

# Knowledge Mapping of Platform Competition: Literature Review and Research Agenda

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**Abstract:** This study offers a systematic review of academic research on platform competition. By using CiteSpace5.7R1, a visualization tool, we analyzed 575 articles on platform competition from Web of Science database. By examining the publications, important authors, and hot spots in the field of platform competition, we found that early literature mainly focused on the concepts and structure of platform competition from a micro level, and the methods including empirical analyses with game theory, mathematical models and so on. Recent literature mainly focuses on digital platform, platform ecosystem, innovation ecosystem, value creation, the role of complementor and so on.

**Key words:** platform competition; Burst words; research agenda

## I. Introduction

With the acceleration of scientific and technological revolution and industrial transformation, information technology has begun to penetrate into all fields of economic and social life. The world is in a new era dominated by platform industry. According to the latest Digital 2021 Global Overview Report, there are 4.66 billion Internet users in the world (out of a population of 7.83 billion) by January 2021. To gain a profitable position, fierce competitions occur among platform enterprises and the traditional enterprises that expand the platform business. Thus, the phenomenon of platform competition has increasingly attracted the attention of scholars in all fields of academia. Therefore, it is of great significance to explore the literature in the field of platform competition, so as to reveal the research agenda for further study.

## II. Data and methods

We take "Web of Science Core Collection" as our main literature source, the retrieval strategy is as follows: IT=(Platform competition) OR AB=(Platform competition) OR KP=(Platform competition); Language: English; Time span: 1985-2020; Citation Index: SCI-Expanded, SCI, CPCI-S, CPCI-SSH, CCR-Expanded, IC. Retrieved date: January 20, 2021, literature type: Article. In all, 1962 articles are obtained. We excluded the categories of Chemistry Multidisciplinary, Chemistry Analytical and so on, and chose categories including Economics (277 papers), Management (215 papers), Business (118 papers), Operations Research Management Science(106 articles) and Telecommunications (107 articles). Thus, 676 publications are selected as the review papers. By checking the abstracts of each paper, we found 575

articles related to platform competition. Finally, the full records and references of the 575 articles were exported into plain text format for analysis by visualization software CiteSpace5.7R1.

We use CiteSpace5.7R1, a bibliometrics and knowledge mapping tool, to analyze hot spots and cutting-edge issues in the field of platform competition literature. It is worth mentioning that CiteSpace5.7R1 is a visualization tool which can be used to conduct visualization analysis and intuitively understand the past and present hot spot changes and the future research direction.

### III. Text analysis

#### 3.1 Distribution of articles

In order to intuitively display the trend of published articles in the field of platform competition research, we plotted the distribution of articles against time. As can be seen from Figure 1, the number of articles in the field of platform competition exhibits an overall fluctuating upward trend, with the number of articles reaching the peak in 2020. Also, we notice that total number of articles from 2014 to 2020 is 371, accounting for 72.04% of the total number of articles.

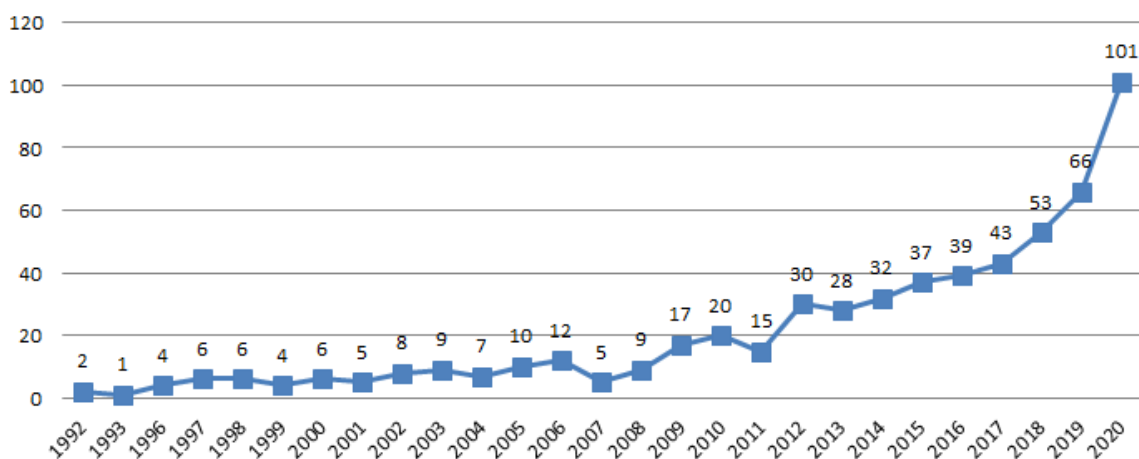


Figure 1

Figure 1 Distribution of articles

#### 3.2 Identifying the important authors

With CiteSpace5.7R1, important authors whose articles have been cited more frequently are identified. It can be clearly found from Figure 2 that the nodes of Rochet and Armstrong are far larger than other nodes. Rochet has been cited for 175 times and Armstrong has been cited for 152 times. Rochet has been considered to be one of the founders of the economics of platform competition. He is the first to propose the competition of two-sided market platform. In 2003, his article entitled *Platform Competition in Two-Sided Markets* which has been cited for 1443 times regarded platform as a "two-sided market", a virtual intermediary connecting the two groups of "buyers" and "sellers". Armstrong, an author who has been cited only second to Rochet in the field of platform competition literature, is one of the researchers in the field of platform economics. Based on Rochet (2003), Armstrong (2006) investigated the influence of different consumer characteristics on platform pricing under three market structures, and found the determinants of equilibrium price. The node with the largest betweenness centrality value (0.56) is Jullien, who has been devoted to the industrial organization economics, especially the network economics, multilateral platform and competition policy. In addition to the above three authors, several other highly cited authors constitute an important group of authors of platform competition

research: Hagiu (cited for 110 times), Caillaud (cited for 103 times), Katz (cited for 78 times), Evans (cited for 65 times), Gawer (cited for 61 times), and Eisenmann (cited for 56 times).

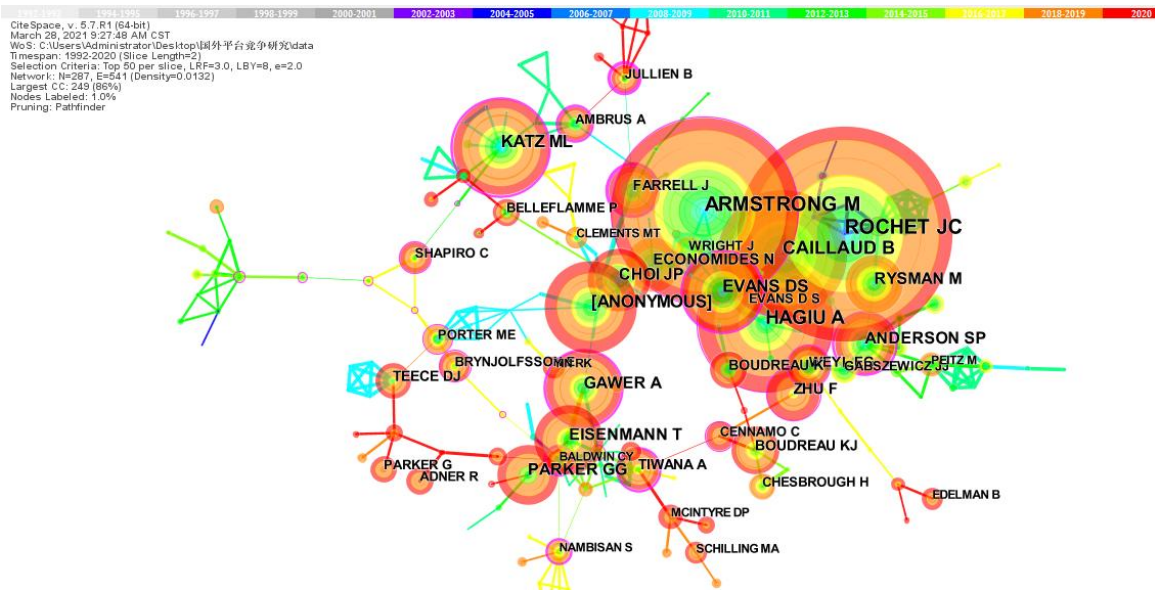


Figure 2 Mapping the co-occurrence of authors

### 3.3 Analysis of research hotspots

In order to explore the evolution path of a hot topic over the time line, a timezone map was plotted, as shown in Figure 3. According to the evolution path of different hot topics, the research on platform competition is divided into the following three stages:

(1) 2002-2008. This is the initial stage of platform competition research, which involves a few but very important articles. In this stage, the concept and connotation of platform in the field of economics was developed, and thus formed the basic theory of platform economics. As can be seen from Figure 3, hot topics in this stage include *platform market*, *Web 2.0*, and *two-sided network*. The two-sided market theory forms the basis of platform competition theory in the field of economics, as well as the cornerstone of platform competition research in other fields. In this period, with the popularity of the internet, the platform just emerged with the development of network externality theory, and the emergence of the platform theory is a natural result. Network externality was first proposed by Katz (1985), who argued that the utility consumers get from consuming goods increases with the number of other consumers consuming the same goods. Caillaud and Jullien (2003) analyzed the model of incomplete price competition among intermediate service providers. Rochet & Tirole (2003) noticed the platform economy phenomenon through connecting network externality with the newly emerging platform, and put forward the concept of "two-sided market". They argued that the total profit of a platform is not only related to the total price collected from both sides of the platform, but also depends on the platform structure in the two-sided market. Armstrong (2006) further studied the phenomenon of platform competition and believed that a platform in a two-sided market always involves two parties, and the benefits of one party joining the platform depend on the size of the other party. To sum up, the research on platform competition in this period lies mainly in the construction of basic concepts and theories.

(2) 2009-2013. In this stage, the specific issues of the platform were studied and new theories emerged based on the

theories and concepts in the previous stage. Therefore, it is very important to analyze the main contents of this stage. As can be seen from Figure 3, the hot topics in this stage include *advertising, game theory, and software*. More scholars began to use these theories to study the platform competition in different industries. The main research methods adopted were case studies and mathematical models, most of which were achievements in the field of economics. The video game industry and TV industry are often regarded as the main research objects due to their unique characteristics that are very consistent with the two-sided market theory. Network externalities have a strong role in promoting the platform competition in these industries. The case studies at this stage have well applied the basic theory of two-sided market. With the popularization of the computer, the software has been developed continuously, and the total revenue of some software has been involved in the total price of both sides of the software, so software has become a new object in the field of bilateral market in this period.

In addition to the literature in the field of economics, the research on platform competition in the field of strategic management had become prominent. Literature based on the perspective of strategic management theory tried to emphasize the important role of strategic decisions on platform competition, such as pricing strategy, entry timing and cooperation strategy of the platform leaders. There are two line of inquiry in this stage. One is to analyze what strategic decisions the incumbent platform leaders takes to maintain their competitive advantages (West, 2013; Boudreau,2010; Lee, 2010; Casey, 2012), and the second is when new entrants choose entry timing and ways to challenge the incumbent platform leaders and capture market share (Zhu,2012).

In addition to the fields of economics and strategic management, new theories have emerged in the field of technology management. Gawer (2009) took the platform as a kind of technological framework that promotes innovation. Tiwana et al. (2010) referred to the collection of platforms and modules specific to the platform as the ecosystem of the platform, where a module is defined as an additional software subsystem that connects to the platform and adds functions to the platform.

In general, this stage is mainly the preliminary practice of the two-sided market theory, which plays a connecting role in the development stage of the platform competition. Furthermore, the platform competition research in the field of strategic management and technology management begins to highlight.

(3) 2014-2020. At this stage, articles on platform competition showed an explosive growth. In-depth analysis of hot topics in this stage will help us to understand the current research hot topics of platform competition. As can be seen from Figure 3, the hot topics in this stage include *ecosystem, online communities, and technology evolution*. With the continuous popularity of internet technology, online communities are becoming more and more prominent, and platform enterprises are no longer limited to the development of a core platform. The establishment of platform-based ecosystem has played a key role for platform enterprises, and the competition between platforms has been increasingly expanding to the competition between platform-based ecosystems. It is worth mentioning that the word "ecosystem" has been borrowed from the field of biology, and the development of platform shows the characteristics of the ecosystem, so the word was applied in the study of the platform. According to the different characteristics of ecological system, scholars put forward the "ecological system", "business ecosystem", "innovation ecosystem".

At this stage, the research on platform competition in the field of economics was no longer particularly prominent, while the research on platform competition in the field of technology management came from behind and became a hot

research issue. Based on theory of platform ecosystem, some scholars have begun to pay attention to the technology interfaces between core platform and components and how to attract the third party products manufacturers. Choi (2018) studied the impacts of technology platform openness to applications and devices on application developers' intention to continuously use a platform.

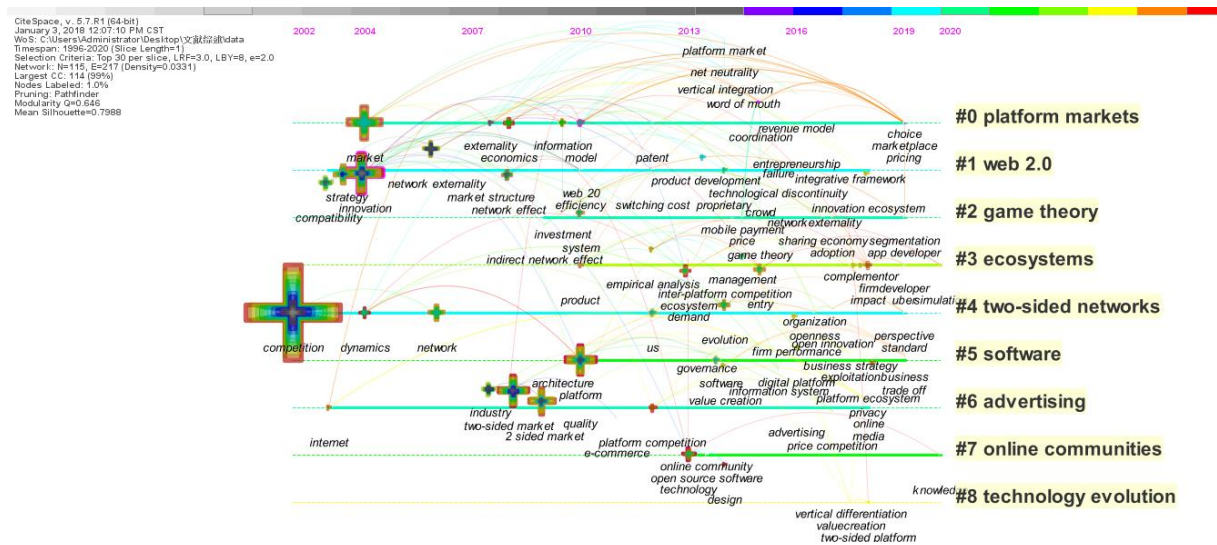


Figure 3 Mapping the timezone of platform competition research

### 3.4 Future research agenda

In order to understand the future research agenda, the burst detection map is drawn, as shown in Figure 4. Burst words began to appear before 2008, such as *Compatibility*, *Innovation*, *Network Externality*, *Competition*, and *Network Effect*. *Compatibility* emerged from 2003 and ended in 2010, lasting 7 years, which indicates that the "compatibility" was the frontier issue in platform competition research in the 7 years. In the early 21st century, technological revolution and technological breakthroughs often brought about new products, which greatly shortened the product life cycles. With the establishment of the two-sided market theory, network externality had become the frontier issue of platform competition in 2006. With the in-depth study of platforms, it was found that the characteristics of two-sided platforms also included indirect network effects. Direct and indirect network effects together constituted network effects, which became the forefront issue of platform competition in 2008.

Burst words like *model*, *two-sided market*, *evolution*, and *digital platform* emerged after 2009 and ended before 2018. The main research methods of platform competition are mathematical model and game theory, so the model had become the frontier problem from 2010 to 2015. With the continuous development of the network and the continuous emergence of network platforms, digital platforms had become a frontier issue in 2016-2018.

Burst words from 2018 to now include *value creation*, *the role of complementors*, *platform ecosystem* and *ecosystem*. As mentioned above, from 2014 to 2020, with the continuous popularity of internet technology, platform enterprises are no longer limited to the development of a core platform. The establishment of platform-based ecosystem had played a key role for platform enterprises, and the competition between platforms has been increasingly expanding to the competition between platform-based ecosystems. Therefore, ecosystem and platform ecosystem have become the current frontier issues. Innovation and platform are closely linked, platform and other stakeholders in the ecosystem

interact with each other to achieve value creation, and form a network relationship of interdependence and symbiotic evolution. The emergence of platform ecosystem makes some scholars begin to study members of the ecosystem, and the focus of the research is the role of complementors. Therefore, value creation and the role of complementors have become the frontier issues of current research.

To sum up, frontier issues vary over time. The initial emphasis had been focused on the concepts and structure of platform competition, then moved to focusing on the network externality with game theory, mathematical models and other methods and network effects. Recent articles have been focusing on digital platform, platform ecosystem, innovation ecosystem, value creation, the role of complementors and so on.

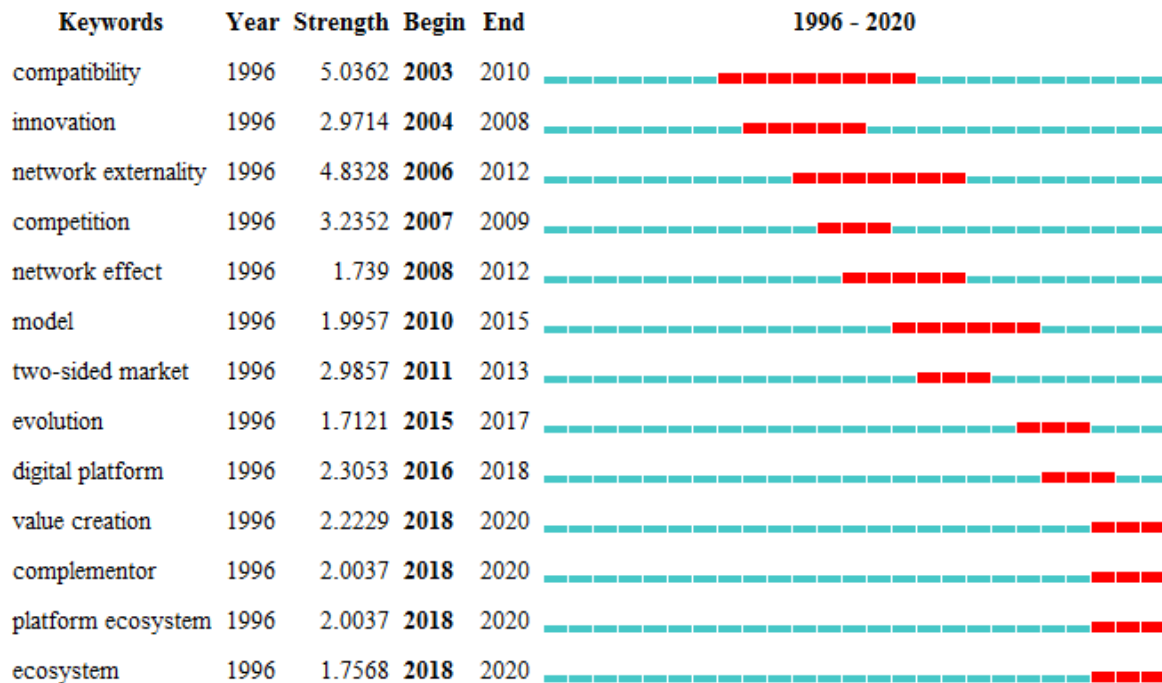


Fig. 4

Figure 4 Busrt words map of platform competition keywords

#### IV. Conclusions

By mapping the literature in the field of platform competition with CiteSpace5.7R1, a visual analysis tool, we examine the publications, important authors, hot topics with co-citation and burst words analysis. We find that early articles mainly focused on the concepts and structure of platform competition. Then the authors moved to focusing on the network externality with game theory, mathematical models and other methods and network effects. Recent articles have been focusing on digital platform, platform ecosystem, innovation ecosystem, value creation, the role of complementors and so on. Such findings would contribute to the future research in the area of platform competition.

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