



Visualization Research on Research Hotspots of China's Science and Technology Policy Based on Text Mining

Xinfeng Wang^a, Zihao Cao^b, Jian Ma^c

North China University of Technology Beijing China

^a3176332470@qq.com, ^b975342493@qq.com, ^cijanma2021@163.com

Abstract. This study employs text mining visualization analysis methods to analyze academic papers on China's science and technology policy field in the past 5 years (2019-2023), and excavates the changing trends of research hotspots in science and technology policy. The research shows that during this period, China's science and technology policy research mainly focused on scientific and technological innovation, industrial policy, technological progress, policy support and other aspects. This study provides visualization analysis support to focus on the frontiers of China's science and technology policy research, and also provides knowledge support for future science and technology policy making.

Keywords: text mining; science and technology policy; hotspot analysis

1 Introduction

With the promotion of China's national innovation-driven development strategy, China's science and technology policy has developed rapidly in recent years, covering a wide range and having far-reaching influence. In order to better study and grasp the changing trends of science and technology policies, it is of great significance to analyze policy documents using text mining techniques ^[1]. This study selects the science and technology policy in the critical period from 2019 to 2023 as the research object, and uses text mining technology to conduct an in-depth analysis of the policy documents. The research methods mainly include word frequency analysis and keyword co-occurrence analysis, so as to reveal the development characteristics and change trend of China's science and technology policy during this period. In addition, the visual presentation of the analysis results is helpful to better understand the development of China's science and technology policy, and provides a useful decision-making basis for policy researchers, practitioners and relevant government departments. At the same time, this study also provides a new analytical method and idea for the research and formulation of science and technology policy in the future.

2 Research Methods and Data Sources

This paper uses Cite Space software for bibliometrics analysis. Cite Space software can excavate the characteristics and degree of interconnection between literatures in the studied field, mainly conducting visualized analysis on keyword frequency and appearance time.

The research data comes from CNKI database master's and doctoral theses from 2019-2023. Using "science and technology policy" as the theme term for retrieval, after removing literatures without the keyword "science and technology policy", a total of 388 Chinese literatures were obtained.

The CNKI papers are named as Download and imported into Cite Space tool respectively. The time zone is set as "2019-2023", function is set as "keyword co-occurrence", and other parameters are default. Click "GO" to start plotting the knowledge map. The specific process is shown in Fig. 1. Data mining and visualization flowcharts

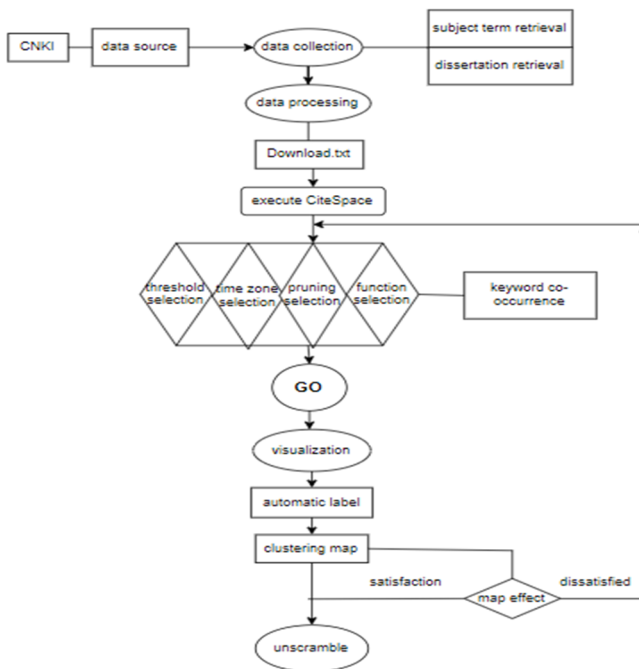


Fig. 1. Data mining and visualization flowcharts

3 Research Hotspot Analysis

3.1 High-Frequency Keyword Analysis

Generally speaking, keywords largely reflect the core of research, and the keyword word frequency distribution characteristics can detect the hot spots in the field of the

research topic. Select "key word" as the node, run Cite Space, get the keyword word frequency, make statistics on the keywords of China's science and technology policy research literature, and retain the top 12 keywords, as shown in the table

Table 1. Keyword frequency statistics table

Serial number	Frequency	keyword
1	38	Scientific and technological innovation
2	34	Science and technology policy
3	31	Policy tools
4	15	Scientific and technological talents
5	14	Tax incentives
6	12	Policy implementation
7	12	Influencing factors
8	12	Fintech
9	9	Public policy
10	8	Policy
11	7	Text analysis
12	7	Technology and finance

In Table 1. Keyword frequency statistics table, we can see that the frequency of scientific and technological innovation is the highest 38 times, science and technology policy 34 times, and policy tools 31 times, which reflects that science and technology policy, science and technology innovation and policy tools are the core focus of this research field [2]. Among them, science and technology policy is the central theme of the entire research, science and technology innovation is the key content that science and technology policy needs to support and guide, and policy tools are the key means to achieve the goals of science and technology policy.

The second place in the centrality ranking of scientific and technological innovation indicates that the research pays more attention to how to promote scientific and technological innovation through scientific and technological policies, and scientific and technological innovation is the starting point and foothold of scientific and technological policy formulation and adjustment, indicating that researchers in the field of science and technology are very interested in the development of new technologies, new methods and innovative solutions.

The high frequency of Science and technology policy and policy tools indicates that researchers are not only deeply interested in the formulation and evolution of Science and technology policy, but also concerned about the specific means and methods of implementing Science and technology policy. Research may involve policies at the national, regional, or organizational levels, including support for innovation, investment in scientific research, industrial development, etc., as well as tools such as financial incentives, regulatory development, and research funding allocation. Understanding the characteristics and directions of science and technology policy can help to understand the overall strategy and vision of a country or region in the field of science and technology, and understanding the use and effect of policy tools can help formulate

more effective science and technology policies and promote scientific and technological innovation and industrial upgrading.

The co-occurrence of the two keywords of policy implementation and influencing factors reflects that researchers not only pay attention to the policy formulation process, but also pay deep attention to the effectiveness of the policy, the implementation effect and the influencing factors in the actual operation process. This may include how governments, organizations or societies ensure that the science and technology policies they develop have a real and substantial impact, changes in the social and economic environment, stakeholder engagement, and the development of technology itself. This holistic perspective can help to build a more effective Science and technology policy framework to promote Scientific and technological innovation and development.

3.2 Research Hotspot Analysis

As can be seen from Fig. 2. Keyword co-occurrence time line chart, with the passage of time, the perspectives and methods of science and technology policy research have shown new characteristics and changes. Specifically, in 2019, the frequency of words such as "scientific and technological innovation" and "scientific and technological policy" ranked first, indicating that the academic community focused more on scientific and technological innovation and policy formulation. The emergence of "policy tools" indicates that research has begun to focus on policy approaches and methods [3].

By 2020, quantitative research methods such as policy implementation effect evaluation and text analysis began to attract attention. The increase in the frequency of policy implementation shows that the academic community has paid more attention to the effect of policy implementation.

In 2021, technologies such as "deep learning" and "artificial intelligence" were widely discussed, demonstrating the efforts of academia to grasp the frontiers of science and technology. The simultaneous emergence of "text classification" further confirms the advancement of quantitative research methods. [4]

In 2022, the statistical term "double difference" appeared, marking a more precise and rigorous research method. The emergence of "regional innovation" shows that local differences are carefully studied.

In 2023, the emergence of new concepts such as knowledge gene coupling and digital economy research indicates that the academic community is expanding its research horizons and paying attention to new issues in science and technology policy formulation. The emergence of the "digital economy" reflects the attention of the academic community to new forms.

In summary, in the past five years, the research on science and technology policy has shown the characteristics of deepening research level, refining research methods, and expanding research perspectives. The academic community is striving to promote the combination of theory and empirical evidence, and keep pace with the frontier of scientific and technological innovation, in order to provide more substantive support for scientific and technological policy decision-making [5]. This trend of in-depth development has made new breakthroughs in problem awareness, methods and

knowledge systems in science and technology policy research, and provided valuable intellectual support for the construction of a scientific and technological power [6].

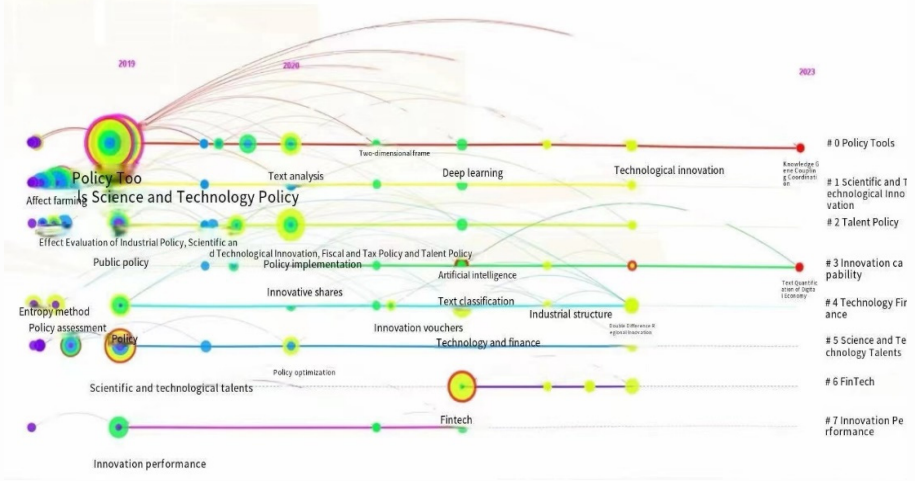


Fig. 2. Keyword co-occurrence time line chart

4 Conclusions

In the five years from 2019 to 2023, the research on science and technology policy continued to deepen, the research perspective gradually expanded from the macro to the micro level, and the research methods also tended to be improved. From the perspective of time change, science and technology policy research is deepening the combination of theory and empirical evidence, keeping pace with the frontier of science and technology innovation, in order to provide more substantive support for policy decision-making. In general, the application of text mining and visualization technology allows us to clearly grasp the development context and hot topic evolution of science and technology policy research in the past five years. This provides us with an effective means to further grasp the trend of policy research, carry out regular research, and provide knowledge support for policy formulation [7]. This study also provides a useful reference for further promotion of text analysis and scientific decision support research.

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