

# A Review of Clique Research in Alliance Innovation Network of Strategic Emerging Industry

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## Abstract

At present, strategic emerging industry has become the core industry that countries seize the commanding point of economic and technological development, and its development mechanism has gradually attracted the attention of many scholars and government departments. Combined with the development of strategic emerging industries and the clique connotation in alliance innovation network, this paper analyzes and comments on the clique connotation and its influence, the relationship between the clique structure and innovation performance of the alliance innovation network, and the knowledge flow in alliance innovation network, and finally concludes that the clique problems in alliance innovation network deserve more attention and research.

## Keywords

strategic emerging industry, strategic alliance, innovation network, clique.

## 1. Introduction

With the development of economic globalization and informationization, the complexity of technological innovation is further deepened. The proposal of open innovation paradigm has further promoted the development of inter-firm cooperation network, and innovation has evolved from a single enterprise behavior to a group innovation behavior based on cooperation among enterprises in the network organization. In China, in recent years, the emergence of strategic emerging industry alliances are: including 90 member units of the TD industry alliance, China automobile information industry alliance, China smart home industry alliance and so on. The model of individual competition has been transformed into the model of clique competition based on cooperation. Extensive alliance activities among enterprises promote the formation and development of innovation alliance cliques, and become an effective way for enterprises to improve their technological innovation ability and enhance their core competitiveness. Therefore, in the current situation that the industrial structure is upgrading and the market competition increasingly depends on technology and innovation, it has obvious theoretical value and prominent practical significance to study the innovation clique of strategic emerging industry alliance.

## 2. Review of Research on Clique in Alliance Innovation Network

Strategic emerging industries have become the core industries for countries to seize the commanding heights of economic and technological development, and their development mechanism has gradually attracted the attention of many scholars and government departments (Lv Zheng, 2012). With the improvement of market competition and complexity of technological innovation, the innovation network based on alliance between enterprises has become an important way for enterprises to innovate in strategic emerging industries (Zheng Zhun, Yu Yajun, Wang Guoshun, 2012). However, this kind of innovation network is not

easy to form a high density, but a core-periphery structure (Rank, Rank et al., 2006), in which the members of the network based on reciprocity select each other to form a closely integrated group called cliques, which is a local network aggregation phenomenon in the evolution of innovation network. The focus of its research mainly focuses on the following aspects:

### **2.1. Research on the Connotation and Influence of Clique**

Early social network scholars involved the idea of cliques in the study of Hawthorne Factory and Yankee City, and its concept was put forward only when discussing the sociological significance of graph theory, and regarded the essential meaning of cliques as "the largest complete sub graph"(Harary, 1969). Doreian (1979) pointed out some characteristics of cliques, and thought that each point in a clique is in a direct reciprocal relationship with other points. Based on the specific social network, Wasserman (1995) thinks that cliques are the members of the network who have strong, close, direct and frequent positive relations with each other. Lewis (2008) further defined different subgroups according to the attributes of nodes, in order to study the different effects of the relationship between subgroups with different properties on the flow of network resources and the change of network structure. Clique structure plays a role in limiting the access of network members to information and resources (Singh, Hansen, et al., 2010). In the internal interpersonal network, Fang (2010) and others think that a moderate level of inter-clique ties will lead to a high level of performance, while Wang Haizhen (2011) and others think that the formation of cliques improves the satisfaction of clique insiders, but reduces the satisfaction of clique outsiders. Luo Jiade (2014) studied the "circle" phenomenon of social network in China, and explored the social network structure and complex adaptation among enterprises based on this idea. At the same time, Zhao Yan and Meng Qingshi (2014) used negative binomial regression model to empirically analyze the relationship between clique behavior and innovation capability among Chinese enterprises.

### **2.2. Research on the Relationship between Alliance Innovation Network Clique Structure and Innovation Performance**

Since Granovetter (1985) put forward the view that economic behavior is embedded in social networks, the role of network structure in various social and economic phenomena has attracted more and more attention from scholars (Goyal, S., Vega-Redondo, F., 2005). Many scholars have used the perspective of social network to study the embedding behavior of enterprises in the alliance network. In recent years, some scholars have tried to use different data mining and algorithms to find a more realistic clique structure in the innovation network of inter enterprise alliance, and further analyze the influence of clique structure embedding on the innovation performance of enterprises. Kajikawa (2010) believed that "fast" connections within cliques not only increased trust among enterprises, but also provided a network structure foundation for knowledge spillover, knowledge sharing and absorption, so technological innovation mainly occurs within cliques rather than between cliques. The "bridge" connection between cliques can provide opportunities for members of cliques to acquire external knowledge, enhance the degree of diversified cooperation among enterprises, and in turn promote the close ties of some enterprises and the formation of clique groups (Bendersky, McGinn, 2010). Therefore, the governance and structural design of alliance innovation network and the appropriate increase of clique ties can improve the learning ability and knowledge transfer efficiency of enterprises (Fang, Lee, et al., 2010). Domestic Scholars Wan Wei and Zeng Deming (2013) also believe that clique technical cooperation is an important way for the continuous development and deepening of the scale and structure of innovation networks, and has a long-term and stable positive effect on the output of industrial technological innovation.

### 2.3. Research on Knowledge Flow in Alliance Innovation Network

With the advent of the era of knowledge economy, the focus of competition among enterprises has gradually shifted from competition based on resources to competition based on knowledge and ability. Knowledge flow has gradually become the key issue of cooperative innovation among enterprises in alliance innovation network. In recent years, more attention has been paid to the knowledge flow in alliance innovation network (Zou Bo, Qingpu Zhang, Rui Sun, 2011), including the relationship between knowledge flow and enterprise innovation (Dai Yong, Zhu Guilong, Xiao Dingding, 2011). It also conducts theoretical research and simulation on cross-organizational learning, knowledge transfer, knowledge sharing, knowledge coupling, cooperative knowledge creation and co-evolution in alliance innovation network (Sun Yaowu, Wei Yingping, 2012). However, many studies have ignored the study of knowledge flow based on the factors of network structure, especially the study of clique structure (Zhao Yan, Meng Qingshi, 2014).

### 3. Conclusion

In summary, from the current research point of view, due to the neglect of the phenomenon of local network agglomeration, most of the analysis of enterprise innovation network is often difficult to find a targeted way of network resource allocation (Provan, Fish, et al 2007). In this regard, some scholars have pointed out that the study of cliques is an important direction of inter-firm cooperative innovation network research (Ahuja, Soda, et al 2012). The clique group is closely related enterprises. The knowledge flow and innovation mechanism among them must be different from those of other cliques. The clique problems of innovation networks among enterprises deserve more attention.

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