Abstract

Industrial clusters play a very important role in the developing of regional economy, in the environment of global economy and continuing upgrading competition between companies, only depending on the congregation of economic cost advantage can hardly get succeed. Since Marshall brought forward the gathered economy, and Schumpeter proposed that technological innovation is the driving force for future economic development, the research on the industrial district and technological innovation did not interrupt. Technological innovation is a crucial measure to prolong the lifecycle of industrial clusters, promote their long-term competitive advantage and boost their sustainable development. Examples showed that we should pay more attention to the construction of technological innovation system in the process of carrying out the strategy of industry clusters. Based on the related technological innovation theory of industrial clusters, the paper analyzed the relationship between industry clusters, technological innovation and built the technological innovation system for industry clusters.

1. Introduction

The research of China's technological innovation system for the industrial cluster was in the 1990s. Looking at the literature, we found that the focus of the study is on the causes of industrial clusters, cluster features, clustering competitive edge of industrial clusters and regional economic development role, the deeper levels of the research have begun to involve how to create a good environment to strengthen the guidance of industrial clusters and norms, and to promote the healthy development of industrial clusters. But for how to develop industrial clusters and maintain the sustainability of cluster development, it seems that there are little research about it. There are many reasons for a recession of industrial clusters, such as changes in the external environment, lack of innovation, intensify of market competition, and rising costs, technological innovation is an important way to avoid recession clusters and to enhance the sustainability development of industrial cluster.

2. The related theory of technological innovation for industrial clusters

2.1. Janme’s theory

Scholars with the view use different types of knowledge to explain the characteristics of industrial clusters. The basic logic is: knowledge can be divided into coding knowledge and tacit knowledge, with transportation and communication, the former can be transferred and spread in long-distance, the latter can only be obtained through face-to-face exchanges; innovation process involving a large number of tacit knowledge input, and such knowledge through face-to-face interpersonal communication can be effective access to Jaffe’s research suggests that knowledge spillovers are more likely to occur in close region, rather than trans-regional flow. The research of Paci and Usai suggests that innovation is higher than the production level of concentration. Baptista and Swann (1998) pointed out that technology can be encoded, the lower level of the main innovations, the more urgent of the geographical concentration. Those view explained the formation of high-tech industrial clusters. Storper analysis the characteristic of the operation for the four types of production systems - small-scale customized, high-tech, large-scale mass production and lean production, he found that each production system so that there are key reasons for the existence of hidden knowledge.[1]

2.2. The theory of innovation environment

The view is from European innovative environmental research group, they have put forward the concept of innovation environment, innovation networks and collective learning, it systematically expounded the innovative industrial clusters within the conditions and mechanisms.[2] The typical case study of innovation environment is Cambridge, UK, France, Grenoble and Sophia - the first Indianapolis, Germany and other
countries in Munich. The group's initial study (Adylot, 1985) stressed the role of innovation environment; some new industrial zone's competitive advantages are benefit from the innovation environment in the region. Later they stress the role of innovation networks between enterprises (Camagini, 1991). The theory of innovation environment divided the innovation environment into 6 kinds of environment: infrastructure environment, market environment, labor environment, legal environment, technological environment and social culture environment. Figure1 shows the relationship between the environment and technological innovation for industry clusters. [3]

Figure 1 The environment of technological innovation for industry clusters

3. The relationship between industry clusters and technological innovation

3.1. The industry clusters provide efficiency carrier for enterprise technological innovation

In the industrial clusters, on the one hand, universities, research institutions, training institutions, provide personnel for enterprises, and on the other hand, the strong ability to absorb talent of industrial clusters itself also forms specialized personnel supply. In addition, with the frequent movement of persons in clusters, labors continue to get replacement and receive training, the degree of specialization increase rapidly. In addition, businesses in clusters can use modern infrastructure, convenient transportation, communication tools and other physical resources, which will greatly reduced the fixed costs of enterprises. [4] The sharing of intangible resources is the source of technological innovation for business clusters.

3.2. Industrial cluster is an effective organizational form of technological innovation

Competitive is the basic driving force of technological innovation for enterprises, while competition will be exacerbated by the number increase of enterprises. [5] As for the large enterprises, but in the aspect of vitality and innovation, it is better than large enterprises, it has both the merits of various types of enterprises, and avoid the shortcomings of various types of enterprise.

3.3. To make enterprise technical innovation is guarantee for the continuing development of industrial clusters

In the industrial clusters, the competitiveness of enterprises determine the competitiveness of industrial clusters. In the opening market economy, enterprises not only facing the region, the competitiveness of domestic counterparts, but the competitive global counterparts. Faced with such fierce competition and lack of resources, the best way for enterprises to survive is to improve their own competitiveness, technological innovation is a better one in many ways.

4. The Construction of technological innovation system for industrial clusters

Enterprise Technology Innovation is a systematic process, in this system, enterprises are the mainstay of technological innovation, but also the core of the innovation system. Universities, research institutions, other enterprises, government, intermediary organizations
and financial institutions constitute the main technological innovation support systems. The development of enterprise technology innovation system greatly benefited from industrial clusters. In the industrial clusters, there is clear network supporting enterprise technological innovation. (It is shown in Figure 2.)

The network of technological innovation for industrial clusters reflects the relationship between innovative actors. Not only similar enterprises formed a network within the industrial clusters, but also non-similar enterprises formed a network. In the industrial clusters, as the source of knowledge and technology, universities and research institutions not only can create new knowledge and new technologies, but also can effective promote the proliferation of knowledge, information and technology. Government provide public services, intermediary institutions for technological innovation and timely delivery of information technology, these will lead to enterprise technology innovation be more easily within the industrial clusters. Through the joint action of five actors, it is relatively easy to realize enterprise technological innovation within industrial clusters, industrial clusters is a good platform and effective breeding ground for technological innovation. The main actors of industrial cluster innovate synergy and innovate in networking, and melting into the technological innovation environment, thus forming the technological innovation system of industry clusters (as shown in Figure 3).

5. Conclusion

This new organizational form industry clusters has become an important way for the country to participate in international competition in the future, competitiveness of the country will no longer be represented by business alone, but by the region as an whole organic. At present, many countries and regions are conducive to the implementation the strategy to form industrial clusters, trying to lower local labor costs, a large number of preferential policies to attract capital, labor, and other elements, especially to attract large multinational corporations for investment. We must see that the new era of industrial clusters is not only the original sense of geographical focus on the capital, labor, and other elements in the on simple physical, but more emphasis on the formation of clusters, the operation of innovative mechanisms. So the industry cluster strategy should pay more attention to the formation of innovative mechanisms, and concerning about how to prompt the transmission of

![Figure 2 The technological innovation network of industry clusters](image)

![Figure 3 The technological innovation system of industry clusters](image)
technology, information and knowledge in the region. If only relying on the most vulnerable, but also the lowest level of low-cost advantage to create industrial clusters, then we can only say that such kind of clusters will not become a modern sense of the industrial clusters.

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