



A Review of Research on Science and Technology Innovation in Universities since the New Era - A Bibliometric Analysis Based on Cite Space

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Abstract. Cite Space software is used to conduct a visual econometric analysis of 340 pieces of research literature on scientific and technological innovation in colleges and universities in the new era in the China Knowledge Network (CNKI) database from 2013 to 2023. Through in-depth analysis of the basic characteristics and research hotspots of university science and technology innovation research literature, the study clarifies the research status quo, reveals the evolution trend and law of research hotspots, and provides certain references for the subsequent research. It is found that since the new era, the research field of scientific and technological innovation in colleges and universities can be divided into two stages of development based on the quantitative characteristics of the literature, one is the period of 2013-2017, which is the guidance period of the 18th National Congress and the period of slow development, and the other is the period of 2018-2023, which is the guidance period of the 19th National Congress and the period of high-speed development. The research hotspots are centred on performance evaluation, influencing factors, talent cultivation, and results transformation. Based on this, scientific and technological innovation in colleges and universities should respond to the development requirements of further comprehensive deepening of reform, in-depth reform of the evaluation system and incentive mechanism in support of scientific and technological innovation, and multifaceted synergy to accelerate the transformation of scientific research results into social productivity.

Keywords: New Era, Scientific and Technological Innovation in Universities, Bibliometric Analysis

1 Introduction

Universities as the main position of education, science, technology and the cultivation of talents, its strategic position in the national development plan has always been given high importance, and now it has become the hub of the integrated development of education, science and technology talents. And in the construction of Chinese characteristics, world-class universities and advantageous disciplines, various types of colleges and universities have also explored the advantages of their own resources to meet the

high level of research, such as classification characteristics of the development path. With the implementation of policies and strategies related to scientific and technological innovation in colleges and universities, domestic scholars have carried out in-depth research in the field of scientific and technological innovation in colleges and universities, which has produced a wealth of academic results, and the analysis and summary of these results will help to promote the depth of the subsequent research.

Based on this, this study uses Cite Space software to visualise and analyse 340 academic journals with the theme and keywords including ‘scientific and technological innovation in colleges and universities’ from 1 January 2013 to 31 December 2023 in China National Knowledge Infrastructure (CNKI), so as to provide corresponding references for the subsequent research.

2 Analysis

2.1 Annual Distribution of Literature

The total amount of literature issued in a certain field represents the current level of theoretical development of the research in this field, while the changes in the number of articles issued in the past years reflect the changes in the heat of the research in this field. According to the search results of China Knowledge, based on the year statistics function of Cite Space software, the literature data were screened, so as to draw a map of the amount of literature issued in the research of science and technology innovation in universities from 2013 to 2023.

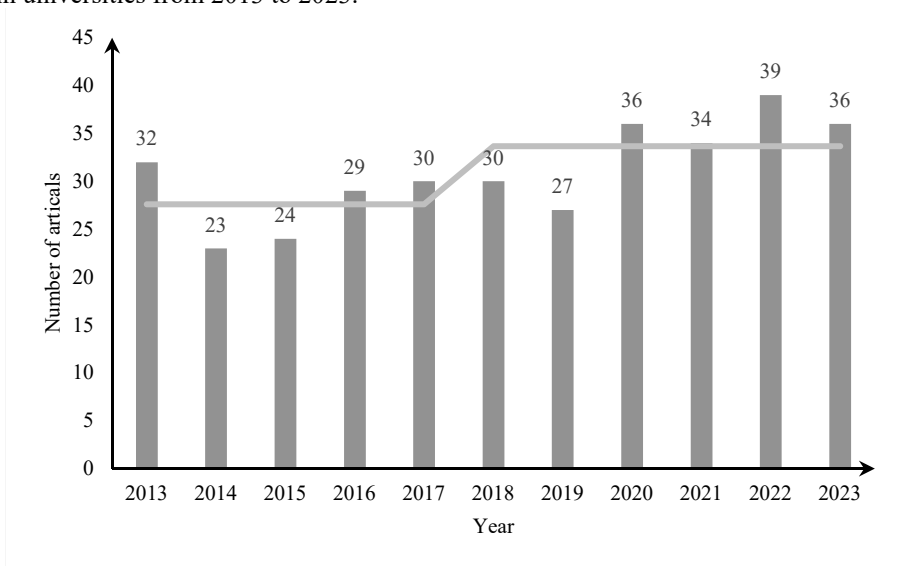


Fig. 1. Graph of the number of publications in the research area between 2013 and 2023.

As can be seen from Figure 1, there are a total of 340 articles in the literature from 2013-2023. According to the 2013-2023 trend of research literature and combined with

the policy background, the research on scientific and technological innovation in colleges and universities is divided into two phases, the first phase is 2013-2017, the 18th guidance period and the slow development period, with an annual average of about 28 articles. After analysis, it is believed that 2013 is the opening year of the 18th National Congress, under the guidance of the new development policy, the academic community for the research status of the field and the development of the systematic analysis of the problem, to lay the foundation for the reform and optimisation during the 18th National Congress.

The second stage is 2018-2023, the nineteenth guidance period and high-speed development period, with an annual average of about 34 articles. During this period, the heat in the field of science and technology innovation research in colleges and universities rises, and the number of articles issued increases year by year to reach a peak in 2022. The 19th CPC National Congress was held in 2017, pointing out the strategic deployment of innovation in the next five years, such as ‘deepening the reform of the science and technology system, and establishing a technological innovation system that is enterprise-driven, market-oriented, and deeply integrated with industry, academia, and research’. Focusing on the strategic direction of national development, scholars then began to discuss and explore the construction of scientific and technological innovation system in universities, and the collaboration of industry, academia and research to promote the high-quality development of scientific and technological innovation in universities.

2.2 Analysis of Institutions

The amount of institutional publications can analyse the distribution of scientific research power, and according to the author's publication institution analysis function of Cite Space software¹, the distribution of publication institutions in the field of science, technology and innovation research in colleges and universities can be obtained from 2013 to 2023. Among the top ten issuing institutions, there is one government agency, three comprehensive institutions, five polytechnic institutions and one teacher training institution. This shows the government's guidance on the direction of the development of science and technology innovation in colleges and universities as well as the exploration of comprehensive and polytechnic colleges and universities to improve their own scientific and technological innovation capabilities.

2.3 Analysis of Hot Research Areas

Cite Space software is used for keyword clustering, and the words with obvious same characteristics in the keywords are taken as the object of clustering, and the keyword clustering table is obtained through ‘Summary cluster’. Accordingly, it can be found that the research field of science and technology innovation in universities mainly focuses on four aspects: performance evaluation, influencing factors, talent cultivation, and transformation of achievements.

Performance evaluation. The research on scientific and technological innovation performance of colleges and universities is generally carried out from three aspects, one

is the selection of the evaluation subject², some scholars choose to reflect the scientific and technological innovation status of the school with the evaluation of teachers' scientific research performance, some scholars use the scientific research performance of scientific research project teams as the scientific and technological innovation performance of colleges and universities, and of course, some scholars choose to use the sample of colleges and universities as a whole as the main body of the evaluation of scientific and technological innovation performance of colleges. The second is the choice of evaluation perspectives, mainly including input-output perspective, key performance indicators perspective and balanced scorecard perspective, of which the most commonly used is the input-output perspective, through the collection of sample data for evaluation³, the results are more objective and reasonable. Thirdly, the evaluation results put forward corresponding countermeasures, some scholars from the perspective of scientific research personnel, proposed to optimise the assessment mechanism, improve the incentive mechanism for scientific research, stimulate the innovation vitality of scientific research personnel, and enhance the performance of scientific and technological innovation in colleges and universities.

Influencing factors. Since the new era, scholars have analysed and tested various hypothetical factors based on different theories and applying different models, including the factors of colleges and universities' own development, the factors of regional development, and the factors of national policies and government measures⁴, and explored the direction and degree of influence of colleges and universities' scientific and technological innovation capacity by each factor. Generally speaking, it can be summarised into three aspects: firstly, the internal factors of universities such as scientific research basic conditions, scientific research resources input and allocation, and scientific research team construction; secondly, the external factors of universities such as regional political environment, regional development level, degree of opening up to the outside world and intellectual property rights protection mechanism; and thirdly, the internal disciplinary synergies of universities, strategic synergies between universities and international scientific and technological exchanges and cooperation, as well as synergistic factors of internal and external subjects.

Talent cultivation. Scholars either summarise and analyse the current mode of cultivation of scientific and technological talents in major domestic universities, identify problems and put forward suggestions for improvement, or analyse the mode of cultivation of talents in foreign universities and explore the experience to draw on. Under the new development pattern, the talent cultivation mode of colleges and universities should also change the new thinking, realise the transformation from skill training to personality cultivation, from merit-based cultivation to comprehensive cultivation, and from plan management to service management, uphold the new development concept, reconstruct the direction of young innovative talents cultivation, cultivation mode and cultivation environment⁴, strengthen the cooperation between schools and enterprises for joint cultivation, strengthen the professional strength and vocational literacy, and reconstruct the innovative talents cultivation of colleges and universities of the new development path⁵.

Transformation of achievements. The Fifth Plenary Session of the 19th CPC Central Committee put forward the 'self-reliance of science and technology as a strategic

support for national development', the key is to deepen the institutional reform, and strive to solve the transformation of achievements, market application of the 'last kilometre' of the organic convergence of the problem⁶. Some scholars have conducted qualitative or quantitative evaluation of the transformation ability of scientific and technological innovation achievements of universities, analysed the existing problems, and put forward relevant countermeasures such as reforming the communication incentive mechanism in the internal scientific research management mechanism⁷. Some scholars also study the literature related to the transformation of scientific and technological achievements in universities, and put forward further research proposals from the perspective of academic research⁸, such as building academic research networks, integrating theories and case studies, strengthening the main body status of colleges and universities, strengthening the empirical study of factors, and comprehensive research on the supply side and the demand side.

3 Conclusion

This study draws the following conclusions by visualising and analysing 340 articles about 'scientific and technological innovation in colleges and universities' published in academic journals from 2013 to 2023 in the China Knowledge Network database.

In terms of the number of articles published, the research on scientific and technological innovation in colleges and universities shows a growing trend in stages from 2013 to 2023, which can be divided into two stages according to the policy background. From 2013 to 2017, it focused on the research on the transformation of the development mode of scientific and technological innovation in colleges and universities. From 2018 to 2023, it focused on the construction of science and technology innovation system in universities, and the discussion and exploration of industry-university-research collaboration to promote the high-quality development of science and technology innovation in universities. From the point of view of the issuing institutions, there are many institutions involved in the scientific and technological innovation of colleges and universities, but the degree of inter-institutional cooperation is relatively low, and interdisciplinary and inter-institutional academic cooperation needs to be further strengthened in the future. From the perspective of keyword clustering, the research hotspots on university science and technology innovation mainly focus on four aspects, namely performance evaluation, influencing factors, talent cultivation, and results transformation. Therefore, scientific and technological innovation in colleges and universities should serve the national strategic needs, deepen the reform of the system and mechanism of scientific and technological innovation management, build diversified scientific research evaluation standards, focus on the transformation and application of achievements, and promote the development of new quality productivity.

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