IACEED2010

Analysis of Influence of Network Structure, Knowledge Stock and Absorptive Capacity on Network Innovation Achievements

Xie Yongping[a,b*], Mao Yanzheng[a], Zhang Haomiao[a]

[a]*School of Economy and Management, Xidian Univercity,China,710071*
[b]*School of Economy and Management, Xi'an University of Technology,China,710048*

Abstract

In the increasingly fierce competition and increasingly volatile environment today, the important position of innovation has been widely accepted by theorists and business enterprise resources. Based on the domestic and foreign relevant research, we discusses the influence of network structure, knowledge stock and absorptive capacity on the network innovation achievements, constructs the theoretical relation model and an empirical analysis by using 124 enterprises of Xi'an high-tech industrial parks as the object, the result of the research indicates that, the network structure and knowledge stock to absorptive capacity have a positive impact on role, and both can also influence innovation performance through absorbing ability, absorptive capacity played a certain role of intermediary; Meanwhile, the network structure and the knowledge accumulation play an directly positive promoting role to the innovation performance.

Keywords: Network structure; Knowledge stock; Absorptive capacity; Innovation performance

1. Introduction:

With the arrival of knowledge-based economy, enterprises rely more and more on the innovation and development of other enterprises or organizations, enterprises promote their innovation performance by forming innovation networks with other organizations to learn across organizations and share knowledge.

*Corresponding author. Tel.: 15029942829
E-mail address: moshangrousang123@163.com

How to improve the network innovation performance becomes scholars' and business' common concern. This paper will use network structure and the knowledge stock as the starting point to research absorptive capacity innovation performance impact.

There are theories involving network structure and knowledge accumulation to the innovation achievements influence, but theory with the relevant empirical analysis is little, the empirical research about absorptive capacity is much less. Based on the existing research results, Combining theory research and domestic condition, this paper is going to analyze the influence of the network structure, knowledge stock and absorptive capacity on innovation network performance by using empirical analysis, in order to further explore the influence of these factors to the innovation achievements.

2. Literature review

2.1 Network structure

According to the point of Hakansson (1987), this paper argues that network includes three basic elements: behavior corpus, activities of occurrence, resources. For innovation networks, behavior subject includes enterprise, government department, financial institutions, universities/research institutions and intermediary organizations, etc.; Activity is consist of the transmitting of knowledge and information between network actors, the exchange activities between enterprises, as well as the flow of information、knowledge and technology in the entire network; Resources include material resources, financial resources, human resources and knowledge resources, etc. This common factor is formed a unique network structure of innovation networks. This is a kind of dynamic balance of mesh structure.

The network structure make member enterprises communicate in a deeper and wider range. While the process of developing and establishing with external relations, Innovation networks also build internal network constantly. In this paper we measure the network structure with four indicators: network density, contact strength and stability. The higher each index, the better the network structure.

2.2 Knowledge stock or accumulation

According to the view of Luo Zhengqing and He Jinsheng (2009), knowledge stock refers to a certain stage within an organization of knowledge resources occupies total attached to the organization or system internal personnel, equipment and organizational structure of the sum of all knowledge, it is knowledge accumulate of people in life and production practice, it is a result of "learning", it reflects the ability and potential for the knowledge production of organization system, embodies the competition ability of organization system [1].Cao Xing (2009) suggests knowledge stock is specific measure knowledge stock enterprise knowledge value of a form, the stock of knowledge in a enterprise mainly includes the knowledge stock with people as carrier, with the thing as the carrier, with the organization structure as the carrier and with the market as the carrier. Among them the stock of knowledge with human carrier is the key factors of formation of enterprise technology core competence [2].

Stock of Knowledge is the result of knowledge accumulation while people living and production practice, is a result of "learning", rather than the dynamic process itself. Organization learning from outside, accessing and absorbing new knowledge constantly, the newly acquired knowledge and prior knowledge colliding within the system, thus the knowledge resources integration and reorganization to produce new knowledge and make the enterprise internal knowledge total increase.

2.3 Absorptive capacity

The concept of "absorptive capacity" is first put forward by Cohen & Levinthal.They suggest absorptive capacity is the capacity of enterprise recognition external new information value, digest the information, and use the information in commerce[3]. Mowery&Oxley (1995) think absorptive capacity is the implicit composition of introducing knowledge that enterprise processing from external, and skills required when trying to adjust these knowledge. Zahra&George (2002) defined absorptive capacity as the ability for enterprises to gain external knowledge, to acquire knowledge and to digest, transfer and apply knowledge [4].

By synthesizing scholars' understanding of absorptive capacity, we consider absorptive capacity is a series of organizational routines the enterprise identification, digestion and application of knowledge.

3. Hypothesis and model

3.1 Hypothesis

3.1.1 Network structure and innovation performance

Member enterprises of dense network are more likely to have the common behavior expectations, is more advantageous to the norms of behavior form, this kind of coordinated can promote the development of network division coordination and improve the efficiency of the decision and action (Oliver, 1996).Simsek (2003) consider good mutually beneficial relations between enterprises can promote knowledge sharing, strong links between enterprises will forms sharing attitude, belief, which promote the depth of knowledge and information communication within network, so as to enable the enterprise to identification of the change of the market rapidly[5].If members of the enterprise innovation network can establish long-term stable cooperative relations, so they can obtain information about products and market through this channel quickly. Thus can be obtained and use these information with a low cost, consequently the performance can be improved. We present hypotheses:

Hypothesis 1. The network structure is related to innovation performance in innovation networks.

3.1.2 Network structure and absorptive capacity

Bosehetal (1999) explain matrix, functional type and division type matrices and systematized, cooperative and socialization conformity ability of absorbing ability of different effects from three dimensions of the knowledge absorption efficiency, scope and flexible. Van den Bosch etc (1999) put forward enterprise organization structure and the Combinative Capabilities features can also affect the result of absorptive capacity [6]. We believe that the structure of networks can make the member enterprises to increase the chance to accept the new knowledge, thus to promote the absorption and transformation and application of knowledge. We present hypotheses:

Hypothesis 2. The network structure is related to absorption capacity in innovation networks.

3.1.3 Knowledge accumulation and absorptive capacity

Cohen&Levinthal (1990) proposed "the enterprise previous Knowledge Base" is one influencing factor of absorptive capacity [3]. Kim (1998) consider absorptive capacity is the function of prior knowledge, its prior knowledge and knowledge organize elements inside, rich prior knowledge can help the enterprises to accept, absorption and application of external knowledge [7]. The capacity for an enterprise to absorb outside information、knowledge and technology is closely related to the level of knowledge and knowledge connotation [8].

Lin Dongqing (2005) believe the accumulating of related knowledge can improve absorptive capacity, the more knowledge accumulation, the more easy to accelerate the absorption, utilization and create new knowledge [9]. We believe the stock of knowledge can promote their absorptive capacity, then the following hypothesis can put forward:

Hypothesis 3. Knowledge accumulation is related to absorptive capacity in innovation network.

3.1.4 Absorptive capacity and innovation performance

Liu and white (1997)'s empirical study show that enterprise innovation ability is originated from the synergy of investment to absorptive capacity of oneself, and new knowledge source; Tsai (2001) consider that enterprise which have higher levels of absorptive capacity often has stronger innovation ability. Besides, Chinese scholars Yu Chengyong and Shi Jianjun (2009) think enterprise absorptive capacity can strengthen their own learning and innovation ability. To sum up, the organization absorptive capacity can positive influence innovation performance, therefore we hypothesize the following:

Hypothesis 4. Absorptive capacity is related to the innovation network performance.

3.1.5 Knowledge accumulation and innovation performance

According to the research of Cao Xing and Guo Zhiling (2009), Enterprise changes of the stock of knowledge expressed by the change of vector changes that knowledge dependent on, and reflect on the enterprise's resources, power changes. Enterprise knowledge stock influence enterprise technology of core competitiveness, and promote enterprise improve innovation achievements raise[2]. We believe, the knowledge stock affects the enhancement of organization absorptive capacity and core competitiveness in innovation network, thus also plays a promoting role to the entire innovation network performance.

Hypothesis 5. Knowledge accumulation is related to the innovation achievements in innovation networks.

3.2 Hypothesized model

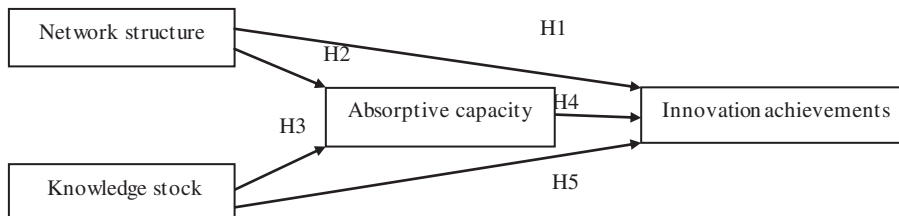We constructed the hypothesized model shown below:

Fig.1.Hypothesized model of innovation performance

3.3 Research methods

3.3.1 Samples

We designed questionnaire, and selected knowledge-intensive industries of Xi'an high-tech parks as respondents. We issued 200 formal questionnaires, received 159 valid questionnaires.

3.3.2 Sample reliability and validity

We measure these variables using a five-point Likert scale. The tool for data analyzing is SPSS 16.0 and AMOS 7.0. Cronbach 's a variable coefficient is used to test the reliability, Cronbach' s value of variables are greater than 0.788, which shows that this scale has good internal consistency.

Each item of this questionnaires are based on the domestic and foreign scholars studies questionnaire and related documents as the theoretical basis. These measures can ensure questionnaire has enough content validity.

3.4 Analysis results

Tab.1 Path coefficients and hypotheses test

Relationship between variable	Path coefficient	P	Corresponding hypotheses	Inspection results
Network structure→Innovation performance	0.345	0.043	H1	Hold
Network structure→Absorptive capacity	0.327	0.057	H2	Hold
Knowledge accumulation→Absorptive capacity	0.570***	0.000	H3	Hold
Absorptive capacity→innovation performance	0.586***	0.000	H4	Hold
Knowledge accumulation→innovation performance	0.358	0.029	H5	Hold

Note: *** means significant in the statistical level $p < 0.001$

4. Conclusion

The main conclusions of this research first is that the network structure can promote absorbing ability and the innovation achievements, an effective structure is needed for networks to improve absorptive capacity and innovation performance; the second is knowledge accumulation can promote absorptive capacity and innovation achievements. This indicates that the enterprise need to improve its quality and quantity of knowledge stock to enhance its level of absorptive capacity and innovation performance.

At the same time, we also take note of some problems to be further discussed. For example, this study samples are taken from Xi'an high-tech development zone, the data may exist one-sidedness. In the future, more research can be done in wider range to verify this model.

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