



Research Hotspots and Trends in University Innovation and Entrepreneurship Education in the Context of the Digital Economy: A Visual Analysis Based on CiteSpace

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Abstract. This study uses CiteSpace to perform a visual analysis of pertinent literature from the core collections of CNKI and WOS (2014-2025) in order to shed light on the research dynamics, thematic evolution, and differences in domestic and foreign research on university innovation and entrepreneurship education (IEE) in the context of digital economy and educational digitization. The results show that: (1) International research displays a wave-like oscillating pattern, but domestic research in China follows a policy-driven inverted U-shaped trajectory. (2) The majority of academics and institutions, both domestic and foreign, work autonomously, lacking organized core research clusters and collaboration networks. (3) Both domestic and international research are paying close attention to the digitization of IEE. Meanwhile, domestic research focuses on the practical exploration of talent cultivation and innovation and entrepreneurship education. Foreign research focuses more on theoretical construction and micro empirical analysis, emphasizing the deep integration of entrepreneurial behavior and social effects. (4) This study constructs an “objective-path-carrier” analysis framework, which can provide a reference for promoting high-quality development of innovation and entrepreneurship education in the digital economy era.

Keywords: Innovation and entrepreneurship education; digital economy; education digitalization; CiteSpace; visual analysis

1 Introduction

The cultivation of new productive forces and the implementation of digital education require integrated coordination among education, technology, and talent. The 20th National Congress of the Communist Party of China emphasized that “education, science and technology, and talent are the fundamental and strategic supports for the comprehensive construction of a socialist modernized country”. IEE, Innovation and entrepreneurship education, centered on cultivating students’ innovative thinking, digital literacy, and entrepreneurial practice ability, serves as the core carrier for universities to connect with industrial transformation and cultivate interdisciplinary talents ^[1]. It is also

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a key link in connecting the education chain, talent chain, industry chain, and innovation chain^[2]. Since “Internet Plus” rose to a national strategy, the integration research of information technology and IEE continues to heat up. With the deep penetration of digital technology, the digital economy has become the core engine for cultivating new driving forces. It puts forward disruptive requirements for the goals, scenarios, and paradigms of entrepreneurship and innovation education in universities. China is advancing the process of digitalization in education. However, the traditional “Internet plus”-oriented innovation and entrepreneurship education has become difficult to adapt to the complexity of the digital economy^[3]. The digital transformation of talent cultivation and the intelligent upgrading of practical environments have become inevitable trends. However, systematic visual analysis of domestic and international research trends comparison, cooperative network evolution, and hotspot iteration remains relatively weak^[4]. In order to close this gap, this study uses CiteSpace for multidimensional visual analysis of key literature from CNKI and WOS (2014-2025). It describes hotspot distributions, evolutionary trajectories, and characteristics that set domestic and international research apart and summarizes the “objectives-pathways-carriers” model.

2 Data Sources and Research Methods

2.1 Data Sources and Methods

This study employs CiteSpace 6.2.R4 to conduct a visual analysis of the literature on “innovation and entrepreneurship education in colleges and universities under the background of the digital economy,” covering seven dimensions: annual distribution, authors, institutions, keyword co-occurrence, clustering, time zones, and prominence analysis, thereby revealing the research status, hotspots, and trends in this field.

3 Bibliometric Analysis

3.1 Temporal Distribution of Publications

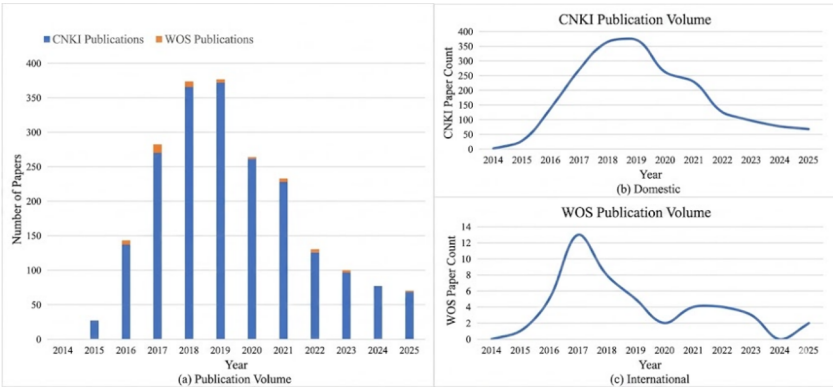


Fig. 1. Annual Publication Volume and Publication Trend.

Based on the annual distribution of publication volume, the evolution trend of research hotspots and directions may be determined. Analysis of the core collections of CNKI and WOS from 2014 to 2025 reveals that domestic publication volume occupies an absolute dominant position and exhibits policy-driven inverted U-shaped growth. In contrast, the international literature shows a market-oriented, fluctuating growth trajectory and tends to concentrate on specific sub-sectors, such as employment quality. The two have significantly distinct development logics (Figure 1).

3.2 Collaboration Networks (Authors and Institutions)

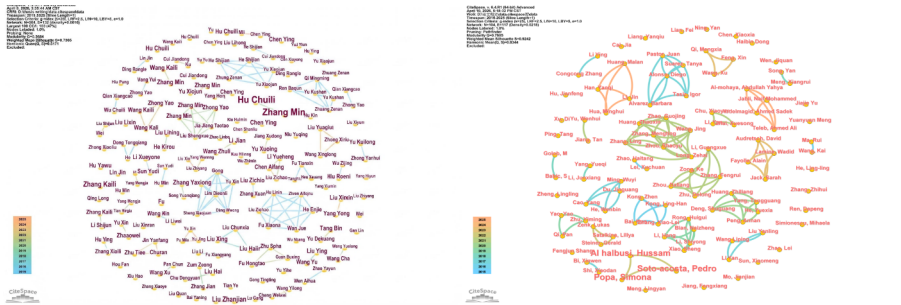


Fig. 2. Author Co-occurrence Network Map from CNKI and WOS.

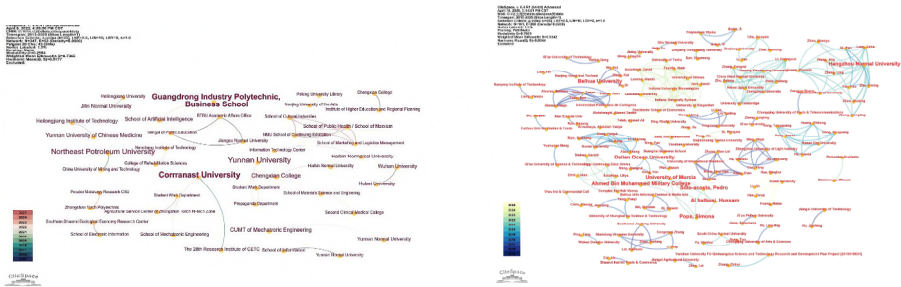


Fig. 3. Institutional Collaboration Network Map from CNKI and WOS.

The author co-occurrence network can reveal the distribution and collaboration depth of disciplinary research groups, while the institutional collaboration network graph can present the spatial distribution and correlation degree of research subjects. An analysis of the core CNKI and WOS collections from 2014 to 2025 demonstrates that the domestic author collaboration network in China is sparse and fragmented (384 nodes, 132 connections, a network density of 0.0018). Although there are local small-scale collaborations, there is a dearth of deep cross-institutional collaboration. A stable core team has not been developed. The collaboration network of the international author comprises 104 nodes and 117 connections, with a network density of 0.0218, indicating that academic cooperation and connections between international scholars are closer than those in China, but still at a loose level. The collaborative research system at the global

High-frequency keyword clustering analysis can reveal the distribution of core hotspots and the structure of knowledge systems. Previous scholars have proposed that when the clustering module value Q is greater than 0.3, it indicates that the network community structure is significant, and when the average silhouette value S is greater than 0.5, it indicates that the clustering results are reasonable and robust. Figure 5 shows the keyword clustering graph. The keyword clustering analysis of the domestic CNKI database shows $Q=0.3984>0.3$ and $S=0.7365>0.5$, indicating a clear clustering structure and good reliability of the graph. There are 9 significant clusters formed in the network, and the core clusters mainly include “vocational colleges,” “innovation and entrepreneurship,” “maker education,” “internet plus,” “innovation,” “teaching reform,” “talent cultivation,” “internet,” “university”. This clearly indicates that domestic research focuses closely on educational carriers, practical models, and contemporary technologies, emphasizing the implementation and system construction of innovation and entrepreneurship education. By comparison, the keyword clustering analysis of the international WOS database shows that $Q=0.7971>0.3$ and $S=0.9427>0.5$, indicating a more significant and clearly defined clustering structure. The network includes 7 clusters, with core themes covering “innovation and entrepreneurship education,” “innovation and entrepreneurship,” “entrepreneurship education,” “perceived social support,” “curriculum reform,” “medical student,” and “system modeling”, reflecting that international research focuses more on micro empirical and interdisciplinary integration directions. Overall, although there are intersections between domestic and foreign research hotspots on basic topics such as “innovation and entrepreneurship” and “teaching or curriculum reform”, there are significant differences in research focus: domestic research focuses on educational practice and the empowerment of digital technology, and constructs a systematic practice system around institutional entities and talent cultivation. Foreign research focuses more on the deep integration of entrepreneurial behavior and social effects, emphasizing the improvement of entrepreneurial quality through curriculum reform and support mechanisms to achieve sustainable social value and development goals.

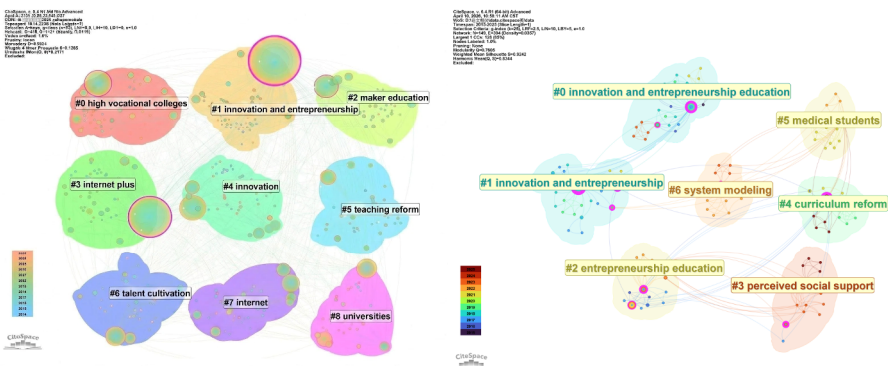


Fig. 5. Keyword Clustering Network Map from CNKI and WOS.

The keyword time-zone map presents the evolutionary trajectory. Research conducted domestically and internationally from 2014 to 2025 can be divided into three stages: the exploration stage (2014-2016), during which domestic research initially explored topics such as “internet plus” and maker education, while international research focused on foundational theories; the deepening stage (2017-2018), during which domestic research concentrated on talent cultivation and industry-education integration, while international research shifted toward empirical studies on entrepreneurial intentions and other topics; and the transformation stage (2019 to present), during which the research context has shifted toward the “digital economy,” with domestic research focusing on educational model innovation and international research increasingly extending to cutting-edge issues such as generative AI (Figure 6).

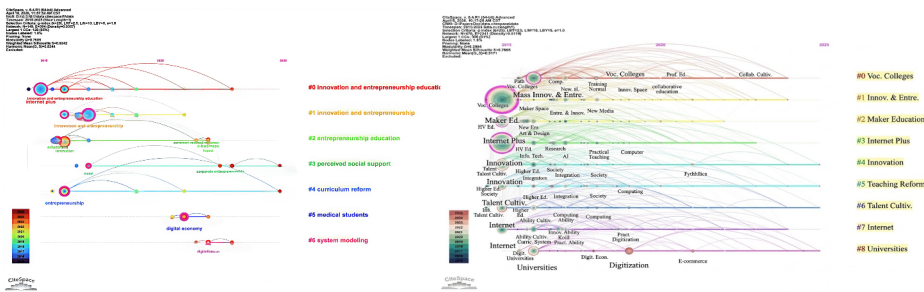


Fig. 6. Keyword Time Zone Map from CNKI and WOS.

4.2 Burst Detection Analysis of Keywords

Keyword burst analysis can reveal the burst nodes of research hotspots. In the domestic CNKI knowledge map, during 2015-2017, terms such as “maker” exhibited bursts; during 2019-2022, the burst of “digital economy” (strength=21.96) marked a contextual shift; and during 2021-2025, research shifted toward systematic construction. In the international WOS knowledge map, during 2015-2018, terms such as “internet plus” signaled the systematic construction of entrepreneurial education theory; during 2021-2025, “digital economy” reflected a contextual shift; and in 2023, the newly emerging burst of “e-entrepreneurship” further focused on digital entrepreneurial behavior (Figures 7-8).

Top 11 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2015 - 2025
maker	2015	5.47	2015	2016	
maker education	2015	3.1	2015	2017	
maker space	2016	3.55	2016	2017	
higher vocational education	2016	3.71	2021	2025	
rural revitalization	2021	3.16	2021	2025	
influencing factors	2021	3.16	2021	2025	
development path	2021	2.53	2021	2025	
digital economy	2019	21.96	2022	2025	
Integration of professional and innovation education	2019	3.54	2022	2025	
path	2016	3.11	2022	2023	
digitization	2021	4.37	2023	2025	

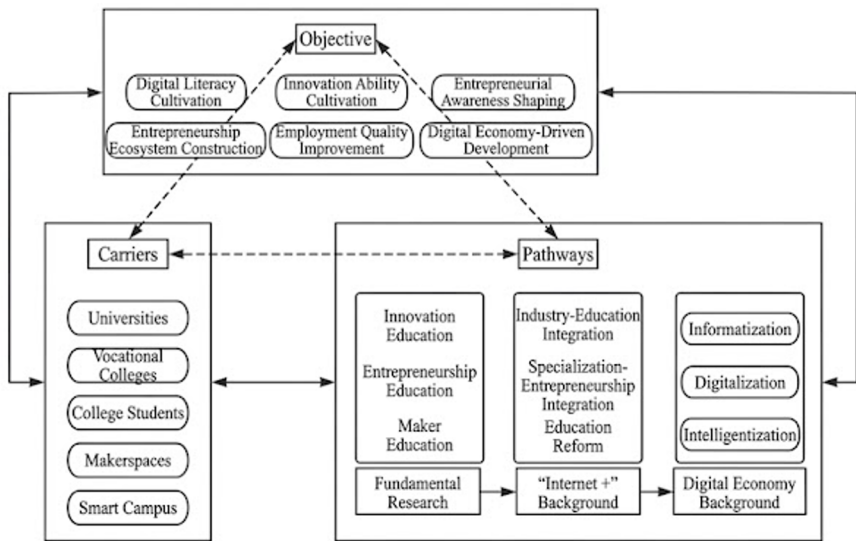
Fig. 7. Keyword Burst Map from CNKI.

Top 5 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2015 - 2025
internet plus	2015	2.15	2015	2018	
entrepreneurship education	2016	1.28	2016	2017	
innovation and entrepreneurship	2017	2.95	2017	2018	
digital economy	2021	1.02	2021	2025	
e-entrepreneurship	2023	1.03	2023	2025	

Fig. 8. Keyword Burst Map from WOS.

5 Research Thematic Architecture

**Fig. 9.** Basic Structure of Innovation and Entrepreneurship Education Research across Different Contexts.

Based on the comprehensive analysis of domestic and foreign keywords, this study constructs an “objective-path-carrier” analysis framework for innovation and entrepreneurship education, which is suitable for the digital economy era (Figure 9). The system presents the core logic and evolutionary laws of field research. In terms of goals, the core of innovation and entrepreneurship education in the digital economy era is to cultivate students’ digital literacy, innovation ability, and entrepreneurial awareness, and use composite talents to promote digital economy and sustainable development^[5]. Parallel goals include creating a digital entrepreneurial environment, improving employment quality, and adopting long-term innovation strategies^[6]. In terms of carriers, higher education institutions, vocational colleges, smart campuses, and co creation

spaces are the core support, supporting discipline and entrepreneurship education as well as full chain entrepreneurship services^[7]. In terms of path, preliminary research has focused on exploring the foundations of innovation education, entrepreneurship education, and maker education, and completing the popularization of the concept and system construction of entrepreneurship education; After the implementation of the “internet plus” strategy, the research focus has gradually shifted to the direction of integration of industry and education, integration of expertise and innovation, and teaching reform; In recent years, the digital economy has become a core development strategy of the country, and research on innovation and entrepreneurship education has shifted towards digital, information-based, and intelligent teaching reforms, empowering the entire chain of innovation and entrepreneurship education with digital technology and further stimulating the educational effectiveness of innovation and entrepreneurship education.

6 Conclusion and Future Directions

6.1 Research Conclusions

This paper employs CiteSpace to analyze the literature on innovation and entrepreneurship education in higher education institutions from the CNKI and WOS core collections spanning 2014 to 2025. Temporally, domestic research exhibits a policy-driven inverted U-shaped growth, whereas international research displays a wave-like oscillation; both have completed the transition from foundational exploration to digital empowerment. Regarding collaboration networks, the majority of academics and institutions, both domestic and foreign, work autonomously, lacking organized core research clusters and collaboration networks. As for research hotspots, both domestic and international research are closely monitoring the digitization of IEE. Meanwhile, domestic research focuses on practical exploration of talent cultivation and innovation and entrepreneurship education. Foreign research focuses more on theoretical construction and micro empirical analysis, emphasizing the deep integration of entrepreneurial behavior and social effects. This study constructs an “objective-path-carrier” analysis framework, which can provide a reference for promoting high-quality development of innovation and entrepreneurship education in the digital economy era.

6.2 Future Research Directions

Future research should break through institutional boundaries, strengthen industry-university-research cooperation, promote network co-construction, deepen research on digital economy empowerment and education digital transformation. In the future, new technologies such as generative artificial intelligence and digital twins can be combined to further improve the architecture content, expand cutting-edge perspectives such as “digital entrepreneurship”, and promote the extension of innovation and entrepreneurship education research to a wider range of fields.

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