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Studying on the Relationship Between Innovation Network Routines and Enterprise Innovation Performance—— The Mediating Effect of Trust and Commitment

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ABSTRACT
This article analyzed the impact mechanisms of different dimensions of network routines on enterprise's innovation performance through the survey to 291 sample enterprises of China. Findings show that: in innovation networks, cooperative innovation behavior agreement has an inverted U impact on enterprise's innovation performance. Innovation network specification consensus has a positive impact on enterprise's innovation performance. Trust plays partial mediating role in the relationship between innovation network routines and enterprise's innovation performance. Relationship commitment plays the partial mediating role in the relationship between innovation network routines and enterprise's innovation performance.
Keywords: *Innovation Network, Network Routines, Trust, Commitment, Enterprise Innovation Performance*

1. INTRODUCTION

The influence of network routines on enterprise innovation performance has gradually attracted the attention of scholars. Witt [1] believed that routines have the function of coordination and stimulation of knowledge interaction in the organization. Sun & Song [2] believed that the relationship between network routines and the stability of network is positive correlation. Further Chang & Dang[3]pointed out that technological innovation network routines affect the stability of relationships between organizations through inter-organization trust. Trust and commitment have always been the scholars' attention focus as the two key variables for establishing and maintaining cooperative relationships among members of the innovation network. The trust between enterprises strengthens their relationship, which helps to improve the performance of partner enterprises. The commitment has a significant positive effect on the stability of the relationship between partners and enterprise performance. At the same time, scholars have found that network routines are an important antecedent variable for trust and commitment among enterprises. For example, Chang & Dang[3] pointed out that technological innovation network routines effect the inter-organization trust. Hagedoorn & Frankort [4] believed that network routines increase inter-subject commitments by interacting with partners repeatedly.

Overviewing existing researches, there are also the following deficiencies: Although scholars have concerned about the impact of network routines on the trust and commitment among organizations, and have recognized the pivotal role of the trust and commitment among organizations in improving enterprise innovation performance, it is still rare to include network routines, trust and commitment, and enterprise innovation performance in a framework for research. Based on the above deficiencies, this paper introduces trust and commitment among organizations to explore their roles in the relationship between network practices and innovation performance.

2. THEORY AND ASSUMPTION

2.1. Network routines and enterprise innovation performance

According to the definition and dimensions of Dang & Sun [5] for innovation network routines, this paper divides the innovation network routines into two

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component dimensions: cooperative innovation behavior agreement and innovation network specification consensus.

First of all, the stable behavior brought about by higher level of cooperative innovation behavior agreement enhances the predictability of organizations, thereby facilitating the coordination with each other and increasing the enterprises innovation performance. However, the lower level of cooperative innovation behavior agreement between enterprises will affect to discern and recognition of knowledge sources, and then will affect the smooth transfer of knowledge. When the cooperative innovation behavior between enterprises is over-consistent, it will prevent the enterprise from acting independently and exerting creativity, thus reducing the ability of the partners to solve challenging problems. Both are not conducive to the improvement of enterprise innovation performance.

Secondly, a higher level of innovation network specification consensus means that the enterprise has a common understanding of the partners' expertise. Thus the relationship between partners is promoted to improve innovation performance. However, when the accumulation of knowledge exceeds a certain level, it will make the mode of thinking among the partners over-consistent. Thereby reducing the ability of enterprises to think independently, which is not conducive to enterprise innovation[6]. Therefore, there is following assumption:

H1a: Cooperative innovation behavior agreement between organizations and the enterprise innovation performance is an inverted U-shaped relationship.

H1b: The relationship between innovation network specification consensus and enterprise innovation performance is inverted U-shaped.

2.2. The mediating effect of trust

Firstly, the trust between innovation network members is an important pre-causal variable of the enterprise innovation performance. Mutual trust partners are very willing to share knowledge and other resources accurately and timely [7]. Based on these shared knowledge, companies can innovate products in real time to improve their innovation performance. However, too high levels of trust between partners may lead to collective blindness and restrict the exchange and combination of knowledge. Therefore, it is not conducive to the improvement of enterprise innovation performance.

Secondly, among the factors affecting the trust between enterprises, behavior agreement between enterprises and innovation network specification consensus play an important role. The lower level of innovation behavior agreement causes employees to have differences in organizational skills and coordination relationships [8]. The inconsistent behavior may enables enterprises to reduce their interaction with partners and pursue their own interests, thereby reducing the level of trust between enterprises. Innovation network specification consensus is conducive to the enhancement of the member enterprises' understanding of the tasks roles and their relationships. This makes information more effectively delivered, so that it can better predict the behavior of partners and make mutual trust increased. Based on this, there are the following assumptions:

H2a: Trust plays an mediating role in the relationship between cooperative innovation behavior agreement and enterprise innovation performance.

H2b: Trust plays an mediating role in the relationship between innovation network specification consensus agreement and enterprise innovation performance.

2.3. The mediating effect of commitment

First of all, in the innovation network, relationship commitment between enterprises is another important variable that affects enterprise innovation performance. When the level of commitment among member enterprises in the innovation network is increased, the cooperative enterprises are more willing to achieve complementary advantages through knowledge exchange, and improve the enterprise's innovation performance.

Secondly, behavior agreement between enterprises and innovation network specification consensus are important factors affecting the relationship commitment. The high cooperation innovation behavior agreement among enterprises strengthens the positive expectations of the partners' successful exchange in the future and the relationship commitment between enterprises. The high level of innovation network specification consensus makes enterprises unwilling to give up their current partners. Enterprises will develop cooperative relations based on the principle of reciprocity and mutual benefit for common responsibility and interests. This will increase the satisfaction of the relationship and the willingness to continue the relationship, thus increasing the commitment to the partnership. Therefore, there are following assumptions:

H3a: Commitment plays a mediating role in the relationship between cooperative innovation behavior agreement and enterprise innovation performance.

H3b: Commitment plays a mediating role in the relationship between innovation network specification consensus agreement and enterprise innovation performance.

3. RESEARCH METHODS

3.1. Samples and data collection

This article focuses on enterprises in the electronic information and biopharmaceutical industries. This

article used the way of snowballing to form an innovation network of 450 enterprises of China based on 15 enterprises such as ZTE firstly. Then select 300 of them as samples. The survey was conducted from March 2016 to November 2017. Questionnaires to enterprises were sent by the means of direct visits and emails mainly. Questionnaires were mainly filled by high-level technology managers from various enterprises to ensure the effectiveness of the survey. And in the survey they were assured that the answers would be handled anonymously. Through the method of Email, 170 questionnaires were distributed and 89 valid samples were recovered, with an efficiency of 52.4%. A total of 350 paper questionnaires were distributed and 202 valid questionnaires were returned. The effective recovery rate was 57.7%. The final total effective questionnaire survey involved 291 sample enterprises of China, accounting for 56.0% of the total sample.

3.2. Questionnaire design

In order to ensure the validity and reliability of the measurement tools, this article made appropriate modifications to the mature scales from previous researchers. After adjusting the questionnaire based on the opinions of relevant experts, the questionnaire was formally distributed. This article used Likert's 5-point scoring method to measure variables (1 for 'completely disagree', 5 for 'strongly agree'). Due to space limitations, the specific variable scale will not be shown in detail here.

4. EMPIRICAL TEST

4.1. Data quality evaluation

Among the 291 questionnaires collected, the majority of the enterprises with the establishment years of 6-10 years and 11-15 years account for 36.8% and 26.1% of the valid questionnaires. In terms of enterprise size, enterprises with 201-500 employees and 501-1000 employees account for the majority, representing 39.3.3% and 19.7% of the effective samples. In terms of industry distribution, electronic information and precision instrument manufacturing accounted for 45.7% and 22.3% of the total valid questionnaires respectively.

4.2. Test of the scale reliability and validity

This article randomly selects 100 data from valid samples for reliability and validity analysis. The results showed that the Cronbach's α coefficient and KMO value of the related variables reached the standard.

4.3. Regression analysis

Before the hypothesis verification, correlation analysis was performed on each relevant variable to initially analyze the relationship between the variables.

This article used a three-step intermediate regression analysis to test whether trust and commitment play intermediary role in the relationship between network routines and enterprise innovation performance. The results of the regression analysis are shown in Table 1.We can see that after eliminating the influence of control variables, cooperative innovation behavior agreement and innovation network specification consensus both have significant positive effects on trust (β=0.252,p<0.01; β=0.264,p<0.01) (see M2). Cooperative innovation behavior agreement and innovation network specification consensus both have significant positive effects on commitment (β=0.164,p<0.01;β=0.155,p<0.01) (see M4). Cooperative innovation behavior agreement has no significant effect on the enterprise innovation performance (β=0.072,p>0.1)(see M6).Innovation network specification consensus has a significant positive effect on the enterprise innovation performance (β=0.264, p<0.01) (see M6).

Table 1 Results of multi-factor regression analysis of enterprise innovation performance.

Variables	Trust		Commitment		Enterprise innovation performance						
	M1	*M2*	*M3*	*M4*	*M5*	*M6*	*M7*	*M8*	*M9*	*M10*	*M11*
Enterprise size	0.173** (0.105)	0.172** (0.103)	0.183** (0.130)	0.186*** (0.131)	0.207*** (0.071)	0.163*** (0.071)	0.183*** (0.071)	0.128** (0.066)	0.081 (0.065)	0.067 (0.069)	0.065 (0.064)
Enterprise establishment years	0.016 (0.044)	0.005 (0.042)	0.098 (0.055)	0.091 (0.054)	0.175** (0.030)	0.169** (0.029)	0.147** (0.029)	0.135** (0.027)	0.146** (0.027)	0.153** (0.028)	0.112* (0.026)
Enterprise ownership form	-0.169** (0.031)	-0.134* (0.029)	-0.183** (0.038)	-0.162** (0.038)	-0.182** (0.021)	-0.150** (0.020)	-0.167** (0.021)	-0.103 (0.019)	-0.097 (0.019)	-0.124*** (0.020)	-0.074 (0.019)
Cooperative innovation behavior agreement		0.252*** (0.041)		0.164*** (0.052)		0.072 (0.028)					
Innovation network specification consensus		0.264*** (0.053)		0.155*** (0.068)		0.264*** (0.037)				0.193*** (0.036)	0.183*** (0.033)

Square of cooperative innovation behavior agreement							-0.205*** (0.029)			-0.147*** (0.026)	-0.191*** (0.024)
Square of innovation network specification consensus							-0.086 (0.028)				
Trust								0.017 (0.037)			
Commitment								0.411*** (0.030)	0.406*** (0.029)		0.373*** (0.029)
Square of trust									-0.201*** (0.013)	-0.217*** (0.014)	
R^2	0.025	0.141	0.033	0.077	0.057	0.126	0.120	0.223	0.261	0.207	0.296
AR^2	0.015	0.126	0.023	0.061	0.047	0.110	0.104	0.209	0.248	0.191	0.281
F	2.423	9.360	3.250	4.769	5.778	8.189	7.736	16.344	20.113	12.377	19.906

Note: * indicates P<0.1, ** indicates P<0.05, *** indicates P<0.01.

When the square term of independent variable cooperative innovation behavior agreement and the square term of independent variable of innovation network specification consensus are introduced, the square term of cooperative innovation behavior agreement has a significant negative impact on enterprise innovation performance (β=-0.205,p<0.01) (see M7), therefore, H1a passes the verification. However, the square term of innovation network specification consensus has no significant effect on the enterprise innovation performance (β=-0.086, p>0.1) (see M7), so H1b has not passed verification.

When the impact of the control variables are excluded, after the mediating variable trust and commitment are introduced (see M8), the impact of trust on enterprise innovation performance is not significant (β=0.017, p>0.1). But the commitment has a significant positive effect on enterprise innovation performance (β=0.411, p<0.01). When the square term of trust is introduced, it can be seen that there is a significant negative relationship between the square term of trust and enterprise innovation performance (β=-0.201, p<0.01) (see M9). When simultaneously examining the square term of the mediating variables trust, independent variables cooperative innovation behavior agreement and innovation network specification consensus, the square term of trust has a significant negative effect on enterprise innovation performance (β=-0.217, p<0.01). The impacts of the square term of the cooperative innovation behavior agreement and innovation network specification consensus on enterprise innovation performance are both significantly weakened (see M10). This shows that trust has a partial mediating effect between cooperative innovation behavior agreement and enterprise innovation performance. And trust has a partial mediating effect between innovation network specification consensus and enterprise innovation performance. Therefore, H2a, H2b pass validation.

When we examine the mediating variable commitment, independent variables cooperative innovation behavior agreement and innovation network specification consensus simultaneously, the result shows that commitment has significant positive impact on enterprise innovation performance (β=0.373, p<0.01). The impacts of the cooperative innovation behavior agreement and innovation network specification consensus on enterprise innovation performance are both significantly weakened (see M11). This shows that commitment plays a partial mediating role in the relationship between cooperative innovation behavior agreement and enterprise innovation performance. And commitment plays a partial mediating role in the relationship between cooperative innovation behavior agreement and enterprise innovation performance. Therefore, H3a, H3b pass the verification.

5. CONCLUSION

This article attempts to study the influence of network routines on enterprise innovation performance. Through the empirical test of the survey data of Chinese enterprises, the following conclusions are drawn： in innovation networks, cooperative innovation behavior agreement has an inverted U impact on enterprise's innovation performance. Innovation network specification consensus has a positive impact on enterprise's innovation performance. Inter-organizational trust has partial mediation role in the relationship between innovation network routines and enterprise's innovation performance; Inter-organizational commitment has partial mediation role in the relationship between innovation network routines and enterprise's innovation performance.

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