Research on the Formation Mechanism of Innovation Clusters Based on Self-Organization Theory

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Abstract: Based on the theory of self-organization, the paper comprehensively analyses the self-organizing features, self-organizing conditions, and self-organizing forms of the innovation cluster and constructs the entropy change model by analysing the changes in the entropy flow of the innovation cluster. Furthermore, it discusses the dynamics mechanisms and synergistic mechanisms of innovation cluster Self-organizing evolutionary. Through the above research, this paper summarizes the self or ganizing evolution mechanism of innovation clusters, reveals the self-organization regular pattern of the formation and development of innovation clusters, and holds that the innovation cluster has experienced the changing process of "Micro fluctuation-Macro fluctuation-Far from equilibrium" under the influence of positive and negative entropy flow changes and positive feedback mechanisms. It conducts self-adjustment through three dimensions of synergistic mechanism which consist of competition, technology innovation and environmental support synergistic mechanism and nonlinear dynamic mechanism, which promote the innovation cluster to an orderly direction, and then realize optimize and upgrade with experiencing iterations.

1. Introduction

(1) Self-enhancement of cluster elements. The innovation cluster itself has a high adaptability to the environment, and its internal enterprises can achieve the enterprise self-sufficiency by forming new enterprises or deriving new enterprises on the basis of existing mature enterprises with the support of technology, capital and manpower. The purpose of growth. In this case, the scale of the cluster is gradually expanding, and the competitive advantage is increasing. At this time, it will attract more innovative enterprises to join. In this cycle, the cluster effect is further amplified and the competitive advantage is greatly improved [1].

(2) Self-magnification of cluster innovation capability. The self-amplification of innovation clusters can be expressed in several aspects: First, the competitive pressure brought by fierce competition is inevitable for every enterprise. In the innovation cluster, the participation of a large number of innovative enterprises leads to increased competition pressure within the cluster. Large, this self-enlargement of competitive pressure can promote enterprises to increase technology

investment, improve product and service quality, and facilitate cluster technology innovation. Second, enterprises within the innovation cluster show a certain degree of spatial agglomeration, cluster enterprises the exchange of information and business contacts are more convenient, which is conducive to the rapid dissemination and sharing of technological innovation results. The peer companies exchange, learn and imitate each other. The self-enlargement of this technology integration capability can effectively promote the optimization and upgrading of technology. Finally, innovation there are invisible knowledge in the cluster that is highly abstract and difficult to spread through standardized forms. The innovation cluster provides favorable conditions for the transmission of invisible knowledge. Tacit knowledge can be self-propagated through in-depth communication and frequent communication among employees of cluster enterprises.

2. Self-Organization Evolution Analysis of Innovation Clusters

2.1. Entropy Flow of Innovative Clusters

As a complex open system, the innovation cluster needs to be measured by the entropy value. Plygojin points out that the entropy change in the open system consists of the entropy flow diS generated inside the system and the entropy flow deS generated outside the system. The process of generating an entropy flow within the system is irreversible. The entropy flow change of the whole system is the sum of two parts, namely dS = diS + deS. According to the principle of entropy increase, diS is always positive, deS may be positive or negative, and entropy is inversely proportional to the formation of systematic ordering structure. Therefore, if we want to make the innovation cluster system develop in an orderly and stable direction, we must continuously absorb the negative entropy flow from the outside to cancel the positive entropy flow inside the system, and pay attention to adjusting the factors affecting the positive and negative entropy flow, thus promoting the whole. The orderly evolution of the system [2].

2.2. Entropy Change Model of Innovative Cluster

In order to have a clearer understanding of the entropy change process of the innovation cluster system, this paper is based on the self-organization theory, in the context of the innovation cluster system, through the analysis of the relationship between the various innovation elements, combined with the entropy flow change process, Innovative cluster entropy change model, hypothesis: dS = Q = dS R + dSK + dSU = diS R + deS R + diSK +diSU + deSU = (diS R + diSK + diSU) + (deS R + deSK +deSU) (deS R + deSK + deSU) < 0.

    (1) If ΔE (dS) < 0, it means that the negative entropy flow absorbed by the innovation cluster system from the outside is larger than the entropy increase inside the system. At this time, the innovation cluster system is in a positive development state, and its internal main elements can cooperate well and promote the innovation cluster has evolved in a stable and orderly direction.

    (2) If ΔE (dS) > 0, it means that the negative entropy flow input to the innovative cluster system is smaller than the entropy increase inside the system, and the innovative cluster system is in a disorderly state, and the whole state is stagnant or even backward.

    (3) If ΔE (dS) = 0, it means that the negative entropy flow absorbed by the innovation cluster system is equal to the entropy increase inside the system, that is, the whole innovation cluster system has no large fluctuation compared with the initial state, and the system is in a kind of Balanced state.

3. Self-Organizing Dynamics and Collaborative Analysis of Innovative Clusters

3.1. Self-organizing Dynamics of Innovative Clusters

The innovative cluster system contains many elements, and there are complex and non-linear relationships between the elements and subsystems. This relationship will lead to the flow of resources, information, talents and other resource elements in the system, and the resulting series of changes will cause sudden fluctuations within the innovation cluster. According to different working environments, the power source of innovation cluster formation can be divided into internal power and external power. According to different power factors, it can be divided into innovation power, environmental power and competitive power. Among them, the innovation power belongs to internal power, and the environmental power and competitive power belong to external power. The internal power of the system refers to the change of system function caused by the interaction between various subsystems within the organization. The external power mainly comes from the change of the external environment of the system. And external power can directly affect the formation of innovation clusters by changing the way of innovation clusters, and can also have an indirect impact on the formation of innovation clusters by influencing internal power. The constantly updated environment promotes internal dynamics and promotes the formation and development of innovation clusters [3].

3.2. Self-Organizing Collaboration of Innovative Clusters

The key to innovation cluster coordination is that it can promote the development of the system structure in a stable and orderly direction through the mutual cooperation of various main elements in the cluster. The knowledge flow, information transmission and technology exchange between the various components of the cluster can promote the continuous innovation of the cluster, optimize the system structure, and promote the sharing of knowledge, technology and resources within the system. The innovative entities can be driven by the common goal. Relying on modern information technology to build a resource platform for multi-faceted communication and collaboration. In addition, through the self-organization, the innovative cluster system continuously improves the orderly degree of its own structure and the ability of self-adaptation and self-adjustment to promote the orderly development of the cluster.

4. Conclusions

In general, as an open ecosystem, the innovation cluster will change its entropy value in the process of energy exchange with the external environment, resulting in unbalanced cluster development and random fluctuations. According to the degree of fluctuations, companies in the innovation cluster will take appropriate actions and will have a positive impact on the development of innovation clusters. This paper puts forward the following suggestions for the development of innovative clusters on the self-organized evolution path and development characteristics of innovation clusters: First of all, an open environment is a precondition for the evolution of the innovation cluster system, and the system is optimized and upgraded by continuously absorbing negative entropy flow. The inflow of negative entropy flow can be promoted in the following ways: Increase cooperation within the cluster, improve the innovation capability of the cluster, and actively introduce advanced technologies to promote the inflow of technology flows;

Secondly, relevant government departments adjust their functions and positioning, give full play to their guiding role, actively formulate policies to promote the development of innovation clusters, and ensure fair competition in the entire market; support the optimization cooperation between

universities and related institutions and innovative cluster enterprises, and always adhere to innovative enterprises.

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