

RESEARCH ON PLATFORM ORGANIZATION BASED ON MAPPING KNOWLEDGE DOMAINS

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ABSTRACT. *This paper selects China National Knowledge Infrastructure (CNKI) as the data source, and uses CiteSpace, a bibliometric tool, to analyze the keywords and literature of platform organizations quantitatively and qualitatively, and to study the research progress and hotspots of platform organizations in China. The results show that 1) the overall situation of platform organization research is on the rise; 2) cooperation between authors and between institutions needs to be strengthened; 3) the overall research focuses on bilateral markets and platform economy. After quantitative analysis, this paper summarizes the shortcomings of the existing platform organization research and puts forward suggestions for future research.*

Keywords: Mapping knowledge domain, Platform organization, CiteSpace, Co-occurrence analysis

1. **Introduction.** With the development of Internet and information technology, the world has entered the era of mobile Internet from the Internet era. Enterprises are closely dependent on the advantages brought by technological change. In this era, enterprises attach great importance to the “Internet” transformation. The external business environment faced by the organization presents the characteristics of high change, high complexity and high uncertainty. How to make the organization flexible in this turbulent era has become an important factor in enterprise transformation. The Internet and information technology have imperceptibly changed people’s living habits and behavior. The result of this change is the change of the “identity” of both supply and demand in the organization and operation of enterprises. The impact of the Internet on organizational management includes the following aspects: the expansion of the scope of consumer choice, the change of business operation mode of enterprises, the change of consumer market view and the dynamics of competition [1]. The change of consumers also has higher requirements for the organizational form. The development of Internet technology makes the information asymmetry disappear day by day, the status of consumers continues to improve, and the “voice” of consumers has become an inexhaustible driving force for the development of enterprises [2]. How can organizations enhance the stickiness of consumers in a more transparent information environment? It plays a vital role in the survival of enterprises.

After the rise of the Internet, the emergence of online transactions and the turbulence of the external environment forced the traditional organizations to carry out organizational changes and adjust the organizational structure of enterprises. The interaction between the Internet and industry is increasing. The implementation of the policy of “mass entrepreneurship, innovation and Internet plus” has an important impact on the domestic economy and the organizational structure of all walks of life. The development of Internet technology not only provides strong development power and broad space for enterprises,

but also puts forward higher requirements for enterprise organizations. Enterprises need to change the structure, operation mode and resource allocation of enterprise organizations through learning, absorbing and using new ideas and methods, so as to completely activate enterprise organizations [3]. The “pyramid” organizational structure is gradually changing to various decentralized and hierarchical organizational structures [1,4], and even to a more flexible “cloud organization” [5]. Bureaucratic system is an organizational form with the highest popularity and easy to be controlled by the organization [6], which is the source of enterprise efficiency [7]. However, bureaucratic system hinders horizontal resource acquisition and vertical personnel communication, and will have an impact on the innovative spirit and sense of ownership of employees in the organization [3,7]. The traditional pyramid organizational structure and hierarchical management model based on the principle of division of labor are facing great challenges today with the rapid development of the Internet. At present, the Internet economy is developing rapidly and the speed of information iteration is faster. How to better serve consumers with the help of the Internet has become the core of enterprise development. The traditional “pyramid” structure has clear levels, but the structure is bloated. It lacks flexibility in the case of uncertain external environment, resulting in time lag in the transmission of information and unreasonable allocation of organizational resources. At this time, the emergence of a platform organization bred in the soil of Internet economy can well solve these problems. The platform organization removes the bureaucracy in the traditional organization form. All departments, teams and employees of the enterprise closely focus on the needs of users and serve them better. Platform organization has two obvious advantages, strong evolution ability and strong network effect [1,8]. Its strong evolution ability makes the organization have good ability to adjust and adapt to the rapidly changing external environment; The Internet connects “points”. With the increase of the number of users, all users on the platform can get more value from the expansion of network scale, which highlights the network effect of the platform organization. “Resource depression” is one of the four components of platform organization [5], which enables stakeholders to obtain resources on the platform at a lower price than the external price, so as to make resources flow reasonably in the platform. In the face of rapid changes in the external environment, information transparency and power transfer in the Internet context, platform organizations can provide enterprises with an innovative source that continuously meets the requirements of the times and is close to the needs of consumers [9]. Therefore, as a networked and borderless organization more in line with the Internet era, platform organization helps to improve the efficiency of resource allocation, empower the organization and empower employees. Reviewing the relevant literature of platform organization, it is found that the research of platform organization mainly focuses on the following aspects: 1) the research on the operation mechanism of platform organization, such as business model innovation, development path research, and competitive strategy; 2) the main research methods of platform organization: case study; 3) research on the development stage of the platform. These research results show that the existing literature has a single and limited review angle for platform organizations, so that the overall picture and research hotspots of platform organizations cannot be displayed systematically, objectively and clearly. Therefore, it is of great significance for understanding the development status and research hotspots of this field to carry out keyword visual analysis on the theme of platform organization through mapping knowledge domain. And this study analyzes the existing literature on platform organizations by bibliometrics, uses CiteSpace as a tool, and gets data from CNKI to provide a “sketch” for future research on platform organizations. This paper focuses on three aspects: 1) the general trend of platform organization research; 2) what are the hot topics of platform organization? 3) What is the further step of future research on platform organizations?

2. Method and Tool. This paper uses bibliometrics, which is a method of quantitative analysis of scientific literature by using mathematics and statistics. It is used to indirectly reflect the correlation between contents, and then explore some structure, characteristics and laws of research contents [10]. CiteSpace is a kind of scientific measurement and knowledge visualization software, which was developed by Professor Chaomei Chen of Drexel University on the basis of Java, or also known as the scientific knowledge mapping software. CiteSpace is a visual analysis software, which can identify and display new trends in scientific development from the articles. The basic elements of CiteSpace are nodes, connections, etc. Through the atlas of elements, the citation and co-occurrence of documents can be clearly displayed. The more the frequency of occurrence, the greater the node. Different colors in the node circle indicate the frequency of occurrence or citation in different time periods, the connection between nodes represents co-occurrence relationship, and the thickness of the connection indicates the intensity of co-occurrence [11].

This paper selects the journal papers of CNKI as the data source. SCI source journals, EI source journals, core journals and CSSCI are selected. In order to ensure the accuracy of the data, first manually delete the unknown author, unknown organization, meeting, news, interview, duplicate articles, etc. Then check the title, abstract and keywords of the article one by one. If the content in the literature is inconsistent with the research theme of this paper, it shall be deleted manually and not included in the analysis sample. Through CiteSpace (5.7. R1), this paper analyzes the keywords co-occurrence of platform enterprises, and conducts qualitative analysis on the basis of quantitative analysis, in order to have a more in-depth understanding of the overall situation of platform organization research.

3. Main Results.

3.1. General research status of platform organizations. The overall distribution of the number of published papers reflects the dynamic change of the number of documents on the time axis, and shows the overall development of the research field and the changes in different years through intuitive and quantitative graphics [12]. It provides quantitative information for understanding the research progress and dividing the research stages. This paper searches four kinds of journals and analyzes the total number of papers published on the theme of “platform organization” from 2005 to 2020. The analysis results are shown in Figure 1. It can be seen that from 2005 to 2012, the number of papers related to platform organizations was less, showing a trend of slow growth. From 2013 to 2015, compared with the previous stage, the number of published papers increased, and the growth rate showed an upward trend, which was a steady progress stage. The number of published papers was 1.8 times of that in 2005-2012. The number of published papers in this stage is relatively fixed, the research results are relatively stable, and the research fields are broadened. From 2016 to 2020, it shows a rapid growth, which is 2.7 times of 2005-2012 and 1.5 times of 2013-2015. Although there are fluctuations in the annual number of papers, the number of papers published around the theme of platform organization shows an overall growth trend. From 2005 to now, the field of platform organization has been a research hotspot and there is no obvious slowing down trend.

3.2. Analysis of research institutions. Research institutions are for a subject to conduct in-depth analysis and research, and grasp the focus and direction of the field. In the parameter setting of CiteSpace, the time span is “2005-2020”, the time slice is set to 1, and the node type is “Institute”. The result of running the software is that there are 372 nodes and 107 lines. From the perspective of research institutions, Renmin University of China has the most abundant research results, with 30 papers published. It is the leader of the theme of platform organization. Shanghai Jiaotong University (27 articles),

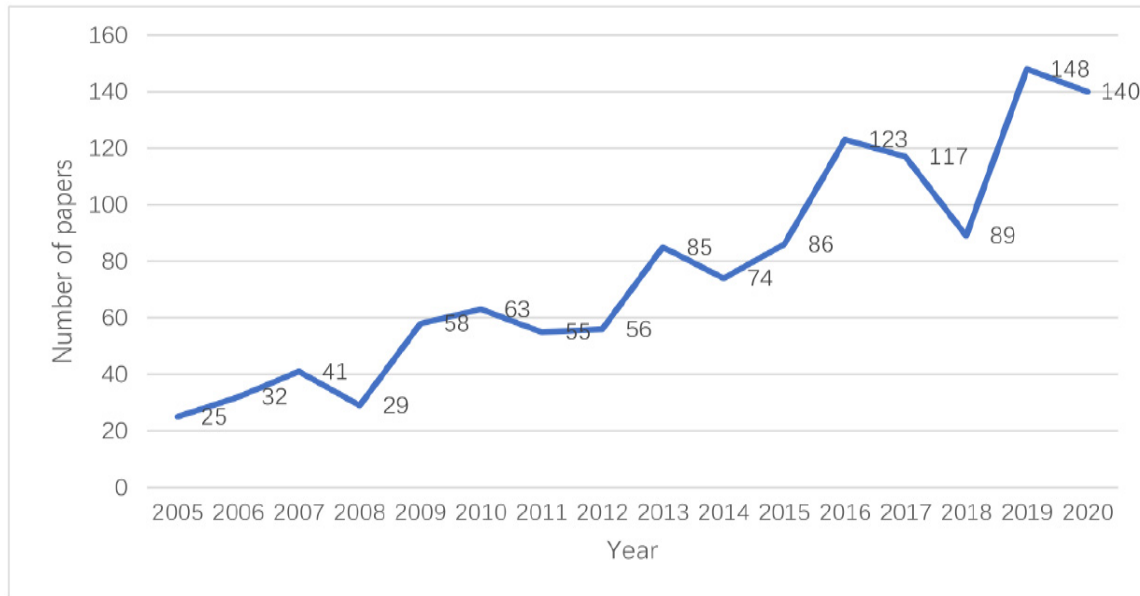


FIGURE 1. Statistics of papers issued by the platform organization from 2005 to 2020

Tsinghua University (24 articles), Nankai University (23 articles), Wuhan University (19 articles), Northeast University of Finance and Economics (19 articles), and South China University of Technology (16 articles) also have a large number of papers and have a great influence in this research field. The top three institutions in terms of the number of papers published are Renmin University of China, Shanghai Jiaotong University and Tsinghua University. CiteSpace was used to analyze the co-occurrence of research institutions. The connection between the two institutions indicates that they have a cooperative relationship, and the thickness of the connection indicates the closeness of the connection. It can be seen that the School of Economics and Management of Shanghai University of Technology, the Graduate School of Chinese Academy of Social Sciences and the School of Business Administration of Northeast University are closely connected with other institutions (the connection is rough). The Graduate School of the Chinese Academy of Social Sciences and the School of Economics and Management of Tsinghua University cooperated more with other institutions (with more connections), forming a cooperative group of research institutions. Among the research institutions of these platform organizations, in addition to the Graduate School of the Chinese Academy of Social Sciences and the School of Economics and Management of Tsinghua University, there are few and scattered links among other institutions, and the degree of contact is low.

3.3. Author analysis. The co-occurrence analysis of research authors reflects the cooperation strength and mutual citation relationship between the core author in a certain field and other authors [13]. In CiteSpace parameter setting, the time span is “2005-2020”, the time slice is set to 1, and the node type is “author”. The result of running the software is 454 nodes and 124 lines. The author co-occurrence map of the platform type organization research was obtained. Renhuai Liu (Jinan University), Xing Wan (Nanjing University of Finance and Economics), Yong Wang (Tsinghua University), Hongmin Chen (Shanghai Jiaotong University) and Yi Zhang (Jinan University) ranked the second in the number of papers published, and they have 5 papers in this research filed. Although the research directions and perspectives of scholars in the field of platform organization show diversity, there is no close relationship in different fields.

3.4. Research focus of platform organization. Keywords are highly concise to an article, which can highlight the theme of the article. Therefore, the analysis of keywords

TABLE 1. High frequency keywords of platform organization research (2005-2020)

Frequency	Centrality	Year	Keyword
90	0.18	2006	Bilateral market
58	0.09	2010	Platform organization
52	0.22	2006	Small and medium-sized enterprises
26	0.10	2013	Platform economy
25	0.05	2017	Sharing economy
25	0.02	2016	Platform enterprises
24	0.10	2006	E-commerce
20	0.07	2010	E-commerce platform

can help to determine the research hotspots in a certain research field [11]. In CiteSpace parameter setting, the time span is “2005-2020”, the time slice is set to 1, and the node type is “keyword”. The result of running the software is that there are 372 nodes and 107 lines. Through CiteSpace analysis of keywords, we get the knowledge map of keyword co-occurrence. Select the keywords whose frequency is not less than 20 times to get Table 1.

As it can be seen from Table 1, bilateral market (90 times), platform organization (58 times) and small and medium-sized enterprises (52 times) are the top three high-frequency research keywords of platform organization research from 2005 to 2020. Centrality in Table 1 refers to mediation centrality, which is an indicator of the node’s importance in the network. In Table 1, there are bilateral market (0.18), small and medium-sized enterprises (0.22), platform economy (0.10) and e-commerce (0.10) with intermediary centrality greater than 0.10 in Table 1. It shows to what extent these four keywords as nodes are “intermediaries” of other nodes, and they play a “bridge” role in the knowledge map network. After analyzing, we can see that the nodes of bilateral market, small and medium-sized enterprises, platform enterprises, platform economy, sharing economy, and e-commerce are relatively large, which indicates that these keywords are hot spots in the research of platform type organizations.

Clustering analysis based on keyword co-occurrence network is a high-level summary of hot issues in a research field, and then shows the panorama of related research. Using CiteSpace to analyze 959 papers, the time span in parameter setting is “2005-2020”, the time slice is set to 1, and the node type is selected as “keyword”. The keyword clustering graph of platform organization research field is obtained by using LLR algorithm. Ten core clusters (in order from 0 to 9) are generated: small and medium-sized enterprises, platform enterprises and bilateral market, sharing economy, e-commerce, information platform, professional town, Internet platform enterprises, enterprises and Alibaba. The cluster number is negatively correlated with the number of keywords contained in the cluster, the smaller the cluster number is, the more keywords the cluster contains. With the increase of cluster number from 0 to 9, the number of keywords in the cluster decreases in turn. Whether the clustering is convincing or not depends on the silhouette value. S value is the average contour value of clustering. Generally speaking, if $S > 0.7$, clustering is convincing. It can be seen from Table 2 that the S value of each cluster is greater than 0.7, which shows that the clustering is convincing. Modularity value is the clustering module value, also known as Q value. It reflects whether the clustering structure is significant. It is generally considered that $Q > 0.3$ has a significant clustering structure. After analyzing, we get the value of Q , $Q = 0.7116 > 0.3$, so the clustering structure is relatively significant.

TABLE 2. 2005-2020 clustering information table for platform organization

Cluster number	Cluster label	Silhouette value
#0	Small and medium-sized enterprises	0.930
#1	Platform enterprises	0.896
#2	Bilateral market	0.752
#3	Sharing economy	0.937
#4	E-commerce	0.939
#5	Information platform	0.891
#6	Professional town	0.947
#7	Internet platform enterprises	0.939
#8	Enterprises	0.972
#9	Alibaba	0.885

4. Conclusions and Future Research. Through bibliometric method, this paper selects CiteSpace as the main research tool for quantitative analysis, systematically sorts out SCI literature, EI literature, core and CSSCI literature published in economic and management field on CNKI from 2005 to 2020, and finally obtains 959 journal literature as research samples. Through analysis, we draw the following conclusions.

1) Through the analysis from 2005 to 2020, it is found that although the number of articles published on this topic has increased significantly since 2016, the number of articles published on this topic is not large in general.

2) The author's co-existing map and the institutional co-existing map indicate that relevant research groups in this field are forming, but the atmosphere of cooperation between the authors is not strong enough and there is a need for greater cooperation between them.

3) Although there is already inter-agency cooperation in platform organization fields, cooperation is insufficient, and most institutions do not cooperate with other institutions, and the atmosphere of cooperation is not enough.

4) The analysis of keyword contribution knowledge map of platform organization shows that researchers still focus on the research of "platform" in the previous development stage of platform organization, such as "bilateral market" and "platform economy".

Future research includes the following.

1) Have in-depth studies on sharing economy. Sharing economy takes the Internet platform as the center, breaks the traditional hierarchical management, and forms a new labor relationship characterized by "platform + individual". Sharing economy is also a platform economy [14]. The core idea of platform organization is the same as the sharing economy. The discovery of sharing economy has produced a new group of workers "slash youth". Platform organization is also the "maker" of enterprise maker space and provides innovation source for enterprises. Existing research has studied the difference between "maker" and "slash youth". As new career choices, both of them can generate new ideas for enterprises, but there is no such background in platform enterprises. The comparison of these two career choices shows that future research should consider this issue. Under the background of sharing economy, the business model, innovation mechanism and personnel management of platform enterprises are also an aspect of future research.

2) Focus on the platform ecosystem. For China, the platform ecosystem has more important theoretical and practical significance. At the theoretical level, the platform ecosystem is a new organizational structure and growth situation that Chinese enterprises need to face in the emerging economy, which is very important for enterprises to grow and gain competitive advantage. At the practical level, the platform for implementing the "Internet plus" strategy – the network platform – is the object of concern for the

platform ecosystem. As the third stage of the evolution of platform theory, the evolution of platform ecosystem is the key to the sustainable development of platform. However, the composition, competition and dynamic development mode of platform system have not formed a unified cognition [15]. The development, competition and governance of platform ecosystem and innovation of platform ecosystem are also the future research directions.

3) Select a new database. The degree of detail of data analysis is closely related to the selection of database. In the process of data visualization analysis, the formats of different databases are also different. Web of science and Scopus have the most complete data structures. CiteSpace has the most comprehensive functions for analysis. Derwent and CSSCI take the second place, with fewer functions than the former. CNKI has the least integrity, so it can only conduct co-occurrence analysis of authors/institutions/keywords [11]. In the future research, we need to select a more comprehensive database and then analyze it. The results can better reflect the whole picture of this research field.

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