Survey of Evolution Mechanism of self-organized in Industry University and Research Institution Cooperative Innovation

Wei Jiang[1, 2]

[1] Fundamental Science on Radioactive Geology and Exploration Technology Laboratory, East China Institute of Technology, Nanchang, Jiangxi, China

[2] Key Laboratory of Innovation Method and Decision Management System of Guangdong Province, South China University of Technology, Guangzhou, Guangdong, China

jw186@163.com

Keywords: Industry university research institution; Cooperative; Innovation; Self-organized

Abstract. This paper analyzed the significance of studying evolution mechanism for industry university research institution cooperative innovation. It introduced the current research of industry university research institution cooperative innovation in domestic and international. It proposed some problem in industry university research institution cooperative innovation and prospected the future of research direction. The research has an important theoretical and practical significance to provide effective plans for the government, universities, research institutions and enterprises related departments. It also can provide some theoretical strategies and optimization recommendations for industry university research institution cooperative innovation.

Introduction

The study of evolution mechanism for industry university research institution cooperative innovation is used by systems science and the research methods of self-organized theory form dynamic evolution perspective. It analysis the dynamic mechanism of industry university research institution cooperative innovation from the qualitative and quantitative aspects. It can propose innovative mechanism specific optimization strategy by build innovative evolution model and based on the conclusion of numerical simulation and empirical studies. It can achieve a comprehensive feature innovation and enhance independent innovation capability and provide a scientific basis and reference in order to solve the current problem about high input and low output in cooperative innovation. It can reveal the significance and mechanism and can put forward to promote the orderly evolution and can provide recommendations for improving capacity and strategy of industry university research institution cooperative innovation.

The Significance of Studying Evolution Mechanism for Industry University Research Institution Cooperative Innovation

It can use the law of natural science to analyze social science problems. Therefore, it can expand the research method of industry university research institution cooperative innovation. It can realize the combination of self-organized theory in natural sciences and the theory of industry university research institution cooperative innovation by studying evolution mechanism. Industry university research institution cooperative innovation has the characteristics of dynamic and complexity by deepening the understanding of evolution mechanism. It can study industry university research institution cooperative innovation from the concept of system and evolution by using the way of nonlinear and holistic. It will be from a new perspective to understand and discover the inherent law of industry university research institution cooperative innovation by introducing the idea of system. Thereby, it can more comprehensive and profound understanding the evolution of innovation systems.

The ultimate aim of industry university research institution cooperative innovation is to promote technological innovation, accelerate product innovation and diffusion, and encourage the healthy and

rapid development of enterprises, universities and research institutions in order to achieve social and economic value. Innovation needs to realize by the economic value of innovative technologies and innovative products through market-oriented to achieve. Therefore, it has important practical significance and application value. It can provide a theoretical basis for the development of cooperative innovation strategy.

Current Research of Industry University Research Institution Cooperative Innovation

As early as 1890, the economist Marshall proposed to study economics by using biological evolutionary in the principles of economics. After 1980, with the creation of self-organized theory, there has been a research and innovation economics issue with self-organized theory. American scholar Nelson published a book economic transformation Darwinism, which laid the basis for innovative research in evolution. Ziman published a book the evolutionary process of technological innovation, which further expressed the technological innovation theory of evolution. The technical innovation is the innovation system to the orderly formation and evolution process from the perspective of self-organized. Therefore, it can reveal the evolution of innovation by the formation and evolution of the condition to the orderly direction and by examining the innovation system. Subsequently, a number of foreign scholars applying self-organized theory have made a wealth of research results in the cooperative innovation system about industrial, regional, national [1-6].

21st century, scholars began to use the system self-organized theory of evolution problems between industry university research institution cooperative innovation and economic system.Ye Jin-guo established the evolution equation of technological innovation and showed that the instability of the innovation process, complexity, mutations and other features. Qin Shu-shing think that technological innovation is a complex system with an open, dynamic, nonlinear, fluctuation, uncertainties and other complex features. Autonomy is inner soul of self-organized evolutionary in technological innovation system and a good social environment is necessary external conditions of self-organized evolution in technological innovation system. Liu Zhi-ying analyzed the complexity of the technology innovation and proposed double-stranded helix model in according to self-organized theory, evolutionary theory and complexity theory. Its operation process is a co-evolution, interaction and co-evolution of each body gradually and formed an increasingly complex technological innovation network system. It analysis self-organized the process of evolution cooperative organization and establish a technological innovation system combination on the basis of recommendations according to the theory.

Mao Jian-qi considered technological innovation occurred the underlying factors such as knowledge, information, intelligence and interaction with the market, humanities, social, institutional convolution process and the reason of technological innovation success is the chosen market from the perspective of the theory of evolution.Li Gang pointed out that open and far from equilibrium is prerequisite, random fluctuation of its incentives, nonlinear interaction is power mechanism, technology mutation is path, super-cycle is in the form from a theoretical point of self-organized analyzes the internal mechanism of the enterprise innovation. Zhen Yan tried to establish technological innovation genetic mutation and natural selection, which the evolution of the analytical framework for analyzing the evolution of enterprise technology innovation to provide a standard frame of reference from the three core concepts of biological evolution.

Yang Jian-fei analysis that enterprise R&D process, tacit knowledge, knowledge profiling distribution, composition, transformation and adaptive, self-organized tendencies AU divided into three stages with the model-based, knowledge-related research and knowledge management theory. Bases on three phrases division, this paper uses related research results of theory of knowledge and knowledge management as theoretical method, and analyzes the distribution, composition, transformation, self-healing and self-configuration of concealed knowledge and literary knowledge in R&D process of company. This paper thinks knowledge type may have process of encoding and increase tendency of visibility. Believes in corporate R&D process has undergone a type of

knowledge can be codified and overt gradually increased and improved process.Dang Xing-hua concludes that self-organized evolution driver of the modular technological innovation network is the process of self-strengthen of mobile design rules, and the self-organizing network evolution path of the modular technology innovation network follows a loop model of instability-hypo-chaos-stability [7].

Based on previous literature, Ma Fei-hong applied complex adaptive system theory to illustrating unique characters of the enterprise innovation network aggregation, flow, diversity and nonlinearity , as well as its three micro-mechanisms tagging, internal model and building blocks when innovation network of enterprises is considered as a complex adaptive system, and expounds the self-organization on and emergence occurred in innovative activities. It indicates that enterprises. Innovation network is just a complex adaptive system, and provides a base for future application of complex adaptive system theory to enterprises [8].

Many papers attempted to use complex adaptive system theory, self-organized theory and triple helix theory to undertake relatively thorough research on the industry university research institution cooperative innovation system． These research contents mainly concerned: the concept, complexity and its producing mechanism of the university-industry-government cooperative innovation, the construction of conceptual model of it and the system simulation model and research method of it.Based on the theory of dissipative structures, this thesis analyzes the dynamic mechanism of the cooperation of enterprise, university and institute, and tries to prove that the system of cooperative technological innovations of enterprise, university and institute is a complex adaptive system, which has some characteristics of self-organization. The flow of various elements in the enterprise, university and institute unification is one of the driving forces promoting the cooperation [9-10].

The related theory study of industry university research institution cooperative innovation has some time and has accumulated a wealth of research results. However, the application of research results from the study of organizational theory in industry university research institution cooperative innovation issues is less. Especially it is lack of run support mechanisms and models to quantify environmental research. In research methods, it is failed to get rid of the shackles of traditional theoretical on the whole framework. For complex research cooperation innovation system, it used to be separated from the issue intrinsically linked in the process. Mathematical model is built in the neoclassical too unrealistic assumptions in Newton's mechanical time and space. The results cannot explain the complexity of real-world phenomena by anglicizing the problem of the mechanism and process. On the content system, the research results are more dispersed and lack awareness of its complexity, University-industry research collaborative innovation systems are dynamic complex systems. With the development of science and practice, the degree of complexity is ever increasing. From this perspective, previous studies on the constituent elements of the different levels of cooperation and innovation systems, structures, and system evolution is not complete. People only certain features of self-organized phenomena and innovation system conducted a brief description and qualitative analysis. The self-organized conditions for innovation systems, evolutionary mechanisms and processes do not fully understand. In the research point of view, the existing research focuses on innovation constitutes the main object innovation types and process models and innovation capacity and performance evaluation. The system concept from the perspective of evolutionary mechanisms for innovation and research systems are rarely intervenes.

Summary

The features and self-organized properties were studied and analysis of Industry University research institution cooperative innovation from three dimensions subject, object, and support systems. Combined dynamic and operating mechanism were studied in industry university research institution cooperative innovation. The conditions evolution mechanism of self-organization was analysis. The key elements of innovation and evolution of self-organized systems was studied. Self-organized evolutionary model was built in industry university research institution cooperative innovation. The study proposed a path of industry university

research institution cooperative innovation by the government led to the evolution of self-organized systems through simulation analysis. It can provide effective plans and measures for the government, universities, research institutions and other enterprises related departments. It also can provide some theoretical strategies and optimization recommendations for industry university research institution cooperative innovation.

Acknowledgements

The soft science research project of Jiangxi province (20151BBA10053) and college of humanities and social science research projects in Jiangxi province (GL1507) and open fund of key laboratory of innovation method and decision management system of Guangdong province (2011A060901001-03M08A) and technology research project of Jiangxi education department (GJJ151534) (GJJ151543) and Jiangxi education planning project (15YB041) and open fund of fundamental science on radioactive geology and exploration technology laboratory (No. RGET1511) supported this work.

References

[1] S. Nolfi, Behavior as a complex adaptive system: On the role of self-organization in the development of individual and collective behavior. Complexes. 3(2005) 195-203.

[2] C.Fuchs, W.Hofkirchner,Self-organization,knowledge and responsibility. Kybernetes, 2 (2005) 241-260.

[3] R.C. Calia, FM Guerrini, GL Moura, Innovation networks: From technological development to business model reconfiguration. Technovation. 8 (2007) 426-432.

[4] J. Markard, B. Truffer,Technological innovation systems and the multi-level perspective: Towards an integrated framework. Research Policy. 4 (2008) 596-615.

[5] A. Bergek, S. Jacobsson, B Carlsson, S Lindmark, Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. Research Policy. 3 (2008)407-429.

[6] O.N. Boldov,Innovation dynamics and financial markets in developed countries from a self-organization perspective. Studies on Russian Economic Development. 5(2008)523-530.

[7] DANG Xing-hua, ZHENG Deng-pan, The Self-organization Evolution Model of Modular Technology Innovation Network. R& D MANAGEMENT. 4 (2009)54-59.

[8] Ma Fei-hong,University-Industry-Government Cooperative Innovation System Modeling and Simulation Method Research. Computer Simulation. 9 (2012) 1-5

[9] Information on http://www.360cxy.cn

[10] Information on http://www.jscxy.cn/