationship. To a certain extent, the strategy choice of non-core enterprises in the network relationship is enriched, and the relevant scholars in this field are provided with theoretical and practical reference and reference.

3. Literature review

Technological innovation performance, which measures the effect and cost of an enterprise's investment in technological innovation[10], is the most easily quantifiable factor in cooperative innovation. At the same time, it is also a manifestation of innovation performance. Most of the current literature on technological innovation performance directly uses innovation performance as an index to evaluate enterprise innovation behavior, and most studies start from enterprise innovation performance and financial performance at the individual level, and cannot systematically evaluate industrial innovation performance in the network[11]. As an organization connecting various innovation entities, network relationship constantly carries out cooperative research and development, knowledge flow and information exchange[12]. Most scholars believe that the relationship between network relationship and innovation performance may be linear or positive. Based on the perspective of network evolution, geographical proximity, technological proximity and organizational proximity have a positive impact on cooperative innovation performance in different stages of the evolution of cooperative innovation networks, and innovation openness plays a moderating role [13]. The synergy of big data application technology resources and analysis ability has a positive and significant impact on supply chain cooperative innovation performance. Market responsiveness has mediating effect in the synergistic influence of big data application technology resources and analysis ability on supply chain cooperative innovation performance; The cognitive distance between supply chain firms has a positive moderating effect on the mediating utility of market responsiveness[14]. The relationship embeddedness in the cooperation network has a positive effect on the technological innovation performance, while the structure embeddedness has a negative effect on the technological innovation

performance. The global cohesiveness of knowledge networks has a positive moderating effect on the influence of structural embeddings on technological innovation performance, but has no moderating effect on the influence of relational embeddings on technological innovation performance. The local cohesion level of enterprise knowledge network has a positive moderating effect on the influence of relational embeddings and structural embeddings on technological innovation performance. Cooperation network embedding has a more significant impact on the technological innovation performance of enterprises in the eastern region[15].

4. Theoretical analysis and research hypothesis

4.1. Main effect: innovation strategy and technological innovation performance

The heterogeneous cooperative network structure formed by non-core enterprises is difficult to obtain asymmetric information and easy to cause information redundancy, which is precisely the strategic disadvantage of non-core enterprises in individual actions. Breakthrough innovation strategy and progressive innovation strategy have different characteristics because of their different positions in the network. The breakthrough innovation strategy is to abandon the technology, business model and customer group that the industry is pursuing, and find a new way to use new technology to provide potential demand for users and the market, and use new business models to more effectively use resources and serve customers more effectively. The progressive innovation strategy is to upgrade the current products or services through in-depth understanding of the consumption preferences of the existing customer groups, better maintain the old customer groups, meet their changing needs, further expand the existing customer groups, dig deep into the consumer needs of new customer groups, ensure the existing market share, and strive to increase market share. Existing studies regard innovation strategy as a whole behavior, ignoring the heterogeneity between them. Few scholars have proposed the effects of different dimensions of innovation strategy on enterprise innovation performance from the perspective of networking. Therefore, the following hypothesis is proposed in this study:

a) Breakthrough innovation strategy has a positive effect on technological innovation performance.

b) Progressive innovation strategy has a positive effect on technological innovation performance.

4.2. The moderating effect of network relationship

4.2.1. The regulating effect of network density

Network density refers to the overall level of various interactions among all members of a network, that is, the density of connections between organizations, which represents the number of relationships in the network and the range and speed of information diffusion[16]. High-density networks will generate many member connections, and enterprises will easily generate more trust relationships and common norms among themselves, accelerate the flow of heterogeneous information and knowledge among them, and promote the improvement of enterprise organizational innovation ability. When a social network has a high network density, there are more connections among its members, and each member has a higher degree of interaction. It is beneficial to the generation of information and communication, and helps to promote the improvement of cooperative innovation performance. Conversely, low network density means that there is little interaction between members, which is detrimental to the operation of the network and its results. Breakthrough innovation strategy and progressive innovation strategy are two kinds of resource allocation and recombination methods. The breakthrough innovation strategy has higher requirements on knowledge search, information flow and resource integration, while the progressive innovation strategy has more strict restrictions on risk control and resource utilization.

Without distinguishing between the two strategies, it is impossible to clearly distinguish the different effects of network relations. When the network is in the open state, the innovation strategy will be adjusted accordingly as the network density changes. Therefore, the following hypothesis is proposed in this study:

a) Network density positively regulates breakthrough innovation strategy and technological innovation performance.

b) Network density positively regulates progressive innovation strategy and technological innovation performance.

4.2.2. The regulating effect of network strength

Network strength refers to the closeness of the links between network subjects, which can be divided into strong links and weak links[16]. Compared with other network relationships, network strength involves more abundant content and covers more comprehensive elements. Therefore, some scholars believe that network strength is more beneficial to enterprise innovation and development than other properties. On the one hand, network strength not only plays a direct and positive role in promoting innovation performance, but also plays a positive role in promoting innovation performance through knowledge acquisition and utilization[17]. Strong connection helps to enhance trust among network members, share heterogeneous information through trust, and reduce innovation costs caused by information asymmetry. Innovation requires access to various heterogeneous resources other than its own resources, and the advantages of network strength will be fully reflected by connecting external resources to facilitate non-core enterprises. In the network, the role played by strong connection can not be ignored, because strong connection means that members can trust each other and interact frequently for a long time, and the level of commitment and reciprocity is relatively high, which is very beneficial for individuals to obtain scarce tacit knowledge and conduct deep cooperation with other individuals. Individuals are able to deal with risk more effectively. Therefore, the following hypothesis is proposed in this study:

a) Network strength positively regulates breakthrough innovation strategy and technological innovation performance.

b) Network strength positively regulates progressive innovation strategy and technological innovation performance.

5. Research design

5.1. Variable measurement

5.1.1. Innovation strategy

Referring to the discussion of innovation strategy by Atuahene(2005) and Sun Yongfeng et al.(2007), the enterprise innovation strategy is divided into breakthrough innovation strategy and progressive innovation strategy. Three items are used to measure breakthrough innovation strategy, and four items are used to measure progressive innovation strategy.

5.1.2. Technological innovation performance(TIP)

Take technological innovation performance as the dependent variable of innovation strategy for model test, refer to the scale proposed by Yin Junjie and Shao Yunfei (2018), and adopt four items to measure technological innovation performance.

5.1.3. Network relationship

(1) Network density (ND) : Three items are selected to measure the communication and cooperation density between the object enterprise and local enterprises, and between upstream and downstream enterprises and non-scientific research institutions. (2) Network strength (NS) : Referring to the idea and definition of item design of the application et al. (2015), three items are selected to measure the cooperation between the object enterprises, major partners, industry associations and other institutions and government agencies at all levels as a frequency.

6. Control variables

6.1. Sample source

Based on the hypothesis of the model study in this paper, it is estimated that the sample size required for the study is 450 questionnaires, and the estimated questionnaire recovery rate is 50%.

Table 1. Basic sample information.

Characteristics	Category Frequency Percentage	Category Frequency Percentage	Category Frequency Percentage
Nature of enterprise	State-owned enterprise	30	12.7%
	Private enterprise	152	64.1%
	other	55	23.2%
R & D	Less than 3%	66	27.8%
	3%-10%	163	68.8%
	10%-15%	8	3.4%
Number of R & D personnel	10 persons or less	107	45.1%
	11-30 persons	51	21.5%
	30-50 persons	79	33.4%
Whether there is a partner	is	237	100%
	no	0	0
Duration of cooperation	Less than 3 years	76	32.1%
	3-5 years	59	24.9%
	More than 5 years	102	4%
Provincial Industry Ranking	5-10 persons	93	39.2%
	11-50	66	27.8%
	50 +	78	32.9%

7. Empirical Analysis

7.1. Reliability and validity test

Use Cronbach's Alpha coefficient values were used to test the reliability of the questionnaire, and the results were all greater than 0. 7, the combined reliability CR was all greater than 0. 7. It shows that the reliability of the questionnaire is good and the internal consistency of each construct is high. The factor load of each variable item is greater than 0. 7. It indicates that the measurement item has high convergence validity. The discriminatory validity AVE values were all greater than 0. 4, and the square root value of each factor AVE is higher than the correlation coefficient between this factor and other factors, which indicates that the discriminant validity is higher.

Table 2. Reliability and Confirmatory Factor Analysis (CFA) results of each scale.

Variable	KMO	Factor loading	Cronbach's α	CR	AVE
BIS	0.678	0.674	0.802	0.813	0.790
PIS	0.840	0.665	0.890	0.886	0.660
ND	0.690	0.548	0.744	0.726	0.469
NS	0.668	0.775	0.710	0.723	0.467
TIP	0.784	0.545	0.894	0.897	0.685

8. Relevance analysis

From Table 3, the correlation coefficient matrix shows that there are two correlations among breakthrough innovation strategy, progressive innovation strategy, network relationship and technological innovation performance. And the correlation coefficients are all less than the critical value, which indicates that there is no multiple collinearity problem.

Table 3. Correlation analysis results.

Items	Years	Nature	Industry	Size	RD	BIS	PIS	ND	NS	NC	TIP
Years	-0.158*										
Nature	0.232**	0.055									
Industry	0.363***	-0.096	0.064								
Size	0.200**	-0.019	-0.009	0.096							
RD	0.173*	-0.022	-0.123	-0.068	0.042	0.889					
BIS	0.069	-0.013	-0.106	-0019*	0.199**	0.729***	0.813***				
PIS	0.061*	-0.003	-0.059	0.089	-0.068	0.413***	0.313**	0.685			
ND	0.013	0.029	0.015	-0.047	0.062	0.459***	0.442***	0.643	0.684		
NS	0.170*	0.086	-0.031	0.037*	0.186**	0.535***	0.494***	0.561	0.560	0.805	
TIP	-0.099	0.058	-0.008	0.114	0226**	0.303***	0.362***	0.425	0.489	0.565	0.825

Note: The values on the diagonal are variance expansion factors. Indicated significant at 10%, 5%, and 1% levels, respectively. The same below.

8.1. Analysis of regression results

8.1.1. Main effect

In the innovation strategy and technology innovation performance hypothesis. H1 proposes that breakthrough innovation strategy has a positive correlation with technological innovation performance; Model 1 is the regression relationship between control variables and technological innovation performance; Compared with model 2 and model 1, the data show that the adoption of breakthrough innovation strategy has a significant positive impact on enterprise innovation performance ($\beta=0.398$, $p<0.001$),H1 is supported by the data. H2 proposes that there is a positive correlation between progressive innovation strategy and technological innovation performance. Model9 is the regression relationship between control variables and technological innovation strategy. Compared with model 9, model 10 shows that progressive innovation strategy has a significant positive impact on technological innovation strategy ($\beta=0.581$,$p<0.001$),H2 is supported by the data. Hypothesis H1 and hypothesis H2 are valid, indicating that different innovation strategy types have positive and significant correlation with technological innovation performance. In order to further explore the influence of enterprise technological innovation performance, model 1 ($\beta=0.428$, $p<0.001$) and model 9 ($\beta=0.253$, $p<0.001$) were compared.

It is found that before innovation strategy is adopted, R&D intensity has obvious effect on technological innovation strategy of enterprises.Positive promoting effect. After innovation strategy is adopted, R&D intensity in model 2 and model 10 still has a positive impact on technological innovation strategy, but progressive innovation strategy (β=0.581, $p<0.001$) has a more significant impact on technological innovation performance than breakthrough innovation strategy (β=0.398, $p<0.001$). At the same time, the R&D intensity under the progressive innovation strategy (β=0.321, $p<0.001$) was lower than that under the breakthrough innovation strategy (β=0.399, $p<0.001$). From this analysis, it is found that there is a more profound internal relationship between innovation strategy and technological innovation performance, and it also puts forward requirements for further research.

9. Regulating effect

9.1. The regulating effect of network density

In terms of the moderating effect of network density on innovation strategy and technological innovation performance, model 2 shows the positive effect of breakthrough innovation strategy on technological innovation performance, and model 3 adds the moderating variable network density on the basis of model 2. Network density showed a positive modulating effect on breakthrough innovation strategy and technological innovation performance (β=0.139,$p<0.01$). Model 4 added the product of interaction term network density and breakthrough innovation strategy on the basis of model 3. The interaction term showed a significant positive moderating effect on breakthrough innovation strategy and technological innovation performance (β=0.164,$p<0.01$). The comparison between model 4 and model 3 further proved that network density positively moderated the relationship between breakthrough innovation strategy and technological innovation performance, and Ha1 was supported by data. Ha2 proposes that network density positively regulates the relationship between progressive innovation strategy and technological innovation performance. Model 10 shows the positive effect of progressive innovation on technological innovation performance, and model 11 is based on model 10 by adding regulatory variable network density. Network density showed a significant positive moderating effect between progressive innovation strategy and technological innovation performance (β=0.131,$p<0.05$). Model 12 added the product of interaction term network density and progressive innovation strategy on the basis of model 11. The interaction term showed a positive moderating effect on progressive innovation strategy and technological innovation performance (β=0.136,$p<0.05$). The comparison between model 12 and model 10 further proved that network density positively moderated the relationship between progressive innovation strategy and technological innovation performance, and Ha2 was supported by the data. Hypothesis Ha1 and hypothesis Ha2 are valid, but comparing the interaction terms of breakthrough innovation strategy and network density in model 4 with the β coefficients of progressive innovation strategy and network density in model 12, it can be proved that network density has a positive moderating effect on the types of innovation strategy choice. However, the moderating effect on breakthrough innovation strategy (β=0.164, $p<0.05$) was more significant than that on progressive innovation strategy (β=0.136,$p<0.05$).

9.2. The regulating effect of network strength

Model 2 shows the positive effect of breakthrough innovation strategy on technological innovation performance, and Model 5 adds the moderating variable network strength on the basis of model 2, which shows the positive moderating effect of network strength on breakthrough innovation strategy and technological

innovation performance (β=0.237, p<0.001), Model 6 added the product of network strength and breakthrough innovation strategy on the basis of model 5, and the interaction term showed a significant positive moderating effect on breakthrough innovation strategy and technological innovation performance (β=0.144, p<0.05). The comparison between model 6 and model 5 further proves that network strength positively regulates the relationship between breakthrough innovation strategy and technological innovation performance, and Hb1 is supported by the data. Hb2 proposes that network strength positively regulates the relationship between progressive innovation strategy and technological innovation performance. Model 9 shows the positive effect of progressive innovation strategy on technological innovation performance, and model 13 adds the moderating variable network strength on the basis of model 9, which shows the positive moderating effect of network strength on breakthrough innovation strategy and technological innovation performance (β=0.173, p<0.05). The interaction term was added to model 14 on the basis of model 13. The interaction term showed a significant positive moderating effect on the progressive innovation strategy and technological innovation performance (β=0.118, p<0.1). Based on model 13, Model 14 further proves the significant effect of network strength positively regulating progressive innovation strategy and technological innovation performance, and Hb2 is supported by data. Assuming that Hb1 and Hb2 are verified at the same time, it is proved that network strength has a positive impact on innovation strategy and enterprise technological innovation performance, but the relationship between network strength and breakthrough innovation strategy and cooperative innovation (β=0.144, p<0.05) is significantly better than that between progressive innovation and cooperative innovation in terms of reliability and influence degree.

Table 4. Test results of breakthrough innovation strategy, network relationship and technology innovation performance relationship model (N=237).

	Dependent variables							
Control variables	**Model9**	**Model10**	**Model11**	**Model12**	**Model13**	**Model14**	**Model15**	**Model6**
Industry	-0.040	0.010	0.028	0.020	0.008	0.017	-0.023	-0.01
Years	-0.095	-0.078	-0.112	-0.099	-0.117	-0.105	-0.020	-0.019
RD	0.428***	0.399***	0.454***	0.434***	0.42***	0.407***	0.318***	0.304***
Size	0.005	0.029	0.037	0.027	0.061	0.070	0.004	0.016
Independent variables								
BIS		0.398***	0.337***	0.351***	0.301***	0.306***	0.177**	0.187**
Moderator variables								
ND			0.139**					
NS					0.237***			
BIS*ND				0.164**				
BIS*NS						0.144**		
R^2	0.188	0.342	0.368	0.394	0.401	0.420	0.503	0.518
Adjusted R^2	0.171	0.325	0.347	0.371	0.381	0.399	0.486	0.500
f-number	10.702***	19.965***	17.726***	17.251***	20.354***	19.224***	31.039***	28.730***

Table 5. Test results of progressive innovation strategy, network relationship and technology innovation performance relationship model (N=237).

	Dependent variables							
Control variables	**Model1**	**Model2**	**Model3**	**Model4**	**Model5**	**Model6**	**Model7**	**Model8**
Industry	-0.024	0.042	0.054	0.048	0.048	0.034	0.013	0.020
Years	-0.115	-0.114	-0.127*	-0.2	-0.127*	-0.111	-0.039	-0.039
RD	0.253***	0.321***	0.347***	0.325***	0.324***	0.302***	0.254***	0.244***
Size	0.129	0.050	0.031	0.032	0.049	0.050	0.007	0.012
Independent variables								
PIS		0.581***	0.543***	0.549***	0.516***	0.519***	0.430***	0.444***
Moderator variables								
ND			0.131**	0.146**				
NS					0.173**	0.171**		
PIS*ND				0.136**				
PIS*NS						0.118*		
R^2	0.098	0.515	0.529	0.546	0.542	0.555	0.622	0.625
Adjusted R^2	0.079	0.502	0.513	0.529	0.527	0.538	0.610	0.611
f-number	5.041***	38.288***	34.117***	31.899***	35.918***	33.057***	50.511***	44.582***

10. Research Conclusions

In this paper, innovation strategy, network relationship and technological innovation performance are integrated into the same research framework, and based on embeddedness theory and contingency theory, reasonable suggestions are put forward for non-core firms to choose innovation strategy under different network relationships. The research conclusion is conducive to non-core enterprises in different network relationships, combined with the resource endowment of enterprises, to choose the strategy suitable for the current enterprise innovation and development, and provide a path for non-core enterprises to effectively improve the strategic choice of technological innovation performance.

The research shows that the types of innovation strategy have a positive effect on the technological performance of enterprises. The choice of the type of innovation strategy belongs to the internal selection of the enterprise, but the internal industrial network relationship is affected by the technology and management system of the enterprise network members, and the external network relationship is interfered by competitors in related industries, upstream and downstream enterprises and other rivals or partners. Therefore, the development of enterprise innovation strategy will take into account all the influencing factors to minimize the innovation risk.

Network density has a significant positive moderating effect on innovation strategy type and cooperative innovation strategy, and breakthrough innovation strategy has a greater moderating effect on technological innovation performance than progressive innovation strategy. The complexity of innovation activities determines the choice of innovation strategy, which needs to consider both internal resources and available resources floating around the enterprise. In the process of information exchange among network members, enterprises can better obtain useful information about the information flow of cooperative innovation, and they can constantly extract the unknown information of their own enterprises in the communication process, so as to apply it to the innovation strategy choice of enterprises, so as to improve the performance of technological innovation. Due to the different management systems, organizational structures and other corporate characteristics of enterprises, in the process of knowledge flow, it is easy to cause the redundancy of management knowledge of

non-core enterprises, waste the time of knowledge selection of non-core enterprises, and further cause the poor performance of technological innovation caused by the innovation strategy selection of non-core enterprises.

The network strength of non-core firms positively moderates the relationship between innovation strategy and technological innovation performance, and has a more significant moderating effect on the relationship between breakthrough innovation strategy and technological innovation performance. The greater the network strength, the greater the contact range and frequency between network partners, which is conducive to the diversified information and knowledge flow of innovation. Breakthrough innovation needs to be carried out within a short period of time, and has high requirements for enterprise technology accumulation and technology upgrading. Greater network density is more favorable to enterprise technology accumulation, and it is easy to play a positive regulating role between innovation strategy and technological innovation performance. Therefore, when enterprises have high network strength, non-core enterprises should choose a breakthrough innovation strategy.

10.1. Management inspiration

Innovation activities of non-core enterprises belong to economic behavior and are social relations embedded in the social network and subject to dynamic changes. The close social relationship network is the social basis for the survival and development of non-core enterprises. Through the strength of the network, the interaction frequency between members is improved, so as to promote the flow of knowledge among the networks, and the dominant position of enterprises in the network is enhanced through the centrality of the network, so as to obtain more ways to actively search for information and resources. Through network density, enterprises can enhance their influence in the network, acquire tacit knowledge, attract more potential partners to actively cooperate, accelerate the commercialization process of research and development results, and help new enterprises achieve their expected performance goals. Network density, network strength and network centrality play a certain role in regulating the relationship between innovation strategy and technological innovation performance, affecting the information flow rate, knowledge acquisition mode and communication and cooperation frequency among network members. Non-core enterprises can adjust the network characteristics of their own networks in an uncertain environment and constantly adapt to its development. Network density has a significant moderating effect on innovation strategy and technological innovation performance. In the stage of industrial technology upgrading, non-core enterprises need to strengthen corporate relationship capital investment; in the stage of corporate expansion, non-core enterprises need to further expand internal governance efforts and relatively reduce the cost of maintaining external relationships. Network strength has a significant moderating effect on the performance of progressive innovation and technological innovation. Non-core enterprises lack various resource endowments and do not have the technology, knowledge and talent reserves required to undertake disruptive innovation. Therefore, they need to strengthen technical and management cooperation with upstream and downstream enterprises, governments and research institutes, constantly integrate explicit knowledge and tap tacit knowledge. Network centrality has a significant moderating effect on the performance of breakthrough innovation and technological innovation. Innovation network is always changing, and when non-core enterprises are in the center of the network, they often do not have the capital to occupy the rich structural holes for a long time. In order to give full play to the network advantages of the central position of the network, non-core enterprises need to quickly integrate various resources, upgrade technologies and optimize management skills. Rapid innovation strategic layout. Non-core enterprises in the network exist in different states, so survival forces

them to make full use of network relations to make long-term layout for development.

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