Studying on the Inter-Enterprise Collaborative Models in the Innovation Cluster Influencing Factors, Pattern Types and Their Selection

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ABSTRACT

The cooperative models are influenced by three levels which are individuals level involving behavioral path, intensity of relational capital and ability of knowledge sharing, organizations level involving discrepancy of position-based resource, learning capability and difference of corporate culture, cluster level involving network relevance types, overall strategy and systematic operation setting. All the influencing factors can be reflected into two aspects of cooperative willingness and ability. From the levels, the various factors affect cooperative willingness and cooperation ability and finally four collaborative models are formed. The models which are community type, chamber type, teamwork type and group type involve different expression forms. The selection of inter-enterprise cooperative model in innovation cluster is just affected by the cooperative willingness and capability from the various levels.

INTRODUCTION

Innovation cluster, which is composed of enterprises, research institutes, universities, venture capital institutions, intermediary organizations and government, is the advanced stage of the development of Industry cluster and forms strategic alliance and variety of cooperation through industry chains, value chains and knowledge chains. It is a kind of technology and economic networks characterized by agglomeration economies and amounts of knowledge spillover [1]. In the cluster, there are many kinds of cooperative relations among enterprises based on knowledge sharing. Different from existing literature [2], this paper argues that the cooperation among the firms in the cluster often manifest as the features of knowledge sharing in the process of production, transfer and utilization of knowledge and receive the systematic effects from three levels which are individuals, organization and cluster. At present, Chinese innovation clusters are facing the problems of irrationality of the innovative resource structure,
seriousness of dissipating and lowness of efficiency [3]. Therefore, it is necessary to analyze the influencing factors, construct the pattern types and select the specific one in understanding the inter-enterprise collaborative models.

THE INFLUENCING FACTORS OF THE INTER-ENTERPRISE COLLABORATIVE MODELS

In the innovative cluster, the enterprises have their respective positions in the networks based on the knowledge sharing. The different relationship structures are formed by the interaction of the nodes and further the various cooperative models arise. In a perspective of systematic analysis, we divide the models into three levels: individual level, organizational level and cluster level [4]. It is the starting point for building up the collaborative models to clarify their influencing factors.

Individual Levels

In the setting of the innovation cluster, it is important to lay emphasis on the staff’s thought and the change of their behavioral patterns. As long as being familiar with and adapting to such changes, the cluster can promote the human capital in good and deeply facilitate the cooperation among the firms in some kind of model. The innovation cluster has a higher requirement to the employees due to the key character of knowledge sharing. The number of the knowledge-based employees is larger and the function is bigger. Accordingly, the availability and mobility is becoming more and more powerful, which is playing a significant role in the development of the relations among the enterprises. The personal situation including the individual quality and the characteristics of behavior will have an influence on the concrete models when the enterprises cooperate with each other. Specifically, it involves three aspects: the level of the path of staff’s individual behavior, the intensity of relational capital and the capability of knowledge sharing.

The level of the path of staff’s individual behavior has a great influence on autonomy of the collaborative model, likewise the intensity of relational capital on openness and the capability of knowledge sharing on flexibility. Meanwhile, however, the impact also possesses the features of hybrid crossover.

Organizational Levels

In the process of knowledge sharing, the firms in the innovation cluster shows various learning capacities, which play different roles in the knowledge production, transfer and utilization. Furthermore, the firms cultivate different types of corporate culture, which will certainly generate the great influence in aspects of the values and organizational behaviors. Also, the enterprises occupying the different positions are unequal in the possession of resources and in the relatively controlling and acquisition of knowledge [5]. The learning capability facilitate the enterprise adjust its behaviors according to new knowledge and long-term objectives [6]. Meanwhile, the knowledge spillover among enterprises can not only decrease the cost of innovation but increase the risk of knowledge loss [7]. Organizational learning will modulate the cooperative models in the process of balancing the two aspects.
The discrepancy of the positions will directly influence the selection of the inter-enterprise cooperative models. The learning ability of the firms will play an important role in the adjustment of the models. Meanwhile, the specific corporate culture can identify and optimize the current collaborate patterns, which makes the enterprise cooperation model be more suitable for its own cultural characteristics and thus is helpful to smooth the process of communication and sharing.

**Cluster Levels**

There are network relevance types among the enterprises in the innovation clusters, with which the knowledge connection and benefits allocation will directly affect the modality for cooperation [8]. The multi-agent composition, in particular, the structural embeddedness of the cluster network into the local social one [9] make the cluster possess the strategy for the purpose of integration. The planning and strategy of the cluster as a whole also has a closed relations with the selection of the models and the efficiency of knowledge sharing. Besides, for the innovation cluster, the structure and function of the knowledge system to a large extent determines the capabilities of knowledge activities because the knowledge sharing is the main carrier for the inter-firm relations, which has a crucial influence on cluster competitive power [10]. To be specific, the operating environment of the cluster can be divided into three kinds: technology and economic environment, social and culture one, knowledge and capability one. Among them, innovative culture system of intellectual property is the core driving force to accelerate identity of innovative culture and incentive of spirit [11].

The three aspects of network relevance types, overall strategy and systematic operating environment as the influencing factors will affect the benefits, efficiency and function of the cooperative models in varying degrees.

**INTER-ENTERPRISE COOPERATIVE MODELS BASED ON KNOWLEDGE SHARING IN INNOVATION CLUSTER**

In terms of the degree of tightness of the relations and the situation of knowledge sharing among the enterprises, incorporating the characteristics of knowledge sharing, we argue that the cooperative models among the firms in the cluster can be divided into four types which are community type, chamber type, teamwork type and group type (Figure 1).

**Community Type**

The firms in this model cover a wide range and are numerous. The types of the relations are variant involving intimate collaborators, special partners and even rivals [12]. In general, the relations among the enterprises are looser. The firms show up obvious flexibility and autonomy. Those having similar setting may get distinct outcomes, which is mainly due to the different performance in their choice behavior.
**Chamber Type**

Comparing with the community type, the enterprises within the chamber type have more closed relations. With more specific cooperative targets, one enterprise access to the network. The deep collaboration will form some rules in the chamber or reach a tacit understanding among the members, which set up required entry conditions. The behaviors of the enterprise show mainly three aspects: firstly optimizing the cooperative relations to fit a new round of deep knowledge exchange; secondly maintaining the relations with the relational capital, position-based resource and suitable culture; and thirdly expanding the cooperation to enhance the competitive advantage with higher efficiency.

**Teamwork Type**

Through long-term observing, contacting, selecting and collaborating, the enterprises move forward to adopt tighter cooperation model. The firms now often share the clear common goals or concrete missions and will not readily enter into or drop out the cooperative relations comparing chamber model. On one hand, the enterprises have to satisfy the higher requirement and contribute to the cooperation; on the other hand, retreating from the collaboration without completing the goals and missions will bring many negative effects. This type of cooperation is akin to an operation of one team. Under the model, the enterprise can engage in much more collaborative activities to share knowledge and then emotion and feelings, which can promote their interaction and deeper cooperation [13].

**Group Type**

In this model, there has been obvious hierarchical structure in the cluster. The enterprises show a tendency of tightness and normalization in a superior degree, which makes the model be similar to the integration of one individual organization. The leading firm located in the centre of the network attain and integrate knowledge resources and dominant the process of knowledge production, transfer and utilization. So, the core-position enterprise often plays a role of one expert in the knowledge
sharing. Now, the interaction assumes master-slave mode and hierarchy mode and the
dependency based on the capability and the role of experts.

In general, the influencing factors involved in the three levels of individuals,
enterprises and innovation cluster interaction with one another and spiraling in the
process. The interaction and influence respectively form the cooperative willingness
and capability for individuals, enterprises and the cluster as a whole (Figure 2).

**SELECTION OF INTER-ENTERPRISE COOPERATIVE MODEL IN
INNOVATION CLUSTER**

In figure 3, we assume coordinate axis X refers to individuals’ cooperative
willingness and capability with the function of the influencing factors and similarly Y
to enterprises’ and Z to Cluster’s. The selection of inter-enterprise cooperative model in
innovation cluster is just affected by the cooperative willingness and capability from
the three levels above dynamically adjusted with the changes of the factors. The
enterprises with different willingness and capabilities, facing the same content of
cooperation, will choose different collaborative models. For instance, Firm A shows
higher standard of cooperative willingness and capability at the three level, while firm
B is inferior to A, if both have the same cooperative content or encoded knowledge, the
optimal model will be teamwork type for firm A and community type for firm B. Then
firm A and firm B are both on the boundary of optimal willingness and capability and
the knowledge sharing works best.

If under the same background, firm B choose teamwork type model, sharing gap
will arise due to its weak willingness and capability at the various levels. Although firm
B has a tighter relations with the others comparing with the situations in community
type, the increasing opportunities of knowledge exchanges cannot bring relative
consequence of knowledge production, transfer and utilization and on the contrary add
weight of learning and raise the cost of cooperation. The phenomenon of lack of
cooperation will be seen at this point. Instead, the firm in a state of higher level model
chooses one cooperative mode which belongs to a lower level, the phenomenon of
redundant of cooperation will arise and result in inefficiency and finally influence the
effect of innovation of the overall cluster.

![Figure 3. Selection of Inter-Enterprise Cooperative model.](image-url)
CONCLUSIONS

The paper systematically researches the inter-enterprise cooperative models in the innovation cluster and lays emphasis on the theoretical and empirical analysis of influencing factors, pattern types and the selection of the models based on the characteristics of the knowledge sharing in the cluster.

Firstly, the cooperative models are influenced by three levels which are individuals level involving behavioral path, intensity of relational capital and ability of knowledge sharing, organizations level involving discrepancy of position-based resource, learning capability and difference of corporate culture, cluster level involving network relevance types, overall strategy and systematic operation setting. All the influencing factors can be reflected into two aspects of cooperative willingness and ability.

Secondly, there are four sorts of models which are called as community type model, chamber type model, teamwork type model and group type model as for the inter-enterprise cooperation in the innovation cluster.

Finally, the selection of the various models is affected by the willingness and capabilities of the enterprises and the specific tasks. If the cooperating model does not match its influencing surroundings, the phenomenon of lack or redundant of cooperation will be seen and result in inefficiency and cost increase.

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