Chinese and Overseas Research Foundation and Frontier Analysis of Innovation Ecosystem - Based on Citespace Visualization Research

Liu Jing, Xie Ruyu, Song Anling

Department of Management, Xi'an Jiaotong University City College, China

Keywords: Innovation Ecosystem; Citespace; Frontier Hotspot

Abstract: This research first selected relevant literature from Web of Science and CNKI as the data source and used Citespace to run the data to obtain the visualized knowledge map. Then based on the map analysis, it summarized the changes in the research foundation and hotspot of innovation ecosystem in China and overseas. Finally it forecast the research direction of innovation ecosystem through a comparison of relevant Chinese and overseas research.

1. Introduction

In recent ten years, enterprises have been increasingly dependent on the innovation ecosystem in which they are located to promote their competitive advantages. Many scholars have carried out in-depth research in this field, and there are also some scholars who have reviewed the research status. For example, Wu Jianlong, Yu Huan et al. summarized related achievements from the dimensions of enterprise, industry, region and country around the connotation, structure, strategy and policy of innovation ecosystem[1], and Mei Liang & Chen Jing used scientometrics to systematically expound the origin, knowledge evolution and theoretical framework of innovation ecosystem theory[2]. However, the existing research lacks comparisons of Chinese and overseas research in this field. In this research, Citespace V was used to analyze and compare Chinese and overseas research on innovation ecosystem, which provides a helpful reference for the management practice in this field.

2. Data Sources and Methods

Overseas literature data was from Web of Science, and 168 articles were retrieved with the title "innovation ecosystem" and time range 1999-2019 after unrelated literature was screened.

Chinese literature data was from CNKI, and 252 articles were retrieved with the title "innovation ecosystem", source categories "core journal, CSSCI, and CSCD" and time range 1999-2019 after unrelated literature was screened[3]. Therefore, a total of 420 Chinese and overseas research articles were retrieved.

3. Literature Scattering

The change in innovation ecosystem research enthusiasm can be understood from that of literature quantity in time.

In 2006-2011, there was little difference in the research results in this field in China and overseas, but in 2011-2014, the research enthusiasm in this field overseas was greater than that in China. In 2014-2019, the research results in this field increased dramatically in China, indicating that the innovation ecosystem has gradually become a research hotspot in recent five years, but the overseas research results have reduced from twenty-two in 2014 to four in April 2019, which indicates a decreasing trend of research enthusiasm overseas.

4. Analysis of Overseas Innovation Ecosystem Research

4.1 Research frontier analysis

Through keyword clustering, Citespace can be used to understand the research frontier in this field, which can be analyzed to master the latest research content. First, the Node Type was set as keyword and the threshold was set as T50 for running to obtain the keyword knowledge map of the innovation ecosystem, which was then clustered with timeline selected to obtain the keyword clustering timeline map (Fig. 2). The results Q=0.537(>0.3), S=0.5358(>0.5) indicate significant clustering structure and reasonable effects[4].

The literature with same clustering was placed on the same horizontal line, the transverse lines represent the beginning time range of the research hotspot, in which the larger node means the greater influence of the hotspot in the time range, and the arc network lines indicate the influence of the field of the hotspot[5].

As can be seen from Fig. 1, the research hotspots of innovation ecosystem can be classified into seven aspects: firm, innovation, organization innovation, prosumer, education and innovation ecosystems, s-d logic, and microstructure.
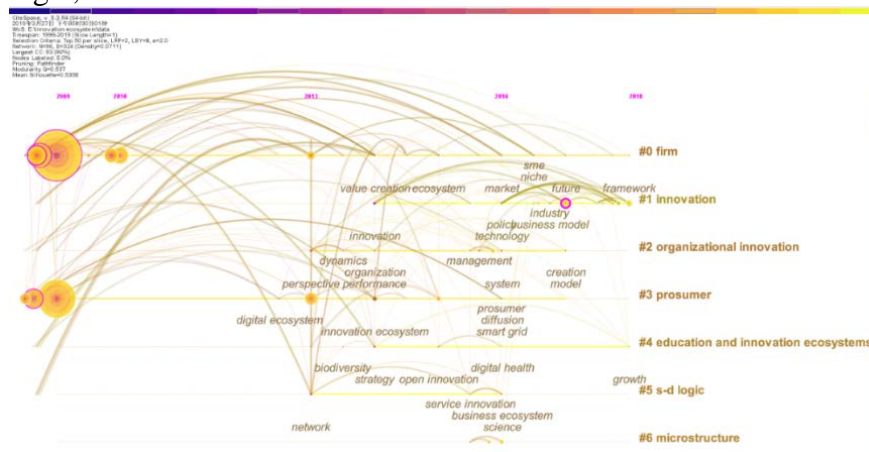

Fig. 1. Keyword clustering timeline map of overseas innovation ecosystem research

As can be seen from the above figure, more research results burst after 2013, which can be analyzed in the following three phases.

In 2009-2012, the fewer research results focused on the research object "firm", but after 2016, small and medium-sized enterprises became the research objects.

In 2012-2016, the research results began to grow rapidly, which focused on "innovation and innovation ecosystem". Some scholars introduced "dynamics" into this field, highlighted the contributions of "organization" to innovation and put forward the research contents of "digital ecosystem" and "diversified open innovation strategy", such as "digital health care" and "service innovation".

In 2016-2018, the research results declined, when scholars focused on "small and medium-sized enterprises" and the biggest research hotspot was "industry and policy" that highlighted the contributions of "education" to innovation.

4.2 Research foundation analysis

The literature cited repeatedly lays a foundation for and has a far-reaching impact on the disciplinary development. This research imported overseas data into Citespace and set the Node Type as Reference and threshold as T50, and the running results indicated that the most cited article is Value creation in innovation ecosystem: how the structure of technological interdependence affects firm performance in new technology generations. According to this article, the success of an innovative enterprise often depends on the efforts of other innovators in its environment. Ron ADNER is the founder of innovative ecosystem research, who has made a number of proposals on value co-creation and system risks of innovation ecosystem[6].

5. Analysis of Chinese Innovation Ecosystem Research

5.1 Research frontier analysis

This research imported CNKI data into Citespace, set the Node Type as keyword and threshold as T50 and selected the visualization mode as "timeline" to generate Fig. 2 Keyword clustering timeline map of Chinese innovation ecosystem research, where Q>0.3, S>0.5.
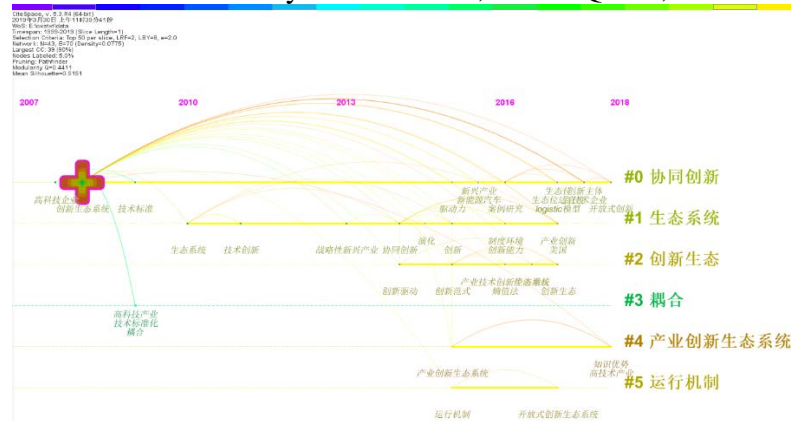

Fig. 2. Keyword clustering timeline map of Chinese innovation ecosystem research

According to Fig. 2, there are six cluster labels generated by Chinese innovation ecosystem research, namely, collaborative innovation, ecosystem, innovation ecology, coupling, industrial innovation ecosystem, and operation mechanism, which were analyzed specifically in the following four phases.

The first phase is 2008-2010, when innovation ecosystem research started in China.

The research in this phase focused on "collaborative innovation" and "technical standard coupling", which took "high-tech enterprises" as the main research object and emphasized advantage integration and resource complementary among subjects. Zhang Yunsheng put forward three basic coupling strategies in Coupling Strategies for Innovation Ecosystems in High-tech Industry[7].

The second phase is 2010-2014, when innovation ecosystem research ascended in China.

In this stage, the early research hotspot was "ecosystem" and the late focus was turned to "technological innovation" and "strategic emerging industry". Guo Yanqing combined NEV industry with innovation ecosystem and constructed the model in Construction of Innovation Ecosystem of NEV Industry in China[8].

The third phase is 2014-2015, when innovation ecosystem research developed rapidly in China.

The research hotspot in this phase was "innovation ecology", and scholars focused on "innovation" and researched how to develop creativity and intellectual property to promote innovation.

The fourth phase is 2015-2018, when the research hotspot was "industrial innovation ecosystem". In the early stage of this phase, some scholars paid their attention to the emerging industries, such as NEV, who used "case study" most and focused on the issues of "industrial technology innovation ecosystem" and "innovation paradigm". In the late stage of this phase, the research hotspot was mainly reflected in "region, industry, and open innovation ecosystem", and according to some scholars, innovation can be promoted by "knowledge advantage" and "value co-creation".

5.2 Co-author analysis

CNKI data was imported into Citespace and Node Type was selected as Author. According to the result, Zhang Yunsheng, Guo Yanqing, Gu Xin, Li Qiwei, Wu Shaobo, et al. appeared more frequently. The highest frequency (13 times) of Zhang Yunsheng means that he has the most research results and highest centrality, indicating that his research in this field supports other scholars for related research to some extent.

Zhang Yunsheng focused on the innovation ecosystem of high-tech enterprises to put forward six

cooperation risks, such as dependence risk, structure risk and specific assets investment risk, and construct the risk evaluation index system. In addition, he analyzed the coupling strategy and governance mode of innovation ecosystem in high-tech enterprises and put forward a licensed price structure of technology standard and a general framework of non-equilibrium theory[9][10].

Guo Yanqing (11 times) and Gu Xin (7 times) ranked second and third. Guo Yanqing first extended "niche fitness" to innovation ecosystem to construct the innovation ecosystem niche fitness evaluation model [11] and then extended Vague to innovation ecosystem niche fitness evaluation, who included "entrepreneur" into innovation ecosystem in 2018 to construct the innovation ecosystem model with entrepreneur as the innovation subject[12][13].

6. Conclusions

This research used Citespace V to analyze the Chinese and overseas literature of innovation ecosystem from 1999 to 2019 and draw the following conclusions:

In recent three years, Chinese and overseas scholars are consistent in the research frontier of innovation ecosystem, who mainly focus on "industrial innovation ecosystem" and mostly use "case study" to make breakthroughs in innovation paradigm and consistently propose the use of "knowledge and education advantage" to promote innovation. However, the research enthusiasm in this field in China is obviously higher and Chinese and overseas scholars are quite different in the cooperative relationship, so Chinese scholars can strengthen teamwork to further improve the quality and output of research results.

In the future, the research on innovation ecosystem also needs to be strengthened in terms of connotation and research methods.

First, more abundant and effective research methods can be adopted. At present, "case study" is widely used by Chinese and overseas scholars as the research method and the methods such as modeling, simulation and game theory can be included.

Second, the research content can be more abundant and in-depth. At present, the research contents in China and overseas mainly focus on "industrial innovation ecosystem", but the depth of research needs to be extended and the innovation paradigm needs to be evolved constantly.

References

[1] Wu Jianlong, Yu Huanhuan, Huang Jing, Liu Jiayang. Research Review of Innovation Ecosystem. Soft Science. 2017(3).

[2] Mei Liang, Chen Jing, Liu Yang. Innovation Ecosystem: Origin, Knowledge Evolution and Theoretical Framework . Studies in Science of Science, 2014, 32(12).

[3] Qiu Junping, Shen Jiachen, Song Yanhui. Chinese and Overseas Progress and Trends in Econometrics Research in Recent Ten Years - A Comparative Visualization Study Based on Citespace . Journal of Modern Information. 2019(2).

[4] Zhou Yao. Progress in International Adult Education Research in Recent Ten Years – A Knowledge Map Analysis Based on WOS and Citespace. Lifelong Education Research. 2018(5).

[5] He Di, Guo Yanqing. Evolution of Innovation Ecosystem Research in Chinese Context and Its Frontier Hotspots - Based on Bibliometric Analysis. Soft Science, 2018(9).

[6] Ron Adner. Value creation in innovation ecosystem: how the structure of technological interdependence affects firm performance in new technology generations. Strategic Manage J.2010.V31.

[7] Zhang Yunsheng. Coupling Strategies for Innovation Ecosystems in High-tech Enterprises. China Soft Science. 2009(1).

[8] Guo Yanqing. Construction of Innovation Ecosystem of NEV Industry in China. Science and Technology Management Research. 2014(12).

[9] Zhang Yunsheng. Risk Generation Mechanism for Innovation Ecosystems in High-tech Enterprises. Studies in Science of Science. 2009(6).

[10] Zhang Yunsheng. Coupling Strategies for Innovation Ecosystems in High-tech Enterprises. China Soft Science. 2009(1).

[11] Guo Yanqing, Yao Yuan, Xu Jinghong. Innovation Ecosystem Evaluation Model Based on Niche Fitness. Statistics & Decision. 2015 (8).

[12] Guo Yanqing. Niche Fitness Evaluation Model For Innovation Ecosystems Based on Vague. Mathematics in Practice and Theory. 2016(2).

[13] Liu Dan, Guo Yanqing, Yi Dongfeng. Architecture and Testing of Entrepreneurial Innovation Ecosystem Maturity Model. Commercial Times. 2014(11).