

Analysis of Intellectual Property Protection Hotspots and Trends Based on Citespace-Taking WOS Data as an Example (2018-2026)

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Abstract

With the advent of China's modernization, intellectual property protection has been elevated to a national strategic level and is regarded as a core institutional guarantee for encouraging innovation and developing "new-quality productive forces." This paper explores the research trends in intellectual property protection to better contribute to its development. The study uses CiteSpace literature visualization analysis software to conduct a visualization analysis of core intellectual property protection-related literature in the WOS from 2018 to 2026. The study found that keywords cluster into nine major categories, and research on intellectual property has undergone three shifts: Cluster #3 and Cluster #2 in 2018-2021; Cluster #5 and Cluster #6 in 2022-2023; and Cluster #0, Cluster #8, and Cluster #9 in 2024-2026.

Keywords

Intellectual Property, Cite Space, Hot Topics and Trends, WOS.

1. Introduction

Intellectual property is extremely important for national development. Internationally, there is extensive research on intellectual property, and it has evolved significantly over time, primarily to adapt to the needs of the times and society. Taking China, the world's largest developing country, as an example, its intellectual property protection development over the past decade can be divided into two main stages. The first stage (2017-2020) was driven by dramatic changes in the external environment and the initiation of internal transformation. The second stage (2021-2026) is driven by strategic initiative and the urgent need for a strong nation, with its core background being the top-level design of national strategy and the pursuit of technological self-reliance and control. Currently, the country is comprehensively advocating and improving quality and efficiency, serving new productive forces, and emphasizing the importance of intellectual property protection.

In addition, there is a lot of research on intellectual property in the academic community. For example, Peng (2026) conducted relevant research on the abuse of intellectual property rights and proposed different solutions from three dimensions: judicial, administrative and procuratorial and social governance. Ultimately, he hopes to realize the transformation of the regulation of abuse of intellectual property rights from individual cases to overall coordination [1]. Zhu and Liu (2026) used panel data of 276 prefecture-level and above cities in China from 2012 to 2023 to empirically examine the impact of artificial intelligence on the development of new quality productivity and its mechanism, and concluded that a sound intellectual property system should be established to build a good legal environment for artificial intelligence to drive the development of new quality productivity [2]. Yang, Chen and Feng (2026) used data of A-share listed companies from 2015 to 2024 and used generative large language model to identify enterprise data technology patents. They constructed a double difference model to

examine the impact of data intellectual property protection on enterprise data technology innovation and concluded that data intellectual property protection further improved the total factor productivity of enterprises by promoting enterprise data technology innovation [3].

In summary, current research on intellectual property (IP) encompasses numerous branches, such as the abuse of litigation rights, IP related to the development of new productive forces through artificial intelligence, and the impact of data IP protection on enterprise data technology innovation. However, no relevant research has been able to trace the changes in IP research over the past decade. Therefore, to better clarify the development relationships and trends of international IP law and future research directions, this study utilizes CiteSpace software and the WOS database for further literature visualization analysis, aiming to clarify a clearer academic research path for the development of IP.

2. Research Method and Data Source

2.1. Research Method

This study uses quantitative research analysis methods. Quantitative research is a common method used in social sciences, engineering, science and economics, which require data analysis. In the research, it can ensure the objectivity and rationality of data analysis and avoid the errors and influences caused by human subjective factors. In order to better analyze the relevant research on intellectual property rights in the international community from 2018 to 2026 (nearly 10 years), the study used the quantitative tool Cite Space 7.0 developed by Professor Chen Chaomei. Xue used the visualization tool software Cite Space to find that the number of research and development papers on intellectual property rights of traditional Chinese medicine in China showed a peak shape. It was concluded that in the future, attention should be strengthened to the protection of intellectual property rights of traditional Chinese medicine, the research efforts in this field should be continuously increased, and horizontal cooperation research should be strengthened [4]. At the same time, geographical indications, trade secrets and other means should be used to protect the healthy development of the traditional Chinese medicine industry and improve the government-university-enterprise cooperation model to cultivate compound talents who understand both the pharmacology of traditional Chinese medicine and are familiar with international intellectual property rules. In summary, the core functions of the tool are knowledge graph construction and research trend prediction, which can achieve better analysis results.

2.2. Data source and analysis process

The research data came from the Web of Science Core Collection database. The search was conducted using the keyword “intellectual property” and limited to OA publications, English language, and a time range of 2018-2026. A total of 2,336 articles were selected, and the top 1,000 articles were exported in plain text format for analysis based on relevance.

3. Analysis of Research Trends in Intellectual Property

3.1. Keyword Cluster Analysis

Through keyword co-occurrence clustering (LLR) and time trend analysis, it identifies eight main areas of current international research on intellectual property: Intellectual Disability (#1), Intellectual Property Rights Protection (#2), Covid-19 Vaccine (#3), Intellectual Disabilities (#4), Open Innovation (#5), Evolutionary Game Analysis (#6), Productive Development Partnership (#7), and Business Model (#8). See Figure 1 for details. It selected two clusters with the most clusters for further detailed analysis: Intellectual Property Rights Protection (#2) and Evolutionary Game Analysis (#6).

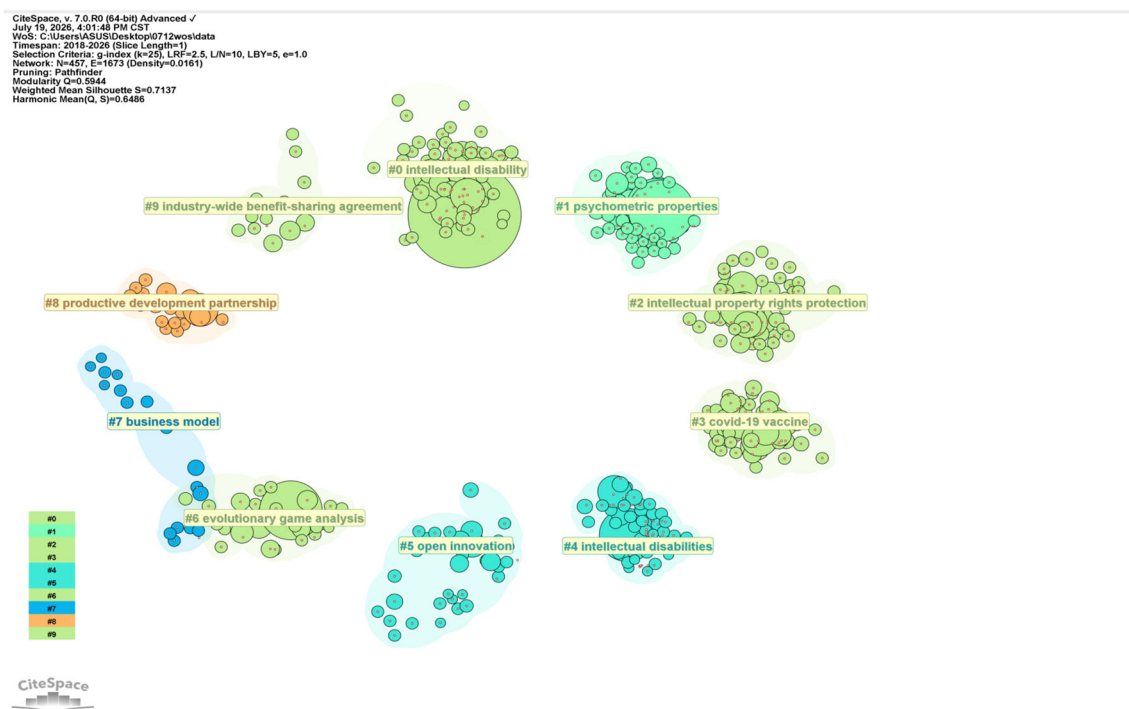


Figure 1. Clustering (co-occurrence) analysis of intellectual property keywords

For the Intellectual Property Rights Protection (#2) cluster, the keywords included include Protection (appeared 29 times), Intellectual Property Rights Protection (appeared 20 times), Empirical Analysis (appeared 19 times), and Positive Effect (appeared 16 times). The research volume of cluster #2 (Intellectual Property Rights Protection) is large and the clustering characteristics are significant. The reasons are as follows: First, policy-driven and institutional changes. In recent years, major economies around the world have continued to strengthen the legislation and enforcement of intellectual property protection. For example, the promulgation of China's "Outline for Building a Strong Intellectual Property Nation (2021-2035)", the implementation of the U.S. "Trademark Modernization Act", and the adaptive adjustments of developing countries to the intellectual property system under the TRIPS Agreement framework have provided continuous policy hotspots and institutional change issues in this field. Second, the needs of social development and digital transformation. For example, Zhai Yun, Jiang Minjuan, and Wang Weiling (2021) analyzed the mechanism of digital transformation leading the modernization of national governance from four dimensions: efficiency, value-added, overall, and openness, based on Chinese practice [5]. Furthermore, this clustering encompasses perspectives from multiple disciplines, including economics, management, and law, forming an analytical paradigm centered on empirical analysis, positive effects, and nonlinear relationships. Scholars have conducted extensive empirical studies on the correlation mechanisms between IPR protection and variables such as economic growth, corporate innovation, and foreign direct investment. The maturity of the methodology and the availability of data have further strengthened the clustering effect in this field, enabling related research to form a highly cohesive academic community within the co-citation network. In summary, the combined effect of these three factors has shaped the scale advantage and cluster significance of this research topic.

For cluster #6 (Evolutionary Game Analysis), the keywords it encompasses include Intellectual Property Protection (85 occurrences), Sustainable Development (13 occurrences), Technology Transfer (10 occurrences), Digital Economy (8 occurrences), and Economic Development (6

occurrences). Cluster #6 (Evolutionary Game Analysis) has a large research volume and significant clustering characteristics, for the following reasons: First, policy support. As countries worldwide elevate intellectual property protection to a national strategy—such as China’s 14th Five-Year Plan emphasizing intellectual property empowering high-quality development, the advancement of the EU’s Intellectual Property Action Plan, and the urgent need for institutional optimization in developing countries under the TRIPS framework—continuous policy guidance has provided rich scenarios for institutional change and reform issues in this field. Second, the advent of the digital economy era has profoundly changed the creation, use, and protection models of intellectual property. Real-world problems such as infringement governance in cross-border e-commerce, the evolution of digital technology-driven intellectual property operation platforms, and the synergy between enterprise digitalization and green technology innovation are emerging one after another. The demand for new governance mechanisms in social development has directly driven the widespread application of evolutionary game theory methods in this field. Thirdly, there is evolutionary game, which refers to the strategic interaction of multiple stakeholders involved in intellectual property protection, such as the regulatory game between the government and enterprises, the competitive evolution between innovators and imitators, and the institutional game between developed and developing countries. Its dynamic evolutionary characteristics are highly consistent with game theory analysis. In addition, Shen Yuhang et al. (2026) divided the evolution of digital transformation research into three stages and summarized three core driving factors: technological challenges drive the deepening of research, business model reconstruction expands the topics, and digital basic research rises. Finally, they concluded that digital entrepreneurship has become an important support for digital industrialization and an important practice for digital innovation value creation, promoting the continuous emergence of digital-based research in academia [6].

3.2. Time Trend Analysis

From 2018 to 2026, the research focusses gradually shifted from institutional protection to value protection (see Figure 2 for details), undergoing three stages of evolution, which are analyzed in detail below.

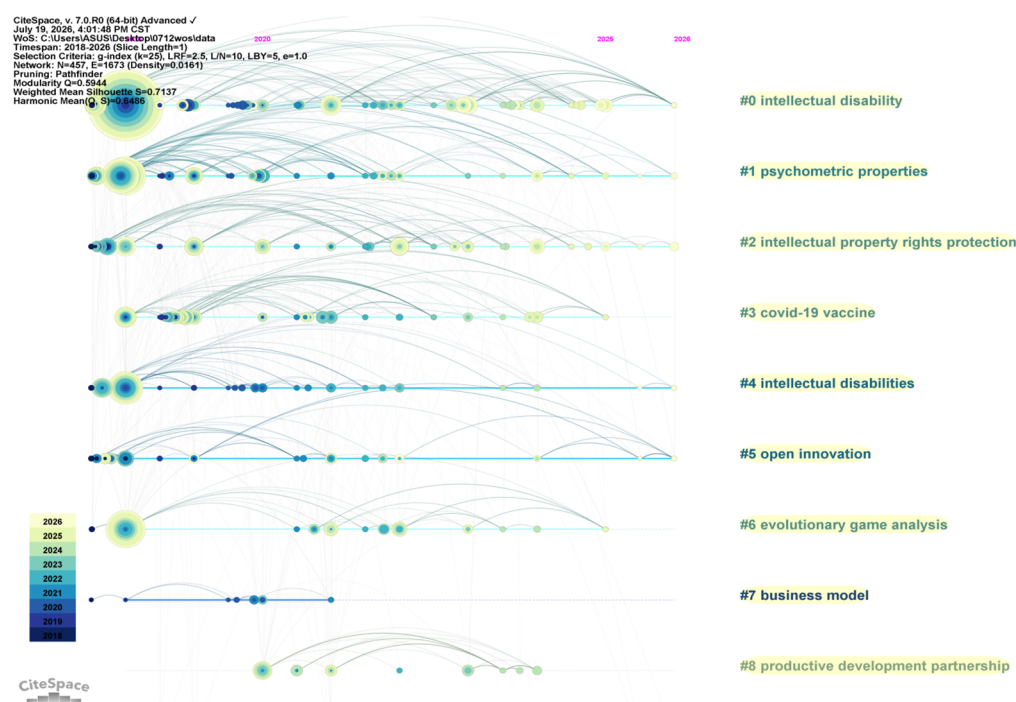


Figure 2. Time Trend Analysis of Intellectual Property Rights

Between 2018 and 2021, clusters #3 (WTO TRIPS Agreement) and #2 (Intellectual Property Rights Protection) formed the core nodes, exhibiting large cluster sizes and dense internal connections. This reflects a focus on the intellectual property system itself during this period, encompassing research on intellectual property, the TRIPS Agreement, and public health. The research hotspots during this timeframe were primarily driven by three dimensions: policy, social development, and disciplinary foundations. On the policy front, major global economies successively introduced national intellectual property strategies, China's "Outline for Building a Strong Intellectual Property Nation (2021-2035)" entered its development phase, and the North-South rules-based competition within the TRIPS framework intensified. The policy dividends of institutional development spurred a large amount of policy evaluation and empirical research. CiteSpace's burst word analysis revealed that "intellectual property" had the highest burst intensity in Cluster #0, confirming its central role in early research. In terms of societal needs, the Covid-19 outbreak propelled vaccine intellectual property exemptions and public health issues to the forefront of research. The concentrated emergence of nodes such as "covid-19 vaccine" and "compulsory licensing" in Cluster #3 directly reflects the shaping effect of the real crisis on the research agenda. On a disciplinary level, intellectual property has gradually established its academic status as an interdisciplinary field of law, economics, and management. The formation of this multidisciplinary landscape has fostered the growth of the research team and the continuous output of research results.

Between 2022 and 2024, research began to focus on Cluster #5 (Open Innovation) and Cluster #6 (Evolutionary Game Analysis), indicating a shift in research perspective from static institutional analysis to dynamic mechanism exploration. CiteSpace time zone maps show that keywords such as "digital economy" and "AI-generated content" emerged intensively from 2022 onwards, becoming key links connecting Cluster #6 and Cluster #5. Further exploration revealed that, in terms of policy, the enactment of the EU's Digital Markets Act and Digital Services Act, as well as China's 14th Five-Year Plan's emphasis on high-quality development of intellectual property, provided institutional analysis samples for this type of research. In addition, evolutionary game analysis methods, due to their ability to characterize the multi-party strategic interactions during institutional change, gained widespread application during this stage. In terms of support, strong funding from universities and research foundations for the intersection of digital transformation and intellectual property provided a solid resource guarantee for the rapid growth of research during this stage, directly promoting the formation and expansion of several emerging clustering branches.

In 2025-2026, research focus shifted to emerging clusters such as Cluster #0 (Operational Resilience), Cluster #8 (Productive Development Partnership), and Cluster #9 (Industry-wide Benefit-sharing Agreement), with traditional protection-centric clusters gradually shifting towards application and governance. The reasons for this shift can be broken down into three dimensions: policy, industry practice, and increased international competition. In terms of policy guidance, the 15th Five-Year Plan explicitly proposed a strategic shift in intellectual property from pursuing quantity and scale to cultivating value realization, emphasizing the institutional foundation function of intellectual property in empowering the development of new productive forces. CiteSpace burst word analysis also shows a significant increase in the burst intensity of keywords such as "sustainable development" and "digital innovation" around 2025, directly reflecting the shaping effect of policy trends on research frontiers. Furthermore, the "empirical evidence" mediation centrality reached 0.12, connecting Cluster #0 and Cluster #9, indicating that empirical research methods continue to play a bridging role across clusters in exploring new issues. In terms of deepening industrial practice, corporate intellectual property management has shifted from exclusive protection to value co-creation, with patent pool construction, governance of standard-essential patents, and industrial collaborative innovation becoming new research growth points. For example, the emergence of nodes such

as “industry-wide benefit-sharing agreement” and “geographical indication” in Cluster #9 reflects benefit-sharing mechanisms in industrial practice. Under the changing global geopolitical landscape, intellectual property has become a core element in international discourse power competition, with foreign-related intellectual property risk prevention and control, proactive shaping of international rules, and traditional knowledge protection under the WIPO framework becoming new research frontiers.

4. Finding and Conclusion

This study, using CiteSpace software, conducted keyword clustering and time trend analysis on intellectual property protection literature in the WOS database from 2018 to 2026, forming nine clusters. Among the more popular research areas were Intellectual Property Rights Protection and Evolutionary Game Analysis. Furthermore, the time trend analysis revealed a three-stage transition from institutional protection to value utilization. The first stage (2018-2021) focused on the institutions themselves, with the TRIPS Agreement and intellectual property protection at its core, emphasizing intellectual property rights. The COVID-19 pandemic also spurred a surge in discussions about vaccine patents and public health. The second stage (2022-2024) shifted research towards dynamic mechanisms such as open innovation and evolutionary game theory, with keywords like digital economy and AI-generated content appearing frequently, marking a shift from static institutional analysis to dynamic governance exploration. The third stage (2025-2026) saw a shift in focus towards emerging clusters such as operational resilience, industry development partnerships, and industry benefit-sharing agreements, indicating a shift in core issues from exclusive protection to value co-creation and collaborative governance.

Based on the above analysis of research hotspots and trends, the study found that future research on intellectual property (IP) will increasingly focus on value realization and ecological governance. Therefore, it needs to be deepened by integrating various aspects. For example, governments should strengthen their international IP risk prevention and control systems and participation in international rules, promoting a shift from passive adaptation to proactive planning. Enterprises should focus on patent pool operation, governance of standard essential patents, and collaborative innovation within industries, building an IP strategy based on value co-creation. Universities and research institutions should deepen patent industrialization mechanisms and financial innovation support to promote the transformation of scientific and technological achievements into new productive forces. In terms of education, interdisciplinary IP talents should be cultivated, integrating digital literacy and interdisciplinary perspectives. Regarding innovation incentives, a comprehensive institutional ecosystem covering the entire chain of creation, utilization, protection, and management needs to be established. Institutional innovation should support IP's transition from quantity-driven to quality-driven development, providing a solid institutional foundation for achieving Chinese-style modernization. This study is limited by time and space constraints, and the selected databases and analysis timeframe are limited. Future research can expand the database and timeframe to better analyze the dynamics of IP development.

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