Research on the relationship between dynamic evolution of inter-firm network and the transformation of hub firm :A Theoretical Framework

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Abstract

In this paper, we focus on two antecedents of innovation performance and competitiveness of industrial cluster (a special type of inter-firm network): (1) Transformation ability of hub firm and (2) collaborative capacity of inter-firm network partners. We develop a theoretical framework that examines cluster dynamic evolution and the transformation of the hub firm in the inter-firm network. We propose that inter-firm network benefit from this two antecedents when mediated by the knowledge and resource integration in cluster.

Keywords: Dynamic evolution， inter-firm network，transformation，hub firm

1 Introduction

Industrial cluster has become a universal phenomenon in today's world economy, which plays an important role in promoting local and national economic development. Since the reform and opening up, the industrial cluster of China has made breakthroughs in developing district economy, promoting the international competitiveness of industry and so on. However, most industrial clusters of China have always been in weak position in international division of labor and stayed in low value-added link of the value chain. Yangtze River Delta and Pearl River Delta have already become the internationally recognized world manufacturing base of low and medium-grade consumption goods. What the theory and practice of Chinese industrial clusters care most is changing the weak position of Chinese industrial clusters in international division of labor, enhancing clusters' competitiveness so that to drive the competitiveness of district economy, preventing the recession of clusters and maintaining the sustainability of resources of the district industrial clusters.

Scholars have realized that resources, knowledge technology, innovation and management in the network of clusters—namely innovation activities and management inside network—is the driving power for network's sustainable

development and promotion, and they are also the main source of competitive advantage of individual owned enterprises embedded in clusters network. Scholars working on enterprise network research have research on strategic management of enterprise network and innovation management. However, they still do not know the dynamic mechanism of the interaction of network resources in cluster enterprises and network evolution. Transformation and promotion in the sustainable growth process of cluster enterprises networking and interactive mechanism relevant to network dynamic evolution are still unclear.

Before solving the problem of industrial group promotion, we have to know the micro-mechanism of cluster network dynamic evolution. Therefore, this paper will clarify several problems by scanning hub firm transformation driven by external global value chain and the interactive relationship between the collaboration of partner enterprises inside cluster network and cluster's dynamic evolution. Firstly, whether hub firm transformation and partners collaboration can strengthen cluster's ability to integrate resources to promote cluster's innovation performance and cluster's competitiveness or not. Secondly, sound interaction between them can whether be achieved or not. Thirdly, how regional industrial cluster breaks enclosed self-locking and drives the promotion of cluster network's holistic innovation ability. To obtain value chain's high-end path in global production competition is a research project needs to be solved, and it is also a key issue in this research on cluster's dynamic evolution.

2 Literature review and framework construction

2.1 Transformation capability of hub firm and the upgrade of cluster

The route of industrial clusters' development depends greatly on the design and running ability of enterprises cluster structure shown in some big enterprises, namely their network capacities. Such kind of big enterprises are often in the core location of enterprises cluster, and they can have influence on the whole network and network members by applying their network capacities. As a result, the big enterprises can be regarded as the focal firm (or core enterprises) in enterprises cluster. Hub firm is one which can create new technique and new technology in the cluster, attract researchers, investors and technicians, improve enterprise's technological innovation ability of technological innovation network, stimulate the demands for new knowledge and get external market. (Agrawal, Coekum 2002; Sehmitz, 1995; Lazerson, Lorenzoni, 1999) Roles and tasks of these enterprises in the network are heterogeneous and irreplaceable, and the heterogeneity comes from the key nodes of the network where the enterprises are located. These enterprises have capacities to design and operate larger networks which are different from that of other enterprises. (Lorenzoni, I, adenFuller, 1995; Dyer, 1996; Uzzer, 1997)

In the environment of dynamic competition, if the hub firm in cluster still sticks to its existing resource and capacity, "Core Rigidities" is very likely to happen. (Loonard Barton, 1992; Teece et al, 1997) To deal with turbulent and complex environment, enterprises shall have the abilities of integrating, constructing and reconfiguring existing functions. Dynamic transformation ability helps the hub firm in cluster to

reconfigure the internal dynamics of existing functions. In order to pursue survival and sustainable development, the enterprise adopts transformation as directional adjustment and change, which is helpful to increase competitive advantages and create market value. Therefore, enterprises need to incessantly innovate, reorganize, or even reconfigure to match the changing market and technical specifications to get survival and development. (Galuni & Eisenhardi, 2001)

Knight (2005) holds that the core competence and network embedded-ness of core enterprises are the main characteristics of hub firm, and we should pay attention to the role of hub firm in network. According to Garcia's research, hub firm can guide the direction of clusters, and they are helpful to the construction and expansion of network. The characters of core enterprises mainly include that the role of core enterprises in clusters is irreplaceable, and the responsibilities that they take are also irreplaceable. This paper holds that the transformation abilities of hub firm are important dynamic capacities of hub firm in embedded cluster network, and the transformation abilities of hub firm will have an influence on the innovation performance and competitiveness of clusters. The above arguments and supported evidence leads to the following hypothesis:

Hypothesis 1a: Transformation abilities of hub firm in cluster have positive influences on cluster's innovation achievements.

Hypothesis 1b: Transformation abilities of hub firm in cluster have positive influences on cluster's competitiveness.

2.2 Collaborative capability of cluster partners and the upgrade of cluster

Collaboration of cluster partners refers to a kind of action that leads a group of task dependency enterprise members to integrate the knowledge, actions and purposes of each other to achieve the same goal. (Malone and Crowston, 1994) Collaboration is also an important process to improve the overall efficiency. (Cohen, 1997) It ensures that cooperative enterprises are able to operate in a holistic way. (Van de Ven et al., 1976) In the process of collaboration, each enterprise member of cluster partners is responsible for a division of labor, and then they depend on the knowledge of each other. (Austin, 2003) When partners know the resources and professional knowledge owned by every cooperative enterprise very clearly, they can assign different work in the business process to the most suitable partners. Even though the distribution of work is unclear, the action of all enterprises can be predicted, so they can collaborate and cooperate with successfully. Even when there is something wrong, they can solve the problem in a more efficient way. (Moreland and Myaskovsky, 2000) In this way, the cluster alliance can obtain better performance and decision quality. (Rulke & Galaskiewicz, 2000)

Rico et al., (2008) points that collaboration includs the two basic elements of planning and communication, and collaboration can make the cooperating team work in a steady and predictable way. To get the knowledge stored in the memory system of partner enterprises to build an interactive memory system, they have to know what kind of knowledge the partners possess in advance, so communication is the basic activity. (Lewis, 2003) Communication is helpful to make the partner enterprises

know about each other better, which does good to the formation of team objective and the consensus of working routine. (Patnayakuni et al., 2007) Effective communication is able to promote the holistic performance. (Hoegl & Gemuenden, 2001)

There are three reasons for partners' coordination communicating and cooperation mentality to promote the cooperative performance of partner enterprises in the cluster. First of all, after having a good understanding on the domain knowledge and resources possessed by each partner and making sure that the knowledge and resources relevant to the task of each partner being obtained, individual enterprise can develop its business scope more deeply and attentively. Second, when partner enterprises clearly knows what domain knowledge and resources they own, they can save lots of time in searching for relevant information in the process of fulfilling tasks. Thirdly, after having a consensus on the domain of each other, a partner enterprise can predict the deeds of other partners successfully, which is helpful for them to cooperate in a more collaborative and effective way. Communication and interaction among team members are good to knowing about and obtaining information knowledge and resources owned by each other. The above arguments and supported evidence leads to the following hypothesis:

Hypothesis 2a: Collaborative capacities of cluster partners have positive influences on cluster's innovation performance.

Hypothesis 2b: Collaborative capacities of cluster partners have positive influence on cluster's competitiveness.

2.3 Knowledge and resource integration capability in cluster

According to the theory of resource base, knowledge is regarded as an important resource for cluster enterprises to gain competitive advantage. The integration of knowledge and resources is not only the key point for applying cluster knowledge and resources but also the source of cluster's core capacity. (Alavi and Leidner, 2001; Carlile, 2002; Reus and Liu, 2004) The integration of cluster resources and knowledge is to combine different partner enterprises' knowledge with their resources to form new knowledge and resources. (Okhuysen and Eisenhardt, 2002; Tiwana and Mclean, 2005). While the heterogeneity of cluster resources and knowledge is the foundation of the integration of cluster knowledge and resources. One key promotion power in the process of cluster's dynamic evolution originates from the professional knowledge distributed in different partner enterprises through the integration of their knowledge and resource. (Grant, 1996b; Spender, 1996)

Alavi and Tiwana defined the integration of knowledge and resources as combining the professional knowledge possessed by each partner enterprise together to satisfy the need of knowledge and resources in particular cases. Robert et al. (2008) thought that the integration of knowledge and resources was to synthesize information and domain of each individual enterprise after the social mutualism. The process of integrating cluster knowledge with resources not only requires partner enterprises to contribute their unique knowledge and information willingly but also requires them to blend these knowledge, resources and information into the business process of their enterprises. (Reus and Liu, 2004; Robert et al., 2008) As a result, the integration of

cluster knowledge and resources is established on the basis of good relationship among partner enterprises, and it is the process of sharing and renewing knowledge and the delivering, spreading, utilizing and collaboration of complementary knowledge. (Robert et al., 2008)

In a cluster, there are various resources owned by all partner enterprises. Especially, knowledge and resources are the important basis and origin for a cluster to achieve its innovation and improve competitiveness. These resources are distributed in the network, and they are spread by continuous communication and interaction among partner enterprises. The integration of these resources can bring opportunities and promote innovation for cluster enterprises. (Dyer & Singh, 1998; Johanson & Vahlne, 2003 and so on).The above arguments and supported evidence leads to the following hypothesis:

Hypothesis 3a: Collaborative capacity of cluster partners has positive influence on the knowledge and resource integration in cluster

Hypothesis 3b: Collaborative capacity of cluster partners has positive influence on the competitiveness of cluster, and the positive influence is affected by the mediating effect of knowledge and resource integration in cluster.

Although knowledge and resources are possessed by individual enterprises (Spender and Grant, 1996), especially some implicit know-how knowledge (Alavi and Tiwana, 2002), as far as the whole cluster network is concerned, integrating the knowledge into one which is possessed by whole cluster is quite important. (Okhuysen and Eisenhardt, 2002; Tiwana and Mclean, 2005) In order to supply more competitive and perfect products and service, cluster network has to obtain and integrate the professional knowledge and resources of different domains and different partner enterprises. (Grant, 1996a) The process of cluster's dynamic evolution includes sharing, passing and spreading knowledge proposed by Carlile (2004) and integrating resources at last. The final integration process is an important process of turning cluster's potential knowledge and resources basis into innovation power, productivity and profitability. The integration of knowledge and resources inside cluster results in the formation of new competitive knowledge, helping cluster enterprises reform and respond to outer reform etc. In the meanwhile, innovation comes from the integration of diversified information. The more diversified the knowledge is, the better effects new knowledge brings. (Lawson and Lorenz, 1999)

The result of integrating resources can improve the existing ability or form new ability. (Sirmon, et al., 2007) To be specific, resources integration refers to adopting a different method, the original method, or brand-new creative method to reasonably configure the original resources of cluster enterprises or the newly obtained resources in quantity and type. The final result is to make resources get valid configuration and maximize its efficiency to bring better performance for the cluster. These theoretical argument and empirical findings provide lead to the following hypothesis.

Hypothesis 4a: Cluster knowledge and resource integration have positive influence on cluster's innovation performance.

Hypothesis 4b: cluster knowledge and resource integration have positive influence on cluster's competitiveness.

Hub firm in cluster have strong demonstration effects on small enterprises in network. Collaboration between core enterprises and other enterprises can promote the resource sharing inside network. (Langen, 2003) What's more, hub firm have the capacity to design and construct all kinds of complex connected relationship around themselves. (Lorenzoni, 1995) Cohenand Levinthal (1990) holds that core enterprises in network have more opportunities and stronger abilities to integrate resources with other organizations inside the cluster. From the aspect of technological innovation path's dependency, Cohen and levinthal (1990) think that hub firm always have advanced technological assets and ability, and they own stronger capacities to seek for and absorb new and useful knowledge. In terms of other enterprises in local cluster network, hub firm will reintegrate incessantly in accordance with their resources and strategic transformation requirements. The reintegration includes eliminating and replacing incompetent enterprises. According to the situation of integrating resources, hub firm replace subordinated firms in local network with more competent enterprises outside network, and even they outsource partial manufacturing steps. In this way, the evolution of enterprise network can be promoted. These theoretical argument and empirical findings provide lead to the following hypothesis.

Hypothesis 5a: Transformation abilities of Hub firm have positive influence on the ability of cluster network resources' inter-integration.

Hypothesis 5b: Transformation abilities of Hub firm in cluster have positive influence on cluster's innovation performance, and the positive influence is affected by the mediating effect of ability of knowledge and resource integration.

Hypothesis 5c: Transformation abilities of Hub firm in cluster have positive influence on cluster's competitiveness, and the positive influence is affected by the mediating effect of ability of knowledge and resource integration.

To sum up the above theoretical arguments and hypothesis proposed the research model of this study is as figure 1.

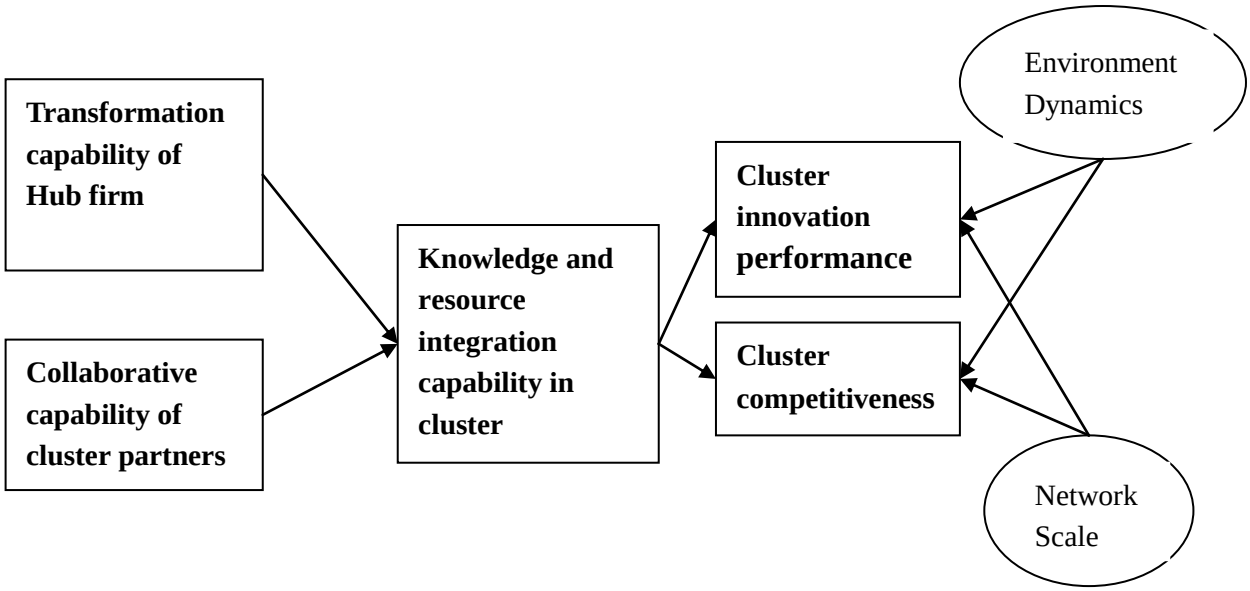

Figure 1. Research Model

3 Conclusion and Future Research

Theoretical and empirical study based on this framework will enable us to develop nuanced and in-depth arguments about how transformation of hub-firm and the collaboration of network partner may contingent enhance cluster innovation performance and competitiveness and exploit the potential benefits provided by knowledge and resource integration .We propose when the transformation of hub firm in the cluster can't benefit the cluster performance when there is no integration of knowledge and resource in the cluster. Also knowledge and resource integration can be a mediator in the relationship between collaboration of network partner and innovation performance and competitiveness of cluster.

Future research should attempt to disentangle the effects of the capabilities. Measurement about the transformation capability and collaborative capability of cluster partner and cluster innovation performance may be needed to investigate this aspect. Additionally, an empirical or qualitative research approach (e.g., a comparative case study analysis, questionnairebased data, or ethnographic study) may provide alternative ways to reveal the relationship between them.

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