



Research Hotspots and Evolution Context of Digital Platforms Based on CiteSpace

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Abstract. Digital technology has enabled high-quality economic development, and digital platforms have become a new engine of economic development at home and abroad. In this paper, we use the papers on “digital platforms” in the core database of the web of science as a sample, and use CiteSpace to systematically analyze the related literature from 2012 to 2021 to show the research hotspots and their evolution of them. It is found that the literature on digital platforms shows an overall increase in quantity; the research hotspots focus on the concepts and connotations, outcome variables, and internal influencing factors of digital platforms; the research topics have gone through three stages, from the nascent stage, exploration stage and comprehensive development stage of digital platforms, showing a progressive pattern.

Keywords: digital platform · digital technology · evolutionary lineage · knowledge graph

1 Introduction

The rapid iterative innovation of artificial intelligence, big data and other digital technologies has driven the global socio-economic development in all fields to compete for changes to meet the requirements of the digital paradigm revolution. Countries around the world have taken turns to introduce strategies and support policies related to the development of digital economy, and the speed and impact of the digital economy have reached an unprecedented height, playing a key role in the reorganization of global resource factors and the reshaping of global economic structure. In this context, digital platforms have emerged and gradually become the leaders of the new economy, which have a great impact on the operation mode of organizations, market competition pattern and people’s life, and have also attracted the keen attention of scholars.

At present, scholars have gradually deepened their research on digital platforms based on different contents, methods and perspectives, but there are still limitations. In terms of content, the related field started early, but few scholars have systematically analyzed the literature in this field; in terms of research methods, the content of the related literature is mostly interpreted in a objective way, and few use visualization software to

review and sort out, which cannot objectively reflect the research hotspots and evolution of this research field.

In view of this, this paper aims to analyze the core authors and institutions in the field of digital platforms by means of knowledge mapping software, present a comprehensive knowledge spectrum of digital platform research between 2012 and 2021, and thoroughly study its research hotspots and evolutionary lineage, in order to provide scholars with reference and reference for grasping international research progress in the field of digital platforms, which is significant for promoting practical innovation in this field.

2 Research Methodology

In this paper, we use CiteSpace software to visualize and analyze the literature on digital platforms, and reflect the research hotspots and evolution by drawing a multi-dimensional and dynamic network map. In selecting the data, we use wos core database as the main collection source, search published literature with the title of “platform”, remove irrelevant literature such as reviews and commentaries, and refine the domain categories as “business”, “management”, “economics”. “management” and “economics”, and 478 papers (2012–2021) were obtained after screening, as shown in Fig. 1.

As can be seen from the figure, the number of relevant papers published shows an overall increasing trend, and more and more scholars have started to focus on the topic of “digital platforms”. In particular, after the Digital Economy Advisory Committee was established at the launch of the Digital Economy Agenda in 2017 and several seminars were held, research results on digital platforms continue to emerge.

3 Literature Characterization

3.1 Analysis of Core Authors

According to Table 1, it can be seen that the most published authors are Trabucchi and Buganza (2020), between whom there has been a collaborative network relationship, focusing on the innovation of digital platforms by shifting traditional bilateral business to multilateral business, going beyond platform-based transactions, and mining the implicit value of data. Based on Price’s law, calculation shows that more than 2 publications are considered as core authors. After calculation, the total number of publications of high-producing authors in the sample is 307, accounting for 64.2%, indicating moderate

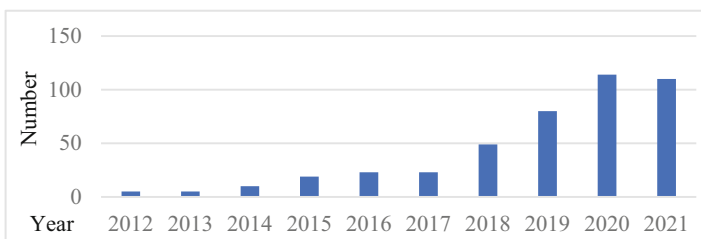


Fig. 1. Dynamic statistics of the number of issued articles

Table 1. Statistics of authors with high publication volume (top 10)

Number	Year	Author	Number	Year	Author
7	2020	Trabucchi & Buganza	4	2019	Kremar
7	2019	Trabucchi	4	2012	Lyytinen
6	2013	Henfridsson	4	2018	Laurell
5	2015	Nambisan	4	2019	Meoli
4	2015	Sorensen	4	2020	Cennamo

Table 2. Statistics of institutions with high publication volume (top 10)

Number	Year	Institution	Number	Year	Institution
22	2013	Copenhagen Business Sch	7	2012	Case Western Reserve Univ
12	2012	Temple Univ	7	2018	Univ Southern Calif
11	2016	Univ Maryland	7	2015	London Sch Econ & Polit Sci
10	2018	Aalto Univ	7	2016	McGill Univ
10	2019	Politecn Milan	7	2019	Univ St Gallen

cooperation among authors, and although some of them form a core author group, they still lack a high-impact and high-output research team.

3.2 Analysis of Core Institution

As can be seen from Table 2, Copenhagen Business Sch is the one with the highest number of articles in the sample, which is ten articles away from Temple Univ, which is the first to enter the field of digital platform and ranks second in terms of the number of articles published, showing its great contribution and fast research speed. In general, most of the research institutions in this field are universities, and the type of institutions is relatively homogeneous, which also shows that universities are the main force in the field of digital platforms.

4 Research Hotspots and Development Trends

4.1 Analysis of High-Frequency Keywords and Research Hotspots

The keywords with a frequency higher than 30 (Table 3) are “platform”, “innovation” and “model”, which are the top three. This is in line with the development trend of the digital economy, which requires enterprises to continuously realize platform, digital innovation and optimization model. As a product of the digital era, the development of digital platforms is inseparable from the changes in organizational models. Therefore,

Table 3. Keyword analysis

Keywords	Frequency	Centrality	Keywords	Frequency	Centrality
platform	133	0.04	social media	52	0.05
innovation	109	0.07	information	50	0.04
model	86	0.13	performance	47	0.03
ecosystem	79	0.08	market	39	0.04
technology	64	0.08	management	36	0.04
strategy	64	0.03	entrepreneurship	34	0.04
competition	59	0.07	network	32	0.02
impact	50	0.03	knowledge	30	0.09

according to the centrality data of keywords, “model” is the most closely related to other keywords and plays a significant intermediary role.

By integrating and categorizing the high-frequency keywords, we can see that the hot spots of digital platform research are as follows.

- (1) Related concepts and connotations. For example, Constantinides et al. (2018) considers digital platforms as the digital resources that enable the interchange of value creation between external producers and consumers, and the resulting digital resources contain digital content and services.
- (2) Resulting variables. “innovation”, “model”, “competition”, “impact” and “performance” are typical high-frequency keywords. Although digital platforms largely determine the direction of corporate innovation, leading to innovation in corporate organizational structure and business models, there are still situations where digital platforms operate better and their corporate innovation performance is relatively low, which leads to the need to shift the focus of research to the path mechanism of innovation output (model, performance, etc.) transformation and the contextual conditions required in its transformation process.
- (3) Internal influences. “technology”, “strategy”, “information”, etc. are all internal factors that influence the development of digital platforms. The digital platform is not just a simple addition of various resources, but a whole resulting from the coordinated integration of all external forces by the platform leader, depending on whether it contains the most optimal internal factors.

4.2 Keyword Clustering and Evolutionary Lineage Analysis

In this paper, the keywords are clustered based on keyword similarity and LLR algorithm, and the information related to the clustered groups is integrated (Table 4). The evolutionary lineage of the digital platform field can be divided into the budding period (#2, before 2014), the exploration period (#1, #3, #4, #5, 2015–2017), and the comprehensive development period (#0, #6, 2018–2021), and the context of the era Conduct literature combing.

Table 4. Cluster analysis

Number	Tightness	Year	LLR Log-likelihood value of the three clustered tag words with the highest
#0	0.621	2018	subjective well-being (8.45), resources (8.45), platform (5.97)
#1	0.701	2016	network effects (16.23), market (12.61), social media (7.89)
#2	0.744	2014	digital infrastructure (11.13), technology and innovation management (5.41), standardization (5.41)
#3	0.728	2016	Ecosystems (8.41), sharing economy (6.59), value co-creation (3.81)
#4	0.76	2017	information technology (14.3), technological innovation (9.99), service innovation (9.52)
#5	0.815	2017	social networks (11.09), social media (7.07), artificial intelligence (6.61)
#6	0.838	2019	digital services (12.12), platform governance (6.05), digital platforms (6.05)

4.2.1 Budding Period

The digital infrastructure of the organization and even the platform ecosystem is closely related to the construction of digital platforms. Digital infrastructure refers to the basic organizational structure with digital technology and the services associated with it (Tilson et al., 2010), which helps companies or their industries to run smoothly. Today's research on digital infrastructure is divided into two main points. One is the architecture of digital infrastructure and the process of its construction and evolution. In addition, the modular hierarchical architecture makes the process of building and evolving digital infrastructures particularly complex, and the existing literature mostly discusses it from the perspectives of strategic choices, learning, and actor networks. Second, governance of digital infrastructure to enable digital innovation. The infrastructures of digital platforms are often reprogrammable, editable, and functionally delayed. Therefore, organizations can further improve or update the digital infrastructure to respond to the external demands of platform changes and flexibility.

4.2.2 Exploration Period

Digital platforms and ecosystems play a crucial role in the innovation activities of companies and are gradually being integrated into a variety of industry sectors such as information technology and aerospace. Since then, digital platform research has gradually entered the exploration phase. The vast majority of scholars provide platform paradigms for traditional enterprises through case studies to guide new directions of innovation (Libert et al., 2016). However, digital platforms have faced enormous challenges since the

beginning and their strategies are extremely complex. Platform-driven, AI technology-enabled ecosystems formed across industries will usher in a new wave of disruptive innovation, and leaders need to explore adaptive and interconnected platform economies to lay the foundation for ecosystem success. As one of the three ecosystems, the platform ecosystem, which includes the sponsors, suppliers, and demand side of the platform, can be used to describe platforms characterized by open, flexible, demand-driven, interactive network architecture and collaborative environments. The coordination of platforms facilitates the creation of diverse entrepreneurial behaviors or the realization of “multi-party markets” for transactions between different groups (Cennamo & Santaló, 2013). Based on the business model perspective of sharing economy, some scholars suggest that platforms can not only store valuable content and resources that cannot be produced by traditional companies by relying on a large number of contributors (Cusumano, 2010), but also increase the flexibility of digital platforms to a certain extent, but there are potential drawbacks of lack of trust and consistent experience.

4.2.3 Integrated Development Period

With the rapid spread of the digital economy, organizations can all use digital platforms to exercise control over products or systems. Companies need to be aware of whether digital platforms will have an impact on them as digital technologies iterate. Digital infrastructure is widely used in design, production and other processes, facilitating the crossing of their boundaries and data sharing with the ecosystem. Based on this, the sense of boundaries among enterprises is gradually blurred, and scholars have begun to study digital platform governance in order to achieve sustainable development. Platform governance is equivalent to the strategy developed by platform owners to create appropriate value and prevent undesirable consequences arising from issues such as conflict of interest or information asymmetry between transaction parties, which affect the use and innovation of the platform (Boudreau & Hagiu, 2009). Scholars have applied organizational governance theory to digital platforms, where platform owners can coordinate the value-creating activities of complementaries through resource sharing, information provision, autonomy granting, and rewards, and further facilitate the production and return of complementary products on the platform. Although command constitutes the core adaptation model of the enterprise, access control, output control, behavioral control, and external relationship control can be used in the platform environment to prevent complementers from bypassing the platform.

5 Conclusion

In this paper, 478 papers retrieved from web of science core database through CiteSpace are analyzed graphically and the following conclusions are drawn. First, since 2012, core authors and core research institutions with high academic influence have been formed in the field of digital platforms. The number of related research literature is fluctuating upward under the passage of time and becoming a popular area of scholarly attention. In addition, the research hotspots mainly include the related concepts and connotations of digital platforms, outcome variables and internal influencing factors. Second, based on

keyword clustering, digital platform research is roughly divided into three development stages. 2014 saw the initial sprouting of digital platforms, and digital infrastructure helps digital platforms continuously iterate to adapt to market changes. 2015 to 2017 entered into in-depth exploration, and its research gradually integrated into information technology, finance and other industry fields, triggering scholars' research on platform strategy. In 2018, it entered a comprehensive development stage, and its related research began to expand to platform governance and other aspects, further deepening the research content in pursuit of sustainable development.

In the context of attaching great importance to the digital economy, the analysis of the knowledge map in the field of digital platforms helps reflect on the problems and explore its development direction, which has certain reference significance for the research and practice of various countries. First, most of the current research on digital platform innovation takes the core technological components that constitute the ecosystem as the unit of analysis, but other units of analysis about the innovation characteristics of digital platforms should be considered in the future to develop a more in-depth and explanatory innovation theory research system. In addition, the impact of digital platforms on our industry and life is also a more important research direction in the future. Second, in order to realize the sustainable development of digital platforms, the current research mostly focuses on the measures and strategies related to the governance of platforms. In the future, we can focus on the vertical changes of the platform governance mechanism and further study the motivation of the changes and how the changes will affect the value creation activities of the complementary players in the platform and the overall performance of the platform. Third, digital platform research is a comprehensive field involving multiple disciplines such as economics and society. In the future, we should continue to strengthen the interdisciplinary integration and find mutual cooperation among interdisciplinary disciplines to continuously enrich the digital platform ecosystem, broaden the research horizon and deepen the system research.

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