Research on Open Innovation at Home and abroad – Based on Bibliometric and Visual Analysis

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Abstract: This paper takes the foreign journals in WOS database and the core periodicals in China CNKI.net as the comparative research object, and applies CiteSpace software of scholar Chaomei Chen to carry on the literature statistical analysis. According to the research needs, the comparison of databases can be divided into national and regional distribution, journals' distribution, research institutions' distribution, etc. The comparison of academic achievements of foreign journals and Chinese core journals with open innovation as the keywords has been studied since 2004. Through the comparative study of databases, we can understand the similarities and innovations of domestic and foreign scholars' research. At the same time, the comparison of databases can help scholars focus on the latest focus and facilitate further detailed academic exploration process in the field of open innovation research.

Innovation is one of the themes of world development in the 21st century, with technological innovation as the main driving force for change and reform. Since 2003, scholars have paid much attention to open innovation, such as many Chinese professors including Wu Qiang, Ge Qiuping, Gu Shengzu, Wang Zhenhong and so on.

There are also many articles about open innovation research using CiteSpace software, such as the co-citation analysis by scholars Li Shuyan and Sun Rui, knowledge map analysis of CSSCI database by scholars He Yafeng and Liu Yixin, a paper based on scientific knowledge map analysis by scholars Zhao Picun, Gao Feng and Yan Jie, as well as a CiteSpace-based software analysis by scholars Cao Ping and Wang Guijun. [7]

1. Analysis on the Development Trend of Open Innovation abroad

1.1 Literature Statistics on Time Series of Foreign Papers

The time series graph of papers in the database can provide basic research status for scholars, such as scholars' research on certain topic is gradually increasing or decreasing, when to reach the peak of research and when to fall etc. Figure 1 shows the following information: (1) The number of relevant articles published by foreign scholars has been increasing in the past 13 years from 2004 to 2017; (2) the data of 2018 does not conform to the growth trend, because of the timing selected in this paper; (3) the research on open innovation by foreign scholars is still in the development period and has not entered the mature stage.

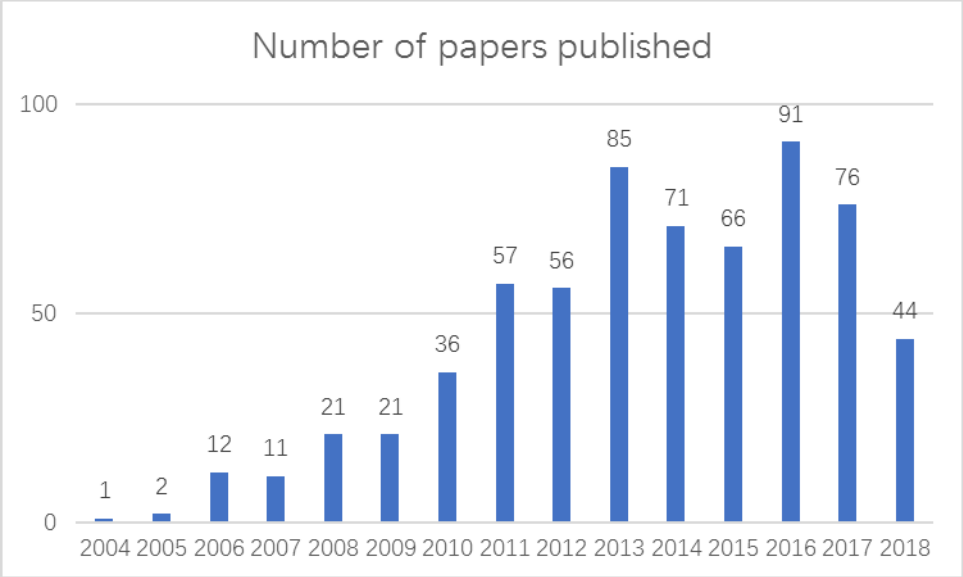

Figure 1 Timing distribution of WOS database

1.2 Document Statistics on the Distribution of Countries and Regions in Foreign Journals

The United States is the country with the largest number of academic articles published, accounts for 30%, followed by the United Kingdom, accounts for 15%, UK and the United States totally accounts for almost 50%, while China accounts for only 7%, which reflects to a certain extent that China is still a developing country in the field of innovation research and lags behind developed countries such as the United States and the United Kingdom. The gap is inseparable from the current situation of technological development and innovation in China.

1.3 Literature Statistics of Foreign Papers Research Institutions

Statistical rankings of research institutions that publish results in the field of the Internet of Things (IoT) are shown as below. Among the publications of the top 10 research institutions, Harvard University ranks first with 70 articles, which indicates that Harvard University pays more attention to the research in the field of open innovation, and with more research results of internationalization. Among the top 10 research institutes, the United States, the United Kingdom, Germany and other developed countries are all among them, while China and other developing countries are not among them, indicating that Chinese universities and research institutes have not started systematic research in this field.

2. Analysis on the Development Trend of Domestic Research of Open Innovation

2.1 Document Statistics on Time Series of Domestic Papers

From Figure 2, it could be seen that the domestic research on open innovation is getting more and more attention. With the attention of various disciplines on open innovation, the number of papers cited is also increasing. The number of papers cited is not only the increase of research focus in this field, but also the affirmation and recognition of published papers.

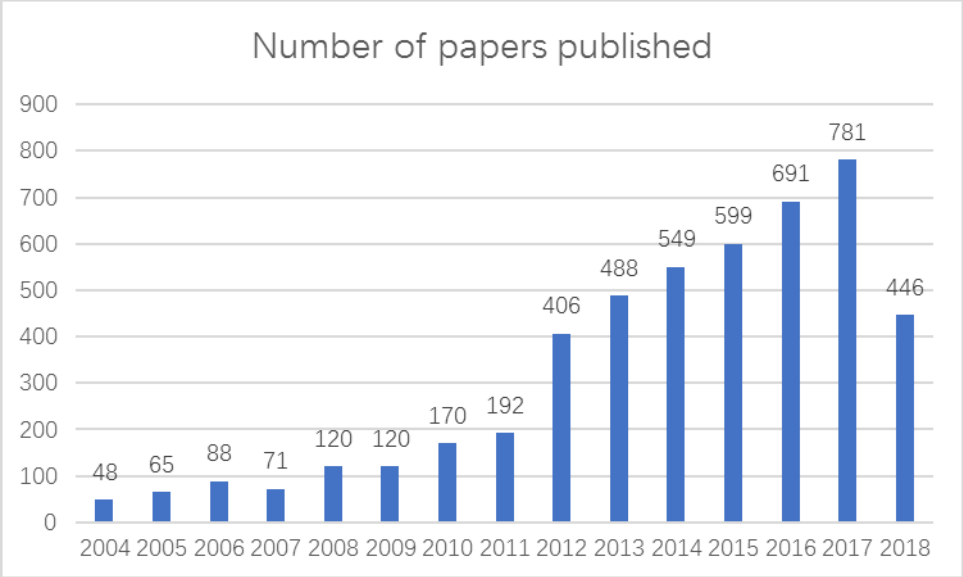

Figure 2 Chronological distribution of CNKI database

2.2 Documentation Statistics of Domestic Papers and Journals Distribution

Among the domestic papers, 67 articles were published in *Science and Technology Progress and Strategies*. The top 10 journals accounted for 46.31% of the total statistics sample, so it can be seen that the journals of domestic research papers in the field of open innovation have formed a stable group of journals, which is relatively concentrated.

2.3 Document Statistics of Domestic Paper Research Institutions

From Figure 3, it could be seen that the top ten research institutes scored 204, accounting for less than one-third of the total. This fully shows that there are not enough research results in the field of research. Therefore, scholars should conduct more in-depth research.

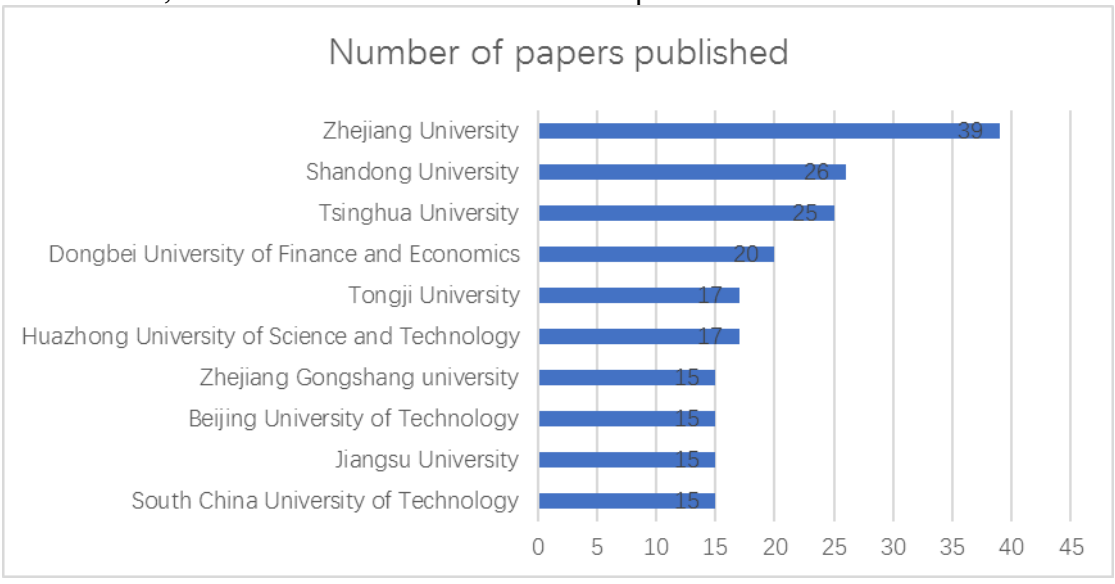

Figure 3 Research Institutions in the Internet of Things in CNKI Database (Top 10)

3. Comparative Analysis on the Development Trend and Rule of Open Innovation at Home and abroad

3.1 Comparative Analysis of Time Series and National/Regional Documents

According to the comparative analysis of domestic and foreign literature databases in terms of time series and national and regional distribution, the following conclusions can be drawn: (1) the initial research time of foreign countries is three years longer than that of domestic countries; the open innovation research field of foreign countries has entered a new stage since 2012, while the number of domestic publications began to increase dramatically in the year 2008; (2). The specific length of time of domestic and foreign research is different, but they are at the same stage of development. Although the number of papers in foreign databases is far more than that in domestic databases, the research literature of Chinese scholars is also included in these foreign databases; (3) The number of papers published by Chinese authors in foreign databases is basically equal to that in domestic databases, so it could be predicted that the ratio of domestic scholars published paper in domestic and foreign database is approximately 1:1.

3.2 Comparative Analysis on Distribution Characteristics of Research Topics and Academic Journals

Through the comparative analysis of the papers on the distribution of research topics and academic journals in WOS and CNKI databases, we could find the similarities and differences as follows: 1. From the same point of view of research topic distribution, both international and domestic research in the field of open innovation presents the characteristics of interdisciplinary integration, and all of them involve business, management, computer science etc. From the point of view of the different distribution of disciplines, management ranks the second and computer science is the third in the international distribution of disciplines in the field of Internet of Things, while policy research (i.e. social science) is the second in the domestic distribution of disciplines in the field of Internet of Things. The third is industry guidance (i.e. social sciences). 2. From the same point of view of the distribution of academic journals, neither international nor domestic journals have formed a core group of periodicals. From the different point of view of the distribution of periodicals, the international journals mainly focus on economic-related journals, while domestic journals mostly focus on management-related journals.

4. Conclusions and Prospects

In summary, although China's research in the field of open innovation started relatively late, but its development speed is faster. And therefore the output of its internationalization research results also has remarkable growth, occupying a certain position in the international community. From the existing research results, it could be seen that China will play a more and more important role in the future development of open innovation research in global community, and will also play an increasingly significant role in international status.

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