# Evolution, Gaps, and Frontiers in Digital Literacy and Youth Employment Research: A Visual Analysis Based on Cite Space

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**Abstract: This paper employs Cite Space to conduct a visual analysis of relevant literature from 2006 to 2026. The findings indicate that domestic research themes have shifted from conceptual discussions to multi-scenario applications, showing a converging trend with youth employment studies, though the integration remains superficial. International research efforts are concentrated in developed countries in Europe and America. Significant gaps exist in mechanism research within the related field. Future research needs to deepen the exploration of the specific pathways through which digital literacy affects employment and strengthen localized empirical testing.**

**Keywords: Digital Literacy; Youth Employment; Cite Space; Visual Analysis**

## 1. Introduction

Employment constitutes the most critical aspect of people's livelihood, necessitating the implementation of an employment-first strategy to promote high-quality and sufficient employment [1]. The youth population represents a vital component of the labor market; therefore, advancing high-quality and sufficient employment requires focused efforts to address the employment challenges faced by key groups, particularly young people [2]. Existing surveys and statistics indicate that the youth unemployment rate remains higher than the average level of the national surveyed unemployment rate [3]. Additionally, structural imbalances in employment have become increasingly pronounced, with the allocation of workers across industries continuing to diverge [4]. Thus, youth employment in China is confronted with dual challenges: both pressure from the overall scale of unemployment and persistent structural mismatches [5]. Concurrently, the digital economy, represented by technologies such as artificial intelligence and big data, is profoundly reshaping the labor market[6], placing unprecedented demands on workers' digital literacy. Digital literacy has transcended mere technical proficiency, emerging as a core competence and fundamental skill for individuals to participate in socioeconomic life and pursue career development in the digital era. In response, relevant national policy documents have been successively issued, underscoring the growing urgency of enhancing digital literacy across the entire population.

In this context, investigating the impact of digital literacy on the employment quality of youth holds significant theoretical and practical importance. Existing research has confirmed the positive effect of digital technology use on employment[7], but most studies either simplistically equate it with internet access capability or explain its influence only through traditional pathways such as information acquisition and social capital[8], failing to fully reveal the deep-seated mechanisms through which the multidimensional and complex construct of digital literacy affects career development. As the penetration of digital technology into work deepens from the tool level to the level of thinking and capability, the impact of digital literacy may more fundamentally be realized by reshaping the core competency endowment of workers themselves, i.e., the quality of their human capital. This leads to the perspective of the new human capital theory, which defines the core of human capital as the individual's intrinsic abilities, including both cognitive and non-cognitive abilities [9]. The process of enhancing digital literacy is itself a process of deeply applying and honing these abilities. Therefore, a reasonable theoretical inference is that digital literacy may improve youth employment quality precisely by enhancing their abilities. However, there is a notable shortage of empirical research systematically dissecting its internal mechanisms from this theoretical perspective in the existing literature.

 

## 2. Research Questions

To clarify the research context, hotspots, frontiers, and core gaps in this field, this paper employs scientometric methods, utilizing Cite Space software, to conduct a visual analysis of relevant domestic and international research literature from the past two decades. By generating keyword co-occurrence, clustering, burst, and timeline maps, it visually presents the distribution of research forces, the evolution of thematic focuses, and research frontier trends in this field, aiming to answer the following questions:

Q1: What is the current state of research in the fields of digital literacy and youth employment?

Q2: How have the research hotspots in these fields evolved?

Q3: What are the core research gaps and future directions for deepening the research?

## 3.Research Methodology and Data Sources

### 3.1 Research Methodology

This study adopts the scientific knowledge mapping method, using Cite Space (version 6.3.R1) software for visual analysis. Cite Space is a scientific literature metrology and visual analysis tool created by Professor Chaomei Chen of Drexel University, USA. Its core function is to reveal the evolution of research hotspots, knowledge structure, and frontier trends in a specific research field through data mining, algorithmic analysis, and visual representation [10]. The bibliographic information obtained from screening was exported in Refworks format and imported into CiteSpace for conversion and processing, serving as the data for this study.

This study primarily conducted the following analyses:

(1) Keyword Co-occurrence and Clustering Analysis: By generating keyword co-occurrence network maps, high-frequency and high-betweenness centrality keywords in the two fields of digital literacy and youth employment were identified, revealing the core nodes and structure of the research network. Based on this, clustering analysis was performed using the Log-Likelihood Ratio (LLR) algorithm to extract main research themes.

(2) Keyword Burst Analysis: This detected keywords whose citation frequency increased significantly during specific time periods, used to identify the evolution and turning points of research frontiers.

(3) Timeline View Analysis: Generated timeline maps based on clustering analysis to visually display the temporal trajectory of the emergence, development, and continuity of different research themes.

(4) Country/Region Distribution Analysis: Utilizing Nvivo software to analyze the country/region collaboration network of Web of Science (WoS) English literature data, understanding the global distribution of international research forces in this field.

### 3.2 Data Sources

To comprehensively acquire research data, this study retrieved data from core Chinese and English databases respectively. The publication volume of related research is shown in Figure 1.

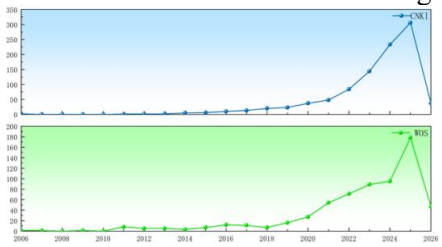


**Figure 1. Publication Trend of Relevant Research**

(1) Chinese Data: Sourced from the China National Knowledge Infrastructure (CNKI). Using “digital literacy” as the keyword for retrieval, the time span was set from 2006 to 2026, with literature sources limited to CSSCI, CSCD, and Peking University core journals. After deduplication and removal of irrelevant literature, 3809 valid documents were obtained, including 880 core journal articles.

(2) English Data: Sourced from the Web of Science (WoS) core collection. Combined topic searches were conducted using keywords such as “digital literacy”, “digital skills”, “employ ability”, “employment quality”, and “youth employment”. The time span was set from 2006 to 2026. Through preliminary screening and analysis of search results, a total of 638 papers were obtained.

## 4.Research Findings

### 4.1 Evolution of Hotspots and Analysis of Frontiers in Domestic Digital Literacy Research

4.1.1 The diversified structure of research themes

Through keyword co-occurrence and cluster

 

analysis of literature on the topic of "digital literacy" (Figure 2), it is evident that research themes in this field exhibit characteristics of diversity and inter connectivity. The core research clusters primarily revolve around the following aspects: firstly, the conceptual connotation and measurement of digital literacy, focusing on keywords such as "digital literacy", "information literacy", "connotation", and "evaluation indicator system", with efforts dedicated to localized conceptualization and the construction of multidimensional measurement frameworks. Secondly, the educational application and empowerment of digital literacy, centering on keywords like "university students", "education", "teaching", and "influencing factors", exploring its cultivation pathways in higher education and its impact on learning outcomes. Thirdly, application studies targeting specific groups and contexts, forming research clusters represented by "older adults" ,"farmers", "librarians", as well as "digital village" and "digital economy," which focus on the disparities and significance of digital literacy across different groups and socioeconomic scenarios. Furthermore, research linked to keywords such as "employ ability", "vocational education", and "talent development" has begun to emerge, indicating initial scholarly attention to the connection between digital literacy and labor market outcomes. However, existing research themes remain relatively fragmented, with most focusing on conceptual discussions, group descriptions, or educational settings. Systematic empirical research on the underlying mechanisms through which digital literacy influences individual career development is still insufficient.


**Figure 2. Keyword Co-occurrence Map of Digital Literacy Research**

4.1.2 The phased evolution of research frontiers

Keyword burst analysis clearly reveals the evolutionary trajectory of domestic digital literacy research frontiers, as shown in Figure 3.

Conceptual Foundation and Introduction Stage (circa 2014-2018): Early burst keywords such as "information literacy", "research methods", "core competencies", and "digital technology" indicate that initial research primarily focused on introducing and differentiating related concepts and exploring applicable research methods.

Application Scenario Expansion Stage (circa 2017-2021): Subsequently, "college students", "library", "higher education", and "digital citizen" became burst words. The research focus shifted towards specific groups (especially college students) and application scenarios, such as libraries, reflecting a transition from theoretical exploration to practical application.

Deepening Development and Mechanism Exploration Stage (2021-present): Recent burst keywords such as "digital economy", "talent cultivation", "practice pathways", and "social capital" indicate that the research frontier is shifting from exploring "what it is" and "who needs it" to exploring "how it produces effects" and "in what context it produces effects". In particular, the strong burstiness of "digital economy" and "talent cultivation", coupled with the emergence of the keyword "employability", jointly point to a clear research trend. That is, exploring the mechanisms of how digital literacy affects personal development (including employment) through specific pathways (such as

talent cultivation, social capital accumulation) within the context of the digital economy has become an inherent requirement of current academic evolution.

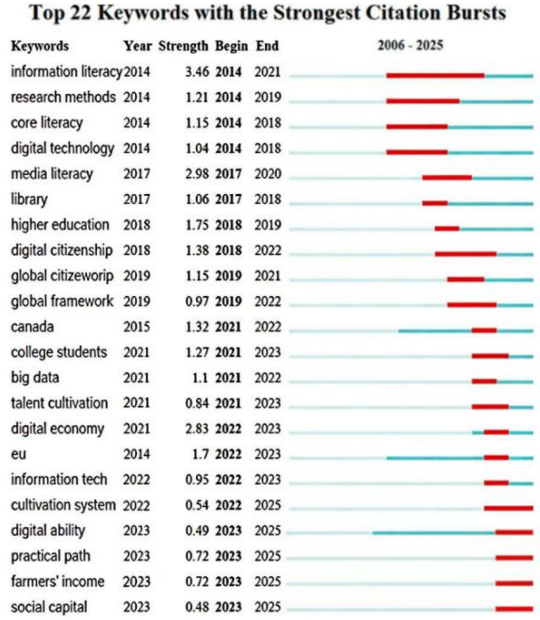


**Figure 3. Results of Keyword Burst Analysis in Digital Literacy Literature**

## 4.2 Structural Context of Domestic Youth Employment Research

4.2.1 The Structured Network of Research Themes

Keyword clustering analysis of literature related to youth employment (Figure 4) shows that this field has formed a structured research network. First, macro-level influencing factors and employment quality, centered on "employment quality", "influencing factors", "social capital", and "human capital". This indicates that improving employment quality is the core goal, and traditional theories such as human capital and social capital are the main frameworks explaining its differences. Second, policies and services, revolving around "employment services", "public employment services", and "college graduates", focusing on the effectiveness of government and institutional policy interventions and service systems. Third, new forms and entrepreneurship, including "flexible employment" and "entrepreneurship", reflecting attention to new employment forms. Finally, education and skills, involving "vocational education", "integration of industry and education", and "employ ability", focusing on the connection between education and the labor market.

It is noteworthy that within this structured network, "digital literacy" or "digital skills" have not become high-frequency or high-betweenness centrality key nodes. This indicates that although the development of the digital economy has been widely discussed, research that systematically incorporates "digital literacy" as a core explanatory variable into the youth employment analysis framework remains insufficient.


**Figure 4. Keyword Clustering Map of Research on Youth Employment in China**

4.2.2 The longitudinal evolution of research hotspots

From the timeline map (Figure 5), the evolution of research hotspots in youth employment can be observed. Early studies focused more on macro-level topics such as "employment policies", "structural contradictions", and "unemployment rates". Over time, the research perspective has become increasingly micro-oriented and specific, with "employment quality" emerging as a core objective that has been continuously examined and deepened. Traditional explanatory variables such as human capital and social capital have also been extensively explored in relation to this theme. In recent years, alongside the rise of the digital economy, keywords such as "digital economy" and "digital skills" have entered the research landscape, intersecting with themes like "flexible employment" and "employment quality". This confirms that academia has recognized the importance of digital skills. However, current studies mostly treat digital skills as a new context or skill requirement. The map clearly shows that there has not yet been an in-depth and systematic integration of digital literacy into a theoretical framework combining it with new forms of human capital, nor an examination of how it enhances youth employment quality by reshaping their intrinsic capability endowments. This represents a significant gap for further research development.

 

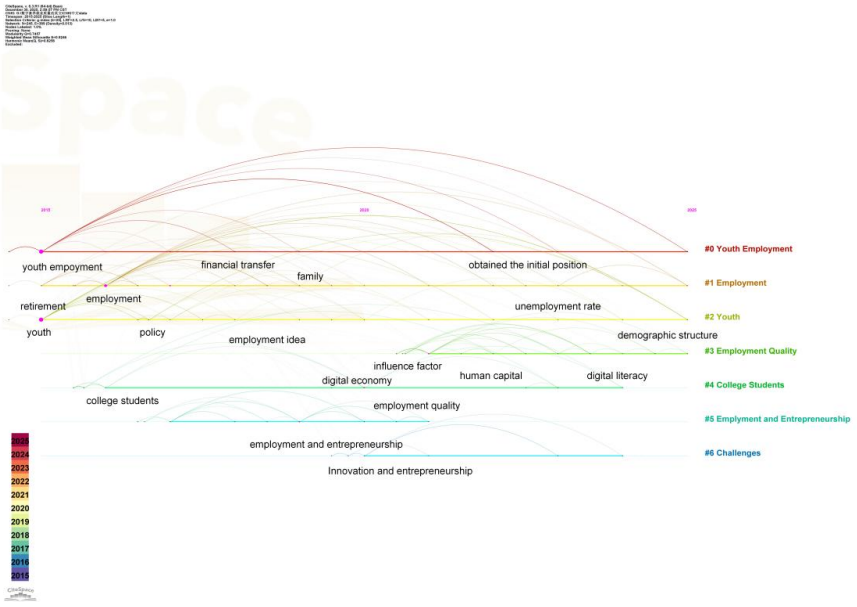


**Figure 5. Timeline Map of Keyword Clustering in the Literature on Youth Employment**

### 4.3 International Research Force Distribution and Correlation with Core Issues

The analysis of national distribution based on Web of Science data clearly reveals a concentrated pattern of international research capabilities in this field, as shown in Figure 6.

The countries with the highest publication output are predominantly developed economies such as the United Kingdom, the United States, Spain, Germany, and Australia, indicating that the topic of digital literacy in relation to employment and labor force development has become a forefront research focus in these regions, which are forerunners in digital economy development. This distribution pattern may stem from two factors: firstly, developed countries have experienced the structural impact of the digital economy on the labor market earlier and more profoundly, leading to more explicit demands and challenges regarding digital skills among workers, thereby generating more urgent research needs; secondly, these regions possess first-mover advantages in relevant theoretical frameworks, such as Digital Competence Framework for Citizens[11], as well as in empirical research methodologies and data accumulation. China occupies a prominent position in this distribution, reflecting the close attention of domestic academia to this issue and its alignment with international frontiers. However, this high concentration of research in a limited number of developed economies also suggests that the existing knowledge system may be more deeply rooted in specific socioeconomic and technological contexts, and the global generalizability of the resulting theories, measurement tools, and policy recommendations requires further examination. Therefore, while actively learning from international cutting-edge achievements, it is essential to conduct in-depth localized contextual research that incorporates China's unique digital economy development pathway, education system, and labor market institutions, in order to generate more explanatory and guiding knowledge.


**Figure 6. National Distribution of Research on Digital Literacy and Employment Quality**

## 5.Conclusions and Prospects

Based on the aforementioned Cite Space visualization analysis results, this study develops an integrated insight into the knowledge structure, evolutionary trajectory, and research gaps in the field of digital literacy and youth employment quality, and proposes future research directions accordingly.

### 5.1 Conclusions

First, research themes have shifted from

fragmentation to focus, yet integration remains superficial. Domestic research on digital literacy has evolved from conceptual introduction and educational application to expansion across multiple contexts, while youth employment studies have deepened from macro-policy discussions to multidimensional measurements of employment quality. Recently, both lines of inquiry have begun to engage with the backdrop of the "digital economy" and pathways for "talent cultivation," reflecting a converging trend. Nevertheless, this convergence remains at a preliminary, associative stage; digital literacy has not yet been deeply embedded into the core explanatory framework of youth employment quality research.

Second, there is a notable theoretical gap in mechanistic research. Both keyword clustering and timeline mapping indicate that while existing studies have accumulated evidence on the correlation between digital literacy and employment, explanations for how digital literacy enhances employment remain largely confined to traditional pathways such as social capital and information asymmetry, or are limited to macro-level descriptions. From a human-capital perspective, systematic investigations that dissect the specific pathways and boundary conditions through which digital literacy empowers capabilities to influence employment quality constitute a conspicuous blank area in the current knowledge map.

Third, international research exhibits a pronounced "core-periphery" structure, reflecting uneven global knowledge production. High-output countries are heavily concentrated in developed Western economies, forming a distinct core region of academic research. On one hand, this confirms that digital literacy, as a core element of human capital, has received systematic attention in advanced economies, whose research findings and theoretical paradigms currently constitute the primary foundation for international dialogue. On the other hand, it also reveals the imbalance in global knowledge production, which may result in insufficient attention within mainstream theories to the diverse contexts of developing countries. China's active participation serves as an important balancing force. Yet overall, profound theoretical refinement and empirical examination grounded in non-Western contexts (particularly those drawing on localized Chinese experience) remain under-represented in the international knowledge map, representing a gap that future research should strive to fill.

### 5.2 Prospects for Future Research Directions

Based on the above findings, future research can be deepened and innovated in the following directions:

First, deepen the theoretical perspective on mechanism exploration. Future research should move beyond treating digital literacy as a simple instrumental variable and conceptualize it as a comprehensive construct that shapes individuals' core competency endowments. The focus should be on constructing and empirically examining how digital literacy enhances specific competencies, thereby positively influencing youth's job performance, career adaptability, and employment stability.

Second, it is essential to strengthen the contextualized empirical validation. Building upon internationally established scales, future research should develop and validate more precise measurement tools for digital competence and employment quality. This process must integrate the specific online behaviors and cultural context of Chinese youth. By leveraging nationally representative longitudinal data such as the China Labor-force Dynamic Survey (CLDS) and the China Family Panel Studies (CFPS), or by conducting specialized surveys, rigorous causal inference analyses should be carried out to provide localized empirical evidence for policy making on human capital development in the digital era.

Finally, promote interdisciplinary and methodological innovation. Interdisciplinary integration across economics, education, psychology, information science, and other relevant fields should be encouraged, adopting mixed-methods approaches. While quantitative research can test macro-level mechanisms, qualitative methods such as in-depth interviews and case studies should be employed to deeply reveal the internal mechanisms through which youth develop digital skills and advance their careers.

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