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Global Digital Culture Research: Framework, Progress and Prospects

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Systematic Review

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Abstract

Since 2012, the core themes of global digital cultural studies have undergone three phases of evolution: initially focusing on the socio-cultural impacts of digital technology, then shifting to cultural practices and innovations in virtual spaces and immersive technologies, and in recent years, focusing on artificial intelligence, particularly the transformative effects of generative AI on cultural production paradigms. This evolution deeply reflects the development and application of digital technology. Existing reviews have primarily concentrated on the digitization of cultural heritage, the digitization of the cultural industry, and public digital cultural services, with insufficient systematic analysis and foresight regarding cutting-edge issues such as generative AI.

Therefore, this study employs bibliometric and thematic review methods, using 1,572 English-language articles from the Web of Science Core Collection between 2012 and 2025 as data. Cite Space software is utilized to analyse annual publication volumes, national/regional and institutional distributions, keyword co-occurrence and clustering, hot topics, and future research directions, thereby mapping the research trajectory and progress. The research questions include:

(1) How have core themes evolved from 2012 to 2025? How do they reflect the development and application of digital technology? What are the characteristics of the current academic landscape? How do national/regional contributions, core institutional distributions, and collaborative networks influence knowledge production and dissemination?

(2) What are the core focus areas of recent research?

(3) In the face of the impact of generative AI and the metaverse, what are the core frontier issues and key ethical challenges that require urgent attention in the future?

Finally, the study summarizes the application scenarios and trends of digital technology in cultural digitization. It prospectively explores. Cultural innovation practices driven by emerging technologies, ethical challenges posed by generative AI, digital narrative and global cultural communication innovation, and global cooperation and interdisciplinary pathways in digital humanities.

1. Introduction

The conceptual connotation of digital culture has not yet reached a complete consensus in the academic community, but its rise and development are closely related to the popularity of digital technology at the end of the 20th century(Alsaleh 2024), especially with the revolutionary breakthroughs in Internet and computer technology (Tylor Edward Burnett 1871). Currently, the rapid development of digital technology is profoundly reconstructing the basic form of human civilisation(Ammirato S et al 2025). From blockchain technology providing a new path of distributed evidence protection(Zhao Z Wei J 2022)and dissemination for cultural heritage(Liu X Dong F Shui W et al 2025), to the cultural production paradigm revolution triggered by generative artificial intelligence (AI) (Liu Y et al 2025), to the spatial

reshaping of cultural experience by meta-universes(F.-C. Yang et al 2024), digital culture has transcended its initial role as an auxiliary technological tool, and leaped into the core driving force for reshaping the global cultural power pattern(Huang R Wang H 2025). UNESCO data show that the digital coverage rate of global cultural heritage has reached 78% in 2025, which not only reflects the breadth of technology application, but also points to the reconstruction of the cultural value system by digital technology at a deeper level(Lamberti G et al 2025),; algorithmic recommendation mechanism is shaping a new type of cultural cognitive framework(M Zhang et al 2024), constantly redefining the boundaries of cultural perception in the environment of the integration of reality and falsehood(P Dai et al 2020), and the blockchain technology-based digital copyright system poses a fundamental challenge to the traditional cultural governance model (Son W et al 2024). In this context, global digital culture research has transcended the scope of a single discipline and evolved into a cross-disciplinary knowledge hub connecting the philosophy of technology(Nie H Yang N 2025), the political economy of culture and digital humanities.

Early studies, mostly from a technological perspective, defined digital culture as ‘a cultural form based on digital technology’(Castells Manuel 1996), emphasising the revolutionary impact of the Internet and computer technology on cultural production, dissemination and consumption(Tran M 2023). With the deepening of research, scholars began to pay attention to the interaction between technology and human nature(Van Beinum 2024), highlighting the role of technology in shaping human perception and behaviour(Schleidgen S et al 2023). In the early stage of development, on the one hand, we faced the challenge of a vague conceptual framework due to the lag in the integration of interdisciplinary theories(Koltay T 2016), which made it difficult to support systematic research, and on the other hand, the imperfect technical facilities seriously restricted the efficiency of the digital transformation of culture and formed a bottleneck in the transformation of resources(Lybeck R Koiranen I Koivula A 2024). At the stage of algorithmic society, Dominique Cardon further put forward critical insights, pointing out that digital culture has evolved into a ‘cultural-political field under the control of platform power and algorithms’(Congge U et al 2023), and its definition must incorporate the alienation phenomena such as data monitoring, traffic competition and user labour (Tsvetkova M Yasseri T Pescetelli N et al 2024). Despite the different research perspectives, there is a basic consensus in the academic community that digital culture is not a mere appendage of technology, but a complex system in which techno-logic, social structure and subjectivity are dynamically inter-constructed in a digital context(S Mihelj et al 2019), and that the fluidity of its connotation confirms the two-sided relationship between technological innovation and cultural evolution(Yordanova Z Todorova Z 2025).

However, there is still a significant cognitive gap in this field. Despite the in-depth progress made by scholars in subfields such as cultural heritage digitisation(Genilson Geraldo et al 2023) and digital cultural communication(Vladia Borissova 2018), existing research still suffers from structural deficiencies: for one thing, the research themes are highly fragmented, e.g., Li Weicong et al (2025) focuses on a localised area of cultural heritage digital preservation, and Ammirato S et al (2025) focus on the technical aspects of the cultural industry and ignore the socio-cultural dimensions(Ammirato S Felicetti M A et al 2025), lacking systematic and interdisciplinary literature integration in the field of

digital culture research(Corvello V Verteramo S Nocella I et al 2023). Secondly, digital culture research issues have the characteristic of high-speed evolution, but traditional research methods are difficult to instantly capture the cultural impacts triggered by the iteration of digital technologies such as generative AI and meta-universes(Qin H X Wang et al 2025), resulting in the obvious 'time lag effect' of the research, and there is an urgent need to comprehensively sort out and analyse the dynamic evolution of the research content in a forward-looking manner(Dong Y Mu R Zhang Y et al 2025). Third, the existing reviews have not sufficiently analysed the logic of the deep connection between the core themes of the research and technological iterations(Birkle C Pendlebury D A Schnell J et al 2020), paid limited attention to the global academic cooperation network and interdisciplinary research dynamics(Emmert-Streib F 2023), and did not explore in depth the key ethical challenges induced by the cutting-edge technologies such as generative AI and the core research topics in the future.

In order to break through the above limitations, this study adopts a bibliometric approach, using CiteSpace 6.3 software(Zang S Liang J Su X Chen Y et al 2023), and integrates the techniques of keyword co-occurrence network analysis, clustering detection, and time-zone evolution mapping to construct a knowledge map and evolution model(Koltay T 2016), in order to go beyond the limitations of the traditional literature review (Zang S Liang J Su X Chen Y et al 2023). The time frame of the study was set from 1 January 2012 to 6 January 2025. At the data level, by constructing a composite search formula 'Topic=("digital culture" OR "digital culture" OR "internet culture" OR "new media culture" OR "metaverse culture")' and using logical operators (AND, OR, NOT) for precise searching, and obtained 1123 valid literatures after strict manual screening, covering 12 subject areas such as cultural studies, communication, cultural industry, computer science, etc., to ensure the comprehensiveness and representativeness of the analysed results.

Analysing and reviewing the existing literature can provide insight into the hotspots and trends in the research field. This not only provides a reference for relevant research, but also a guide for achieving inclusive and diverse development of digital culture. This paper endeavours to answer the following core research questions:

(1) How have the core themes of global digital culture research evolved over the period 2012–2025? How does this evolution reflect and respond to the development and application of key digital technologies (e.g., AI, big data, VR/AR, blockchain, generative AI)?

(2) What are the characteristics of the current global academic landscape of digital culture research, and what are the characteristics of national or regional contributions and distribution of core institutions? Is there a close network of co-operation among research institutions, and how does this affect knowledge production and dissemination?

(3) In recent years, what are the areas that have been the core focus of digital culture research globally?

(4) In the face of the disruptive impact of generative AI and the reconfiguration of cultural space in the meta-universe, what are the core cutting-edge issues and key ethical challenges that digital culture

research needs to focus on in the future?

2. Data Sources, Research Methodology and Framework

2.1 Data Sources

This study uses the Web of Science core collection as the data source, and searches the SCI and SSCI databases between 1 January 2012 and 6 January 2025 for relevant literature on digital culture research. In this paper, we use logical operators to narrow down the search scope, according to the subject term search to find the literature related to digital culture in the title, abstract, keywords and other fields of the literature: Topic=('digital culture' OR 'digital culture' OR 'internet culture' OR'new media culture'), firstly, the TS search method ensures that information on digital culture can be retrieved in the title, abstract and keywords, and secondly, the use of TS = ('digital culture') ensures that culture-related literature is covered in order to maintain relevance to digital culture research.

By selecting'Article'and 'Review' for the type of literature and 'English' for the language, a total of 1,572 articles were obtained, excluding dissertations, conference reports, information, and missing articles. A total of 1,572 articles were obtained, excluding dissertations, conference reports, information and missing papers, and finally 1,123 articles were identified and analysed. It covers high-quality academic literature in a wide range of disciplines, including natural sciences, social sciences, arts and humanities, and provides citation analysis functions to help researchers track the impact of academic achievements(Boboc R G et al 2022). SCI and SSCI are two important academic citation databases under Corevision(Gong K Cheng Y 2022), focusing on high-quality academic literature in natural sciences and social sciences respectively(Gong K et al 2022). They are both important parts of the Web of Science core collection, which includes academic literature worldwide, provides citation relationships between literature, supports citation analysis and academic impact assessment(Waikhom L Patgiri R 2023), and helps assess the academic impact of journals and scholars through impact factor, H-index and other metrics, which are widely used in academic research, literature analysis and scientific evaluation(Cheng Y 2022) .

2.2 Research Methods

2.2.1 Bibliometric Methods

Bibliometrics is a method of analysing research trends based on mathematical and statistical principles for exploring and analysing a wide range of scientific data sets( ). It involves the application of quantitative techniques to analyse bibliometric data( ) to help researchers assess academic research in a particular field (Zhang B 2024). This approach helps to identify nuances and emerging trends within a specific field, as well as intuitive visual representations of quantitative disciplinary knowledge(Van Leeuwen T 2006). Knowledge mapping is a state-of-the-art technique in bibliometrics and scientometrics for visualising quantitative research results on a given topic(Borgman Rice 1992). Given the large

number of articles reviewed, this study used automated methods for data extraction and relied on advanced visualisation tools to achieve its research objectives.

Commonly used tools include RefViz, VOSviewer(Van Eck NJ Waltman L 2010), and CiteSpace(Ping Q He J Chen C 2017).CiteSpace 6.3 was chosen for this study because of its ability to comprehensively analyse the literature, especially in tracking the evolution of the research themes(Li G Li D Tang T 2023) .CiteSpace allows for the extraction and visualisation and analysis of thematic information(Ping Q He J Chen C 2017), such as keywords, topics, authors, institutions, etc., and intuitively, through the Knowledge Map presenting the interrelationships between these entities(Kastrin A Hristovski D 2021). Co-occurrence and co-citation analyses can also be performed, and timeline diagrams can be constructed to illustrate the development trend within a discipline or knowledge domain, thus revealing the current status of scientific knowledge(Barredo Arrieta A Díaz-Rodríguez et al 2020).

2.2.2 Path Pruning Algorithm

Path pruning is a method of optimising paths and simplifying them by removing redundant points. The basic idea is to start from the starting point and try to connect directly to the subsequent points and if there is no obstacle, then skip the intermediate points until an obstacle is encountered(Zheng Q Tian X Yang M et al 2020). The path pruning algorithm optimises co-occurring networks, the mathematical essence of which is a graph-theoretically based least-cost path preservation model (Walmsley AP Kersten TP 2020).

The specific implementation process is to first construct a literature dataset based on the Web of Science core collection for the time span of 2012–2025, set the time slice length as 1 year, select the node type as ‘Keyword’, and extract the high-frequency nodes through the g-index (k = 25) threshold. Subsequently, the PFNET pruning algorithm is executed, with the weight attenuation factor of r=∞ (only the global minimum weight path is retained), and the network dimension of q = n-1 (n is the total number of nodes), which can effectively eliminate redundant connections and highlight cross-disciplinary knowledge hubs, so as to highlight the core keywords and their relationships(Zang S Liang J Su X Chen Y et al 2023).

2.2.3 Log Likelihood Ratio Algorithm (LLR)

In order to better study the research hotspots in the field of digital culture, with the help of Citespace's keyword clustering function(Chen J 2023), the clustering is generated by modular analysis of the network after pruning, with the modular value Q > 0.3 as the structural significance threshold, and the average profile value S > 0.5 indicates that the clustering is reasonable, and S > 0.7 indicates that the clustering effect is significant, and the Log-Likelihood Ratio (LLR) algorithm is used to Automatic labelling of clustering theme labels(Mollah Md Alamgir et al 2024). In order to adapt to the multidisciplinary nature of the digital culture field, pruning sliced networks are additionally enabled to protect the early seminal literature, and the cosine similarity threshold is set to 0.2 to weaken the noise interference. Finally, the Kleinberg burst detection algorithm (γ = 0.7) is used to identify the inflection points of the research frontiers, forming a knowledge graph with both structural clarity and domain

specificity(Zhang Z Zou Y 2022). The keywords are divided into nine cluster cluster networks by the log-likelihood ratio algorithm, with smaller numbers representing more keywords contained in the clusters. Q = 0.7127 and S = 0.8893 in this study, so the cluster structure of this cluster map is very significant and the clustering effect is stable.

The log likelihood ratio algorithm (LLR) is calculated as:

$$\mathrm{LLR} = 2\sum {}_i \mathrm{O}_i \bullet \log\left(\frac{\mathrm{O}_i}{\mathrm{E}_i}\right)$$

1

Where:

O_i is the observed value.

E_i is the expected value.

2.2.4 Descriptive statistical analysis

Descriptive statistical analysis refers to the use of tabulation and classification, graphs, and computational generalisations to characterise data(Qi M Abdullah Z Zhou B et al 2025). In this study, the evolution of the digital culture research field and the geographical distribution of scientific research are visualised by drawing line graphs of annual publications, statistical tables of the number of source journals included, statistical tables of institutions, and statistical tables of cited countries and regions.

2.3 Research Framework

This study employs bibliometric analysis methods utilising CiteSpace software. Drawing upon 1,572 digital culture research articles published between 2012 and 2025, selected from the Web of Science core databases SCI and SSCI as primary data, it conducts quantitative analysis of the historical trajectory, research progress, and knowledge map of digital culture studies. This analysis focuses on dimensions including publication volume, keyword co-occurrence, keyword clustering, timeline analysis, research institutions, authors, research hotspots, and research frontiers. It aims to summarise research hotspots within the digital culture field and predict future research content and directions. See the research framework diagram (Fig. 1) for details.

3. Results

The results of the study consider three themes

(1) Development stage and publication volume analysis to understand the number of published articles;

(2) Analysis of source journals, publishing institutions and countries to identify the relationship between journals, institutions, and countries;

(3) Research hotspots and their evolution, by analysing hot keywords, keyword clustering, and keyword emergence to derive the research hotspots and their evolution in the field.

3.1 Analysis of the number of articles issued

The search results are shown in Fig. 2a. Literature on global digital culture research shows that the number of papers published during this period showed an upward trend with slight fluctuations.Only 28 articles on digital culture were published in 2012.The subsequent international digital culture research can be divided into three phases.

The research germination phase (2012–2016) is the theoretical foundation period of international digital culture research. This stage has a low compound annual growth rate, with less than 200 papers published annually, reflecting the exploratory character of the early stage of the field. The research results mainly focus on early technology diffusion countries such as the United States and the United Kingdom, as well as digital application frontier regions such as China and South Korea, with the core topics focusing on digital identity construction, self-presentation in social media(Lybeck R Koiranen I Koivula A 2024), virtual community culture, and techno-ethical controversies(Walmsley AP Kersten TP 2020), which provide a foundational theoretical framework for the subsequent research.

The steady development phase (2017–2019) is a period of slow growth in the field. Despite the low average annual growth rate, the overall trend shows a continuous rise. This feature indicates that international digital culture research is still in the stage of disciplinary establishment, and the relevant results are mainly focused on research teams in science and technology-developing countries, and the research theme focuses on the exploration of the basic application of digital technology and the mechanism of cultural communication.

Rapid growth stage (2020–2024), from 2019 to 2021, is an explosive growth stage, the number of published articles continues to increase, indicating that in these years the rapid development of science and technology, more digital transformation, reform, researchers around the world began to get involved in the study of digital culture. 2021 to 2023 the growth rate becomes slow. A combination of epidemics, funding constraints due to the global economic slowdown, and policy constraints led to a lower growth rate in the number of publications. 2024 saw a return to a normal growth rate in publications, which continued to rise. This suggests that digital culture is receiving attention from global researchers from different disciplinary backgrounds and perspectives.

Figure 2b shows the research fields involved in these articles, showing an interdisciplinary character, with more articles in computer science, environmental science, science and technology, information science, library, arts and humanities, and so on.

3.2 Analysis of Source Journals

In order to identify the main publishing platforms and the distribution of the inclusion of global digital culture research results, the source journals of the literature in this field were statistically analysed. A total of 191 journals have included literature related to digital culture, including interdisciplinary journals on cultural heritage preservation and information management, such as *JOURNAL OF CULTURAL HERITAGE, COMPUT HUM BEHAV, PLOS ONE, MIS QUART*, and so on; and there are also journals such as *J BUS RES TECHNOL FORECAST SOC* and other comprehensive social science journals, as well as *COMPUT EDUC, J MED INTERNET RES* and other subject journals in the field of information technology, medicine and health. The source journals are listed in descending order according to the number of articles (Table 1), which shows that the first journal with the highest number of articles is *JOURNAL OF CULTURAL HERITAGE* with 166 articles, accounting for about 15 per cent of the total number of documents; the second journal with the highest number of articles is *COMPUT HUM BEHAV* with 126 articles.

Table 1
Statistics on the number of source journals included

Serial Number	Journal	Number of Publications	Serial Number	Journal	Number of Publications
1	*JOURNAL OF CULTURAL HERITAGE*	166	16	*LANCET*	60
2	*COMPUT HUM BEHAV*	126	17	*J MARKETING RES*	59
3	*PLOS ONE*	122	18	*ACAD MANAGE J*	56
4	*MIS QUART*	118	19	*NEW MEDIA SOC*	56
5	*J BUS RES*	108	20	*BMJ-BRIT MED J*	56
6	*TECHNOL FORECAST SOC*	89	21	*INT J INFORM MANAGE*	54
7	*J MED INTERNET RES*	87	22	*STRATEGIC MANAGE J*	52
8	*FRONT PSYCHOL*	81	23	*LECT NOTES COMPUT SC*	51
9	*SCIENCE*	78	24	*BMC HEALTH SERV RES*	49
10	*INT J ENV RES PUB HE*	73	25	*ORGAN SCI*	47
11	*COMPUT EDUC*	73	26	*MANAGE SCI*	45
12	*ACAD MANAGE REV*	68	27	*J PERS SOC PSYCHOL*	45
13	*J CLEAN PROD*	67	28	*EUR J INFORM SYSTEM*	46
14	*INFORM MANAGE-AMSTER*	65	29	*COMMUN ACM*	44
15	*INFORM SYSTEM RES*	61	30	*INT J PROD ECON*	43

3.3 Distributing Institutions

The results of the web of science search as well as the cite space visualisation are shown in Table 2, where a total of 256 nodes were generated with institutions as network nodes, representing 256 research institutions involved in the field of digital culture.

From 2012 to 2025, there are 13 institutions with 5 or more publications, accounting for 12.28% of the total number of publications, and the institution with the most publications is the University of London, followed by the University of California, and Johns Hopkins University. These three universities also have a strong centrality of 0.06, 0.04, 0.04 respectively, indicating that they have a strong influence in the field of digital culture.

Table 2
Institutions with 5 or more publications in digital culture research literature

Serial number	Count	Centrality	Institution	Proportion(%)
1	18	0.06	University of London	2.40
2	12	0.04	University of California System	1.60
3	7	0.04	Johns Hopkins University	0.93
4	7	0.02	University of Sydney	0.93
5	6	0.01	Harvard University	0.80
6	6	0.00	State University System of Florida	0.80
7	6	0.00	University College London	0.80
8	5	0.01	California State University System	0.67
9	5	0.00	King Saud University	0.67
10	5	0.03	La Trobe University	0.67
11	5	0.00	Pennsylvania Commonw.	0.67
12	5	0.00	Polytechnic University	0.67
13	5	0.00	University of Oxford	0.67

3.4 Countries and regions

Table 3 shows that China is the most cited country in the field of digital culture (370 articles), accounting for 33% of the total literature. Italy, with 242 citations, and the United States, with 206 citations, follow. Centrality refers to the importance of a node in a network, the higher the correlation between each node, the higher its centrality and the higher the importance of that node in the field(Zhang S et al 2023)The cooperation with other countries is relatively stronger. The centrality values of China, Italy, the United States and the United Kingdom are 0.04, 0.19, 0.21 and 0.43 respectively, indicating that the United Kingdom, the United States and Italy have more cooperation with other countries in the field of digital culture.

Table 3
Top ten cited countries and regions in the field of digital culture, 2012–2025

Serial number	Count	Centrality	Countries	Proportion(%)
1	370	0.04	PEOPLES R CHINA	33 per cent
2	242	0.19	ITALY	22 per cent
3	206	0.21	USA	18 per cent
4	173	0.43	ENGLAND	15 per cent
5	148	0.09	SPAIN	13 per cent
6	75	0.11	AUSTRALIA	7 per cent
7	74	0.15	GERMANY	7 per cent
8	62	0.01	GREECE	6 per cent
9	61	0.05	FRANCE	5 per cent
10	59	0.04	SOUTH KOREA	5 per cent

Figure 3 shows the citation statistics for a total of 64 publishing countries and regions from 2012–2025. Although China lags behind other regions in terms of centrality, the relatively high number of citations indicates good research quality. The total number of citations in Europe far exceeds that of other regions, and the research results are the most influential, indicating that the in Europe quality of research is the highest globally, by followedAsia and North America. While regions such as Africa, South America and Oceania have fewer citations, digital culture applications and research are relatively backward.

3.5 Core Keyword Co-occurrence

Keyword co-occurrence can extract keywords that co-occur in different articles, which helps to discover the research trend of digital culture. We filtered out 24 digital culture-related keywords by merging duplicated keywords and removing search terms. The results are shown in Fig. 4 Keyword co-occurrence map. The five keywords with the highest frequency of occurrence are cultural heritage (frequency = 114, centrality) = 0.07, virtual reality (frequency = 63, centrality = 0.06), social media (frequency = 57, centrality = 0.10), digital humanities (frequency = 56, centrality = 0.20), and digital transformation (frequency = 54, centrality = 0.10) suggesting that these topics have an important role in digital cultural studies occupy an important place. The following five research hotspots were derived from the measurement of frequency and centrality: digital preservation of cultural heritage, VR narratives of digital culture, social media communication of digital culture, digital humanities, and digital transformation of culture, which are also the themes that scholars focus on within the field.

3.6 Keyword clustering

The clustering results are shown in Fig. 5., by using Cite Space to cluster the keywords, the results show that the module value Q = 0.7127 > 0.3 and the average profile value S = 0.79133 > 0.7, indicating a significant clustering structure and accurate, reasonable and highly credible results. The atlas is divided into nine keyword clustering clusters. The largest cluster #0 has 38 keywords with a silhouette value (silhouette) of 0.943 and is labelled by LLR as digital heritage preservation.

In addition, the keywords of digital culture were analysed by Cite Space software to generate a keyword clustering co-occurrence network diagram. The nine clusters are #0 digital heritage preservation, #1 digital cultural industry, #2 digital humanities, #3 application of digital technology in cultural preservation, #4 digital transformation of culture, #5 digital cultural dissemination, #6 cyberculture, #7 metacosmos, and #8 digital art, and this study will focus on analysing the first five clusters in the discussion section. The size of each cluster is determined by the number of articles it contains, and the high-frequency content it contains is specifically listed in Table 4.

Table 4
Results of keyword clustering analysis of digital culture research literature

Cluster Labels	Size	Silhouette	Key Keywords
#0 Digital Heritage Preservation	38	0.987	ancient book digitization, intangible cultural heritage databases, virtual restoration of archaeological sites
#1 Digital Cultural Industry	36	0.904	Short videos, AIGC creation, digital entertainment, interactive film & television, virtual idols, virtual tourism, online guided tours
#2Application of Digital Technologies in Cultural Preservation	36	0.899	Multispectral imaging, site mapping, digital cataloging of movable cultural relics, interactive digital exhibition design, AR, VR
#3 Cultural Digital Transformation	25	0.895	Artificial intelligence, smart guided tour systems, digital identity authentication systems, intelligent creative assistant tools, big data analysis of user portraits
#4 Digital Humanities	33	0.867	Social network analysis, historical document corpora, algorithm-based artistic style recognition, digital museums, Silk Road digital maps
#5 Digital Cultural Communication	21	0.792	short-video challenges, digital games, new media platforms, secondary creation ecosystems, Generation Z subcultural symbols
#6 Internet Culture	19	0.703	Internet subcultures, internet culture governance, virtual communities, digital identity symbols, digital labor, UGC
#7 Metaverse	17	0.838	AI digital humans, digital twins, brain-computer interfaces, human-computer interaction, data security, digital narrative, virtual reality, scene replication
#8 Digital Art	12	0.825	Digital sculpture, digital painting, digital performances, digital imaging, virtual galleries, game art, AI-assisted painting design

3.7 Analysis of keyword emergence

It is found that the research on digital culture in the past decade or so has shown a shift from ‘digitisation’ to ‘intelligence’and ‘virtualisation’, with the emergence of the ‘meta-universe’ and ‘virtualisation’. Emerging keywords such as ‘meta-universe ’and ‘artificial intelligence’ have emerged(Yang L 2023). By analysing the keyword emergence mapping in Fig. 6, it can be found that digital culture research has presented the following distinctive features in the past decade or so:

2012–2018: keywords such as ‘cloud computing’, ‘big data’, ‘VR’ and so on have a higher intensity of emergence, reflecting the fact that digital culture research in this period mainly focuses on the impact and influence of digital technology on the impact and influence of digital technology on society and

culture, as well as the change of cultural production and dissemination methods under the new media environment(Poell T Nieborg D B 2018).

2019–2022: ‘digital copyright’, ‘blockchain’, ‘5G’, ‘online education’, ‘meta-universe’, and ‘digital culture’. Keywords such as ‘meta-universe’ begin to emerge prominently, indicating that digital culture research is beginning to focus on the impact of emerging technologies such as blockchain and big data on society and culture, as well as the role of algorithms in cultural production and dissemination.

2023–2025: Keywords such as ‘digital twin’ and ‘AIGC’ have significantly increased in emergence intensity, reflecting the fact that digital culture research focuses on cultural phenomena in virtual space, as well as the social and ethical issues brought about by the development of digital technology such as artificial intelligence ethics and algorithmic bias. reflecting the fact that digital culture research focuses on cultural phenomena in virtual space and the social and ethical issues brought by the development of digital technology such as artificial intelligence ethics and algorithmic bias.

4. Discussion and Research Outlook

4.1 Discussion

In this paper, a total of 1,123 papers on applications in the field of digital culture from 2012 to 2025 were searched in the WoS database. The total number of papers issued shows an increasing trend year by year, indicating that the research in the field of digital culture is more extensive and has become a continuous research hotspot .

4.1.1 Analytical Discussion of Source Journals, Research Institutions and Countries

Based on the empirical statistics of source journals (Table 1), the research in this field shows significant disciplinary decentralisation, with cultural heritage journals dominating and information management and social sciences supporting. The top 30 journals in terms of the number of publications cover 16 JCR disciplinary categories, and the number of publications in Journal of Cultural Heritage (166) and Computers in Human Behavior (126) exceeds 100, and the total number of publications in Top5 journals accounts for 18.7% of the total number of publications.

This distribution indicates a clear interdisciplinary split, with 4.85% in cultural heritage journals and only 2.3 co-occurrences per year with the top information systems journal MIS Quarterly (3.45%); secondly, scholars' publication preferences are concentrated, with 32.1% of contributions to the top international journals Technological Forecasting & Social Change (89 articles) and Journal of Clean Production (67 articles) contribute 32.1%, while the top international journals Strategic Management Journal (52 articles) and Academy of Management Journal (56 articles) have a participation of less than 8%; the top journals have an average annual frequency of only 2.3 times; secondly, scholars' publication preference is concentrated in the technology management journals Technological Forecasting & Social

Management (89 articles) and Journal of Clean Production (67 articles). less than 8% participation; seven of the Top 10 journals belong to different disciplinary divisions. In general, the source journals involve a wide range and cover more disciplines, indicating that the research on digital culture is technologically integrated and interdisciplinary, but the disciplinary fragmentation is more obvious.

From the statistics of research institutions, it can be concluded that based on the analysis of the volume and centrality of articles issued by research institutions (Table 2), the field is characterised by the dominance of developed countries and the weak participation of developing countries such as China. The University of London, with 18 articles, accounting for 2.40% of the volume of articles, has the highest centrality of 0.06, which makes it a core hub, while the University of California, University of California, has published 12 articles, with a centrality of 0.04 constituting a secondary node. The volume of publications helps to visually judge the influence of an institution in a particular field. Similarly, centrality allows scholars to better understand inter-institutional collaboration, which improves inter-institutional cooperation and communication and facilitates the dissemination of research results.

Finally, at the national level, the UK tops the centrality ranking (0.43), followed by the US (0.21). This indicates that research papers in the field of digital culture are currently spreading radially with the UK as the core, and the UK takes the lead in the field. Although China ranks first in terms of the number of papers issued, the centrality is relatively low (0.04). This implies that Chinese scholars are producing more and more valuable research results, although academic co-operation and exchanges with other countries in this field are still relatively limited. Overall, the research in the field of digital culture is more advanced in developed countries, whether considered in terms of countries, institutions or the dimension of the volume of publications.

4.1.2 Analytical Discussion on the Clustering of Research Hotspots

In the keyword co-occurrence mapping generated from the data obtained from the WoS database, nine significant clusters were formed. In cluster #0 Digital Heritage Preservation, Nishanbaev et al (2020) proposed that at the level of technological convergence(Mikko Koho et al 2023), a cloud-based Web-GIS architecture integrating Linked Open Data from DBpedia and GeoNames builds a multidimensional interactive space for cultural heritage exploration(Nishanbaev I et al 2021). Mozina et al. through the chemical analysis of 19th-century Slovenian typefaces with digital Through chemical analysis and digital optimisation of 19th century Slovenian typefaces, Mozina et al. verified that traditional typography can still maintain information persistence and readability after digitisation(Giannini T 2019). Artificial Intelligence technology deeply intervenes in the field of cultural heritage,(Chen D Sun et al 2024)developed an AI dataset of Manchu music, which demonstrates the groundbreaking potential of AI in the preservation and analysis of ethnomusicology(Chen D et al 2024). Current research shows a remarkable feature of multi-technology integration, and the rise of the meta-universe concept promotes the innovation of digital preservation paradigm. Wang et al.(2023) developed a VR exhibition system for the Forbidden City, which realises immersive display and interaction of cultural heritage through spatial

computation(Sorea D Csesznek C 2020)and real-time rendering technology(Lei M Yu S 2024). The European ‘Time Machine’ project (Abel et al 2022) uses large-scale digitisation and spatio-temporal modelling techniques to build a simulation platform for the evolution of urban history across the centuries(Tao Y 2023). Artificial Intelligence deeply intervenes with machine learning to optimise image retrieval(Krishnaraj N Elhoseny M Lydia E L et al 2020), and blockchain technology guarantees the traceability of digital heritage metadata(Toscano M et al 2022). At the same time, digital ethics research has been receiving increasing attention, with authoritative disputes involving digital reconstruction(Jones S A N et al 2018) and intellectual property balancing of open source data(Edmond J 2020), signalling a shift in the field towards both technological governance and humanistic critique. Future research will focus on multimodal data fusion, the optimisation of intelligent repair algorithms, and the construction of collaborative mechanisms for globalised digital protection.

In the research base of Cluster #1 Digital Culture Industry, the core keywords are clustered around ‘efficiency assessment’, ‘industry clustering’ and ‘policy-driven’. Early studies focused on the economic contribution and efficiency measurement of the cultural industry, (Peris-Ortiz et al 2019) defined the cultural industry as a multi-dimensional industrial system integrating culture, creativity and technology, and emphasised its role in promoting economic transformation(Peris-Ortiz et al 2019). In terms of efficiency assessment methods, data envelopment analysis and its derivative models have become mainstream tools, (Lin et al 2017) quantify the performance of China's cultural industry parks through the super-efficient SBM model, and find that technological inputs and capital allocations significantly affect efficiency(Lin M H Chen H C et al 2017), Fuchia Yang, Kevin Duque et al (2024)design the ‘digital inclusiveness index’ Balancing the distribution of regional resources, research on digital cultural industry covers a wide range of fields from digital entertainment and arts to education and tourism, (Liu M 2022) argues that the core of digital cultural industry lies in the use of digital technology to promote the innovation, dissemination and consumption of cultural content(Li Z Huo M Huo T Luo H 2024). Digital entertainment includes online games and e-sports, short videos and live streaming, interactive film and virtual idols, interactive films from Jitterbug, YouTube, Netflix, virtual idol Hatsune Miku, as well as e-books and online literature.

The continued digitisation of the digital culture industry has created a strong demand for cutting-edge technologies. Zuo Hui pointed out from the perspective of cutting-edge technology empowering the development of the culture industry that cutting-edge technologies such as virtual reality (VR)(George E Raptis 2018), augmented reality (AR)(Dai-In Han 2018), artificial intelligence (AI)(Chen D 2024), blockchain, etc., and a variety of application software technologies that continue to be constantly innovated are being applied to the development of the culture industry, and through the ‘technology + culture’, it empowers the creation of cultural industry, creates brand new experience for users, and opens up new space for the development of the industry(Wang T Ma Z et al 2023). In addition to VR and AR, AI technology was an early adopter in the cultural and creative sector(Marasco A Buonincontri P et al 2018), and recent technologies have been driving the development of intelligent systems in creative applications(Chen D 2024). The value co-creation of the digital cultural industry innovation ecosystem is driven by six factors: market economy, value demand, cultural consensus, industrial policy, IP resources,

and digital technology, and there are six modes of behaviour: content creation, channel docking, IP ecology, intermediary cooperation, technology empowerment, and collaboration between government and enterprises, so as to realise the value acquisition, transmission, creation, value-adding and cyclic iteration.

Application in Cultural Research With the help of big data technology, researchers can analyse massive text materials, image data, audio and video resources, etc.(Lee J 2025), to dig out the historical and cultural information and trends hidden therein, and provide new perspectives and methods for academic research(Li et al 2025), taking Tibet as an example, found that digital infrastructure needs to be adapted to the regional characteristics, and that a decentralised layout can improve the efficiency of the cultural industry by 22.38%(Li W Xiao J X 2021), Instead, standardised logistics solutions are detrimental to localised needs(Li Y Du Q et al 2025). On the ethical level, (Han Liu 2022) designed the 'Digital Inclusion Index' to emphasise the key role of balanced distribution of digital resources between urban and rural areas on cultural equity(Chen W Song H 2025). Image recognition, data visualisation and AI-generated content have become hotspots in recent years. In the future, to promote the development of digital culture on the technical level, the research scope will be larger and the personal involvement of scholars will be higher.

4.2 Future Research Outlook

Based on bibliometric visualisation analysis, this study constructs a systematic theoretical analysis framework table, as shown in Table 5, encompassing the digital cultural domain, technological application scenarios, and future research directions. Table 5. Typical application scenarios and future research directions of digital culture

Classification	Practical scenario research	Future Research Directions
Digital Cultural Heritage Protection	The Vatican Secret Archives deciphers 13th-century papal documents using GAN-based ink restoration.(Pietroni E Ferdani D 2021)	Digital Archiving and Restoration of Cultural Relics
	Laser Point Cloud Scanning, AI based Material Aging Prediction for Digital Reconstruction of Notre Dame de Paris(Biryukova M V Nikonova A A 2017)	Digital Reconstruction of Ancient Monuments
	Lamu Island Digital Archives: Federated Learning for Ethnic Heritage Data Sovereignty (Kenya)(Shuai He Yu Wu 2021)	Protection of Data Sovereignty of Ethnic Cultural Heritage
Creation and Immersive Experience of Digital Cultural Arts	‘Memories of Passersby I’ in the UK, the First AI Artwork Auction	Generative Digital Art Creation
	Virtual Migration of the Abu Simbel Temple in Egypt, VR Immersive Navigation System(Elliott Wen Chitralekha Gupta 2024)	Immersive Cultural Scene Performance
	Sonic Skin Sensor in Canada, Muscle Contraction controlled Sound Sculpture Deformation	Brain Computer Interface and Neural Interaction
Dissemination, Education and Popularisation of Digital Culture	India's ‘Digital Textbook’ Project covering 8 million students, Solving the Problem of No Internet Access	The "Digital Textbook" project covering 8 million students, Solving the Problem of No Internet Access
	Tiny Happy People in the UK, Free Early childhood Education based on TAI Voice Synthesis Technology	Digital Cultural Education
	DreamWorks Animation LLC, a U.S.-based animation studio, developed and produced the Kung Fu Panda film series	Cross Cultural Interaction
Governance and Digital Transformation of Digital Culture	EU ‘Digital Services Act’, Australia's Department of Culture using Blockchain Technology to Establish Artwork Copyright Chains	Protection of Digital Intellectual Property Rights
	Open API for Digital Students in the British Museum, Cloud based Migration of Japan's Animation Industry	Digital Transformation of the Cultural Industry
	China's ‘Zhejiang Model’ Governance Model	Digital Governance
Digital Cultural Entertainment and Smart Cultural Tourism	Half-Life: Alyx, the first AAA-tier story-driven VR game(M Foxman D Beyea A P et al 2022)	Digital Media Production

Classification	Practical scenario research	Future Research Directions
	Metaverse Urban Tourism in South Korea, AR enhanced Virtual Button pressing at the Metropolitan Museum of Art(Valdiviezo-N J C Urcid G E 2017)	AR Navigation, Metaverse Tourism
	Dunhuang Research on ‘Digital Dunhuang People’(Zhiheng Zhou et al 2022), AR Digital Business Cards(Malik U et al 2021)	Digital Cultural and Creative Industries
AI Driven Production and Re creation of Digital Cultural Content	Chinese Digital Human Beauty, ABBA Digital Human Full dimensional Concert in the US	Digital Human Technology
	Integration of Artificial Intelligence Technology with Physical Robots, Enabling Robots to Perceive, Reason and Make Decisions(Yu Peng Jiang et al 2025)	Multimodal Embodied Intelligence
	Spain's pioneering research in AI-directed cellular programming, Tesla's Optimus Embodied Intelligence Application	Human Machine Symbiosis, Emotional AI

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Based on our findings and practical needs, four future research directions are proposed: cultural innovations brought about by emerging technologies, ethical issues and challenges of generative AI, digital narratives and global cultural communication, and digital humanities global academic cooperation and interdisciplinary paradigms.

4.2.1 Cultural Innovations Brought about by Emerging Technologies

Technological advances are driving cultural innovation. Artificial intelligence(Vuong N A Mai T T 2023), 5G(Hoffmann S Bradshaw S, Taylor E 2021), blockchain(Jin Y N Tian L 2019) and other cutting-edge technologies(Rastegar H Eweje G Sajjad A 2024) are not only a single engine, but also, through deep synergy, jointly construct a technological base to support the new form of culture, such as the 5G network to support the augmented reality cloud experience(Tadjik H Geng J Jaatun M G Rong C 2022), the combination of 3D visual sensing(X Qu LWang et al 2020) and artificial intelligence(Wang L Wang Y Liu Q et al 2024), and blockchain to confirm the power and empowerment(Benedict S 2020). Driven by this, the development of cultural technology presents a pattern of diversified integration(Machidon O M et al 2020), multi-dimensional upgrading and multi-directional empowerment(Chuang S M Chen C S Wu E

H 2022), which has profoundly changed the way of cultural production, dissemination and consumption(Guo J 2025).

Future research should focus on breaking through the proposition of ethical governance of technology, and the first task is to establish the laws and regulations for defining the ownership of AI-generated content, improve the application mechanism of blockchain in the digital rights of cultural heritage, and build a data privacy protection system in immersive technology. In the dimension of social equity, efforts should be made to formulate technological strategies to mitigate the digital divide, develop intervention mechanisms to correct the weakening of cultural diversity by algorithmic bias, and continue to explore empirical evidence of the evolution of cultural identities in the environment of fusion of reality and fiction. These researches will directly support the practice of innovation, reconstructing the synergistic ecology of industries through cross-border integration to break down industry barriers, activating cultural heritage resources through the process of cultural digitisation, opening up new fields such as immersive arts, and fostering the productivity of popular culture through the participatory co-creation of the community. Multi-dimensional academic explorations and practical innovations complement each other, jointly promoting the formation of a new paradigm of cultural development that is both dynamic and sustainable, and jointly shaping a vibrant cultural landscape for the future.

4.2.2 Generative Artificial Intelligence Ethical Issues and Challenges

Generative AI has demonstrated strong learning and creative capabilities, and further research could focus on how generative AI grand models change the way culture is produced and disseminated(Zi Yan et al 2025), AI digital heritage protection(Ferretti V Gandino E 2018), and ethical and regulatory issues of AI(Cao Y 2025). Artificial Intelligence technology(Chen D 2024) can accomplish complex work that is difficult for humans to achieve, with the advantage of saving a large amount of human costs and demonstrating accuracy, efficiency(Serafimova S 2020), and comprehensiveness in the process of researching and dealing with problems(Google Arts 2024). For example, the Sanxingdui Museum in China uses AI and 3D printing to recreate exhibits for tourists to visit (Kiourexidou Matina et al 2025). And every technological innovation is accompanied by a social debate about the value of life(Bruno F et al 2010), ethical rules and regulations, and employment and survival (Linyingying et al 2025) Will AI affect our deep understanding of human culture? Can human history and culture modified or reshaped by AI still be called ‘human history and culture’(Taseer M 2024)?

Future research should deeply explore the application scenarios and methods of generative AI macromodelling, as well as how to solve the new ethical issues brought by it, such as data privacy and copyright ownership, etc. Since generative AI relies on massive amounts of data in content creation, the first challenge is data privacy protection. At the same time, the vague copyright attribution of its output content is prone to disputes, and it is difficult to guarantee its authenticity and accuracy, and it may contain prejudice and discrimination, which impacts social values. Existing regulations are lagging behind in dealing with the new problems posed by this technology, leading to regulatory gaps and

dilemmas. How to balance the potential and risks of the technology and effectively address these ethical and regulatory challenges is an urgent task. Therefore, future research should focus on these aspects and continue to contribute to the development of theory and practice.

4.2.3 Digital Narrative and Global Cultural Communication

Digital Narrative and Global Cultural Communication refers to the interdisciplinary field of using digital technology(Agnieszka Wlazel 2023) to reconstruct the paradigm of cultural expression(Zhongxuan Tan 2023) and achieve civilisational mutual understanding through globalised media networks(Suh S 2020.). The core characteristic performance includes integrating generative AI(Mollah Md Alamgir et al 2024), extended reality XR(Chen X et al 2023), blockchain and other technologies to transform linear narratives into immersive and interactive multimodal cultural experiences(Radcliffe-Brown 1952), such as generative AI restoration of Egypt's Rosetta Stone Monument(Pal S 2024), Acropolis AR Epic Theatre(Biocca F Delaney B 1995), and users' co-creation of the ‘Legend of King Gesar’ digital epic; or breaking through geographic constraints to build a channel of cross-civilisation dialogue through VR(Errichiello L Micera R et al 2019)live broadcasting of globally shared cultural scenarios(Mills K A Brown A 2022); both Enjoying the democratisation of narratives brought about by technological empowerment(Tang Y Zhou L Cao J Li J Nie X 2018), but also encountering ontological challenges and disputes over the authenticity of digital narratives and human culture(Laia Pujol-Tost 2019).

Based on this, future research should pay further attention to the balance between technological efficiency and cultural depth, the coordination between global dissemination and local protection, and the symbiosis between machine intelligence and humanistic values(Liu Zhi Feng et al 2018). On the one hand, as the research results show, the current technological applications are facing crises caused by generative AI's handling of historical narratives, cross-border digital communication triggering the theft of cultural resources, and algorithmic black boxes blurring the ethical boundaries of humanism. On the other hand, deepening the research on the balance between technological efficiency and cultural depth is related to the authenticity of human civilisation, the coordination between global and local determines the survival of cultural diversity, and the symbiosis of human-machine values is related to the right to interpret civilisation. Solving these contradictions is the urgent need for human beings to avoid ‘cultural division’ in the rapidly developing digital culture.

4.2.4 Global Academic Cooperation and Interdisciplinary Paradigm of Digital Humanities

Digital humanities is an important branch of digital culture, an emerging field derived from the intersection of information technology and humanities(Brügger N 2016), and reconstructs the methodology of humanities research with digital technology(Jyi-Shane Liu 2018). It includes research themes such as multimodal embodied intelligence(Wu J Cheng L 2025), human-computer symbiosis(Cross ES Ramsey R 2021), and digital activation of cultural heritage(Zhaoqing Yu 2025). As the research results show, AI technology is developing rapidly and has a great impact in various industries(Emmert-Streib F 2023), deepening the application of multimodal embodied intelligence in

humanities scenarios(Wu J Cheng L 2025); however, there is little cooperation between scholars in various countries around the globe(Sai C-C Elizabeth AC Bozeman B 2016), and there is insufficient cooperation between scholars in the humanities and social sciences and technologists(Hribar et al 2015), which is more biased towards autonomous research(Láng B Megyesi B 2024), and there is a need to strengthen academic cooperation. In addition, only technology is not enough, but also need to be human-centred(Cheng S Cao R Md Rashid S 2025), shifting from tool dependence to human paradigm dominance(Agrawal et al 2024), and realising the human-machine co-creation model.

Therefore, two core problems need to be cracked in future research, insufficient global academic cooperation and lack of interdisciplinary paradigm. At the level of transnational cooperation, we should establish a joint laboratory mechanism similar to the European Union's ‘Time Capsule’ project, and develop a multilingual virtual collaboration platform to break down language barriers and cultural conflict barriers; develop a multimodal AI model that integrates multi-source data such as text, image, and voice to promote the automated integration and innovation of interdisciplinary knowledge. We focus on reconstructing technical paths with humanistic issues as the origin, and realising ‘warm digital humanities’ through ethical governance, technological integration, mechanism innovation, digital narrative and sustainable development.

5. Limitations and Future Work

Although this study quantitatively and intuitively evaluates the academic achievements and progress in this field, there are some limitations. Firstly, the literature data focuses on the English literature of web of science core library, Latin American, African region and grey literature, the data coverage of policy reports and industry white papers is insufficient, and the literature sample is biased. Second, the methodology overly relies on the platform API interface to obtain social media data, there is a risk of data black-boxing, and fails to capture the complex interaction between technology and human nature. Finally, we set search keywords and delineated search boundaries when searching for literature, which may have the error of incomplete literature inclusion.

Therefore, in future studies, we consider increasing data sources, such as Google Scholar, Scopus, and UNESCO Digital Library, and in order to prevent problems such as data bias, we do not overly rely on API interfaces, and apply Zotero's self-constructed literature library by combining open-access resources and specialised databases; at the same time, in the literature search of the subsequent studies, we further expand the search terms .

6. Conclusion

Using CiteSpace bibliometric analysis tools, this study systematically combed through 1123 digital culture research articles published between 2012 and 2025, and quantitatively and intuitively evaluated the academic achievements and progress in this field. By presenting a knowledge map, the article reveals the content of the field and the evolution of the knowledge structure from the macro to the micro

level, and proposes four future research directions: cultural innovations brought about by emerging technologies, ethical issues and challenges of generative artificial intelligence, digital narratives and global cultural communication, and digital humanities global academic cooperation and interdisciplinary paradigms.

Theoretical research suggests that:

(1)During the period of 2012–2025, the number of publications in the field of digital culture shows an upward trend with slight fluctuations. We classify it as germination, steady development, and rapid growth stages. Digital culture is receiving attention from researchers from all over the world.

(2)The results of the global digital culture research field published in journals with interdisciplinary aggregation characteristics, mainly gathered in the cultural heritage, information management, social sciences as the theme of the journals. The cultural heritage journal JOURNAL OF CULTURAL HERITAGE (166 articles, 15%) is the leading journal, and the human-computer interaction journal COMPUT HUM BEHAV (126 articles) is the support.

(3)In terms of research institutions, the field is characterised by the dominance of developed countries and the weak participation of developing countries such as China.

(4)At the national level, although China is the first in the world in terms of the number of articles published (370), it has low centrality (0.04) and weak international cooperation; the UK occupies the core position of the global digital culture research network with centrality 0.43.

(5)The research hotspots now derived from keyword clustering and co-occurrence are digital heritage preservation, digital cultural industry, digital humanities, application of digital technology in cultural preservation, digital transformation of culture, and digital cultural communication.

(6)The results of keyword highlighting show that the hot areas of digital culture research show a stage-by-stage evolution characteristic 2012–2018 focus on the socio-cultural shaping effect of digital technology; 2019–2022 turn to the cultural production paradigm reconstruction of AI and big data; 2023–2025 Focus on the innovation of cultural practices in virtual space and immersive technologies. It is characterised by a shift from ‘digitalisation’ to ‘intelligence’ and ‘virtualisation’, with the emergence of ‘meta-universes’, ‘artificial universes’ and ‘artificial technologies’. The study is characterised by a shift from ‘digitalisation’ to ‘intelligence’ and ‘virtualisation’, with emerging keywords such as ‘meta-universe’, ‘artificial intelligence’ and ‘virtual reality’.

From a practical point of view, this study summarises the various technologies involved in digital culture and the application scenarios of such technologies, and incorporates them into the future research direction of digital culture, so as to provide insights for scholars' research and practitioners' operation.

Declarations

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Data sharing is not applicable to this research as no data were generated or analysed.

Ethical Approval and Informed Consent

This article does not contain any studies with human participants performed by any of the authors.

Author Contribution

Yike Zhang: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation. Binbin Ma: Writing – review & editing, Supervision, Resources, Methodology, Funding acquisition, Conceptualization.Ruian Pei: Editing, Formal analysis. Xiaoyu Chen: Writing – review & editing. Xiaohua Hou: Writing – review & editing.

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Figures

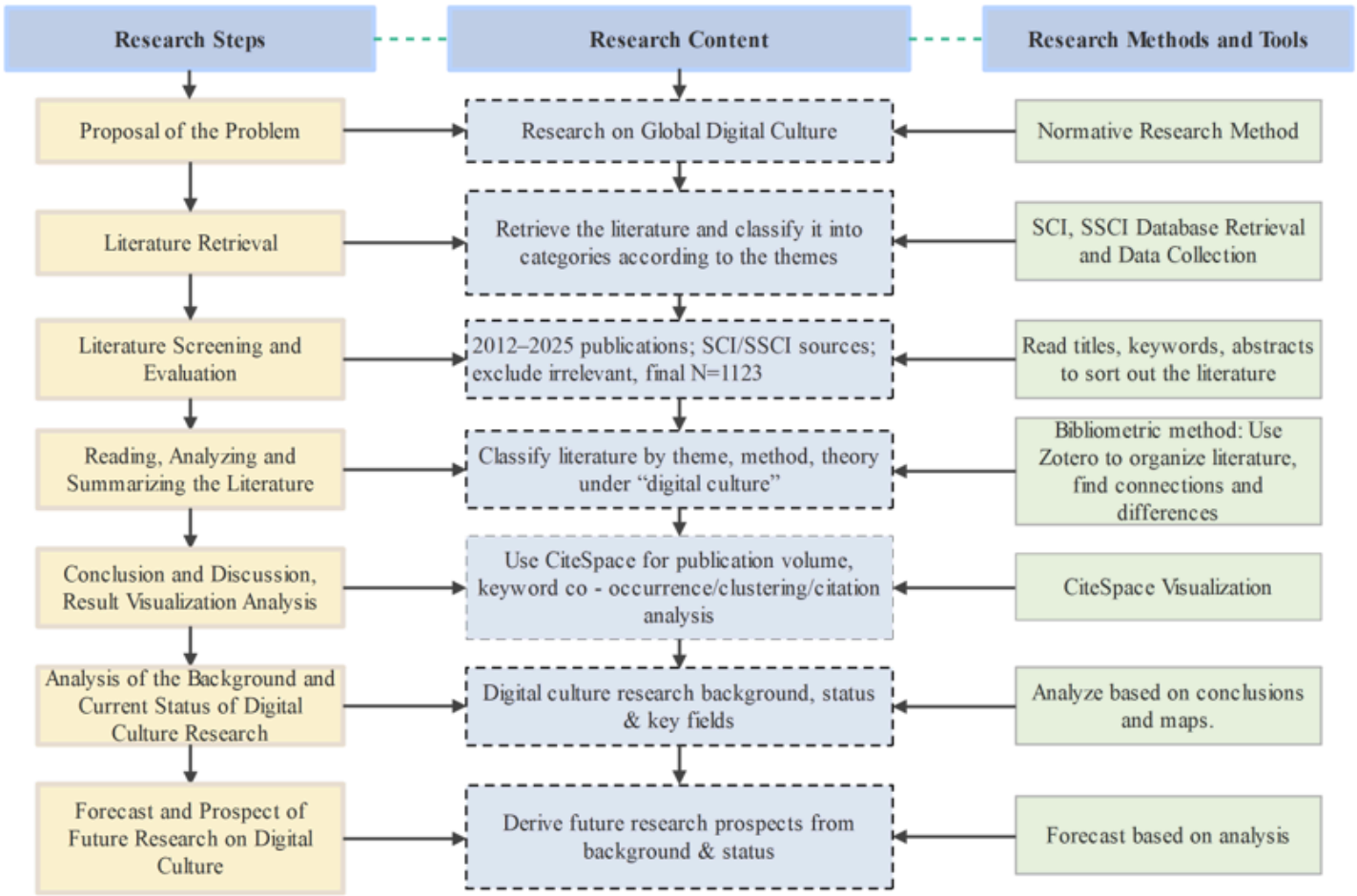
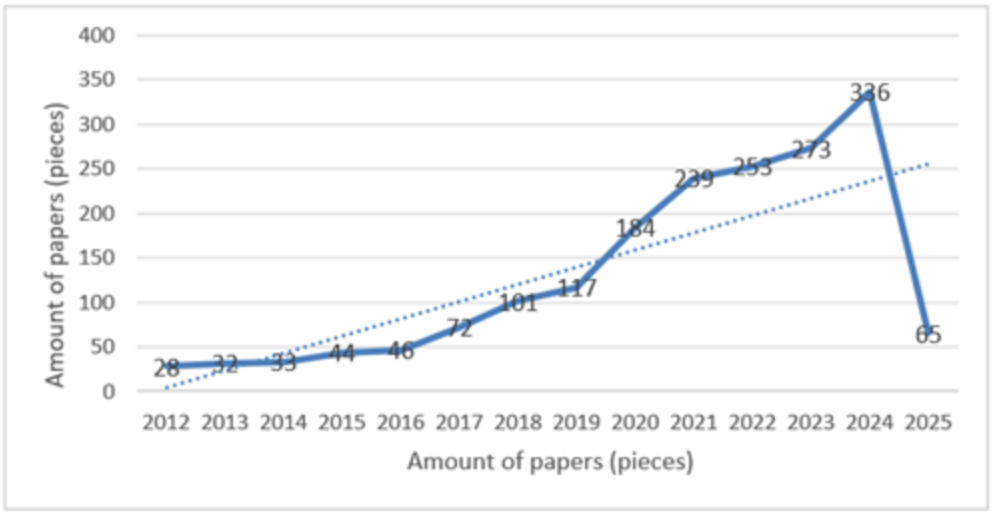


Figure 1

Research framework diagram



a



b

Figure 2

a. Annual distribution of digital culture research publications

2b. Classification of research fields involved in the articles

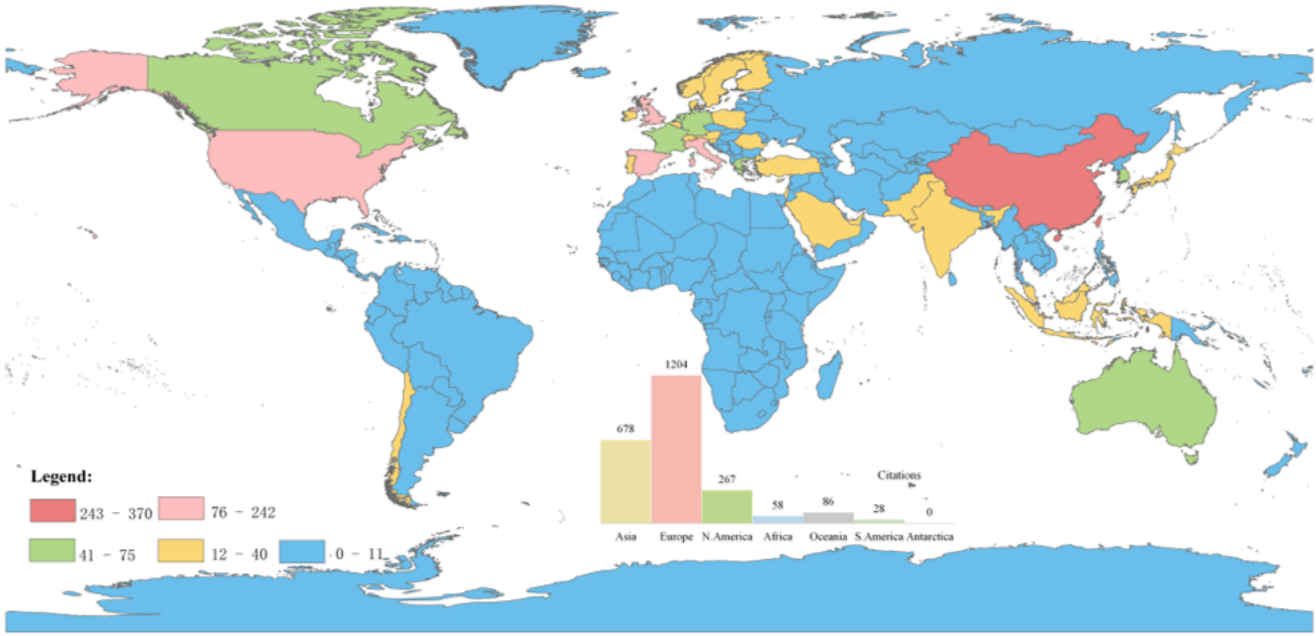


Figure 3

Distribution of citations by country and region in the field of digital culture

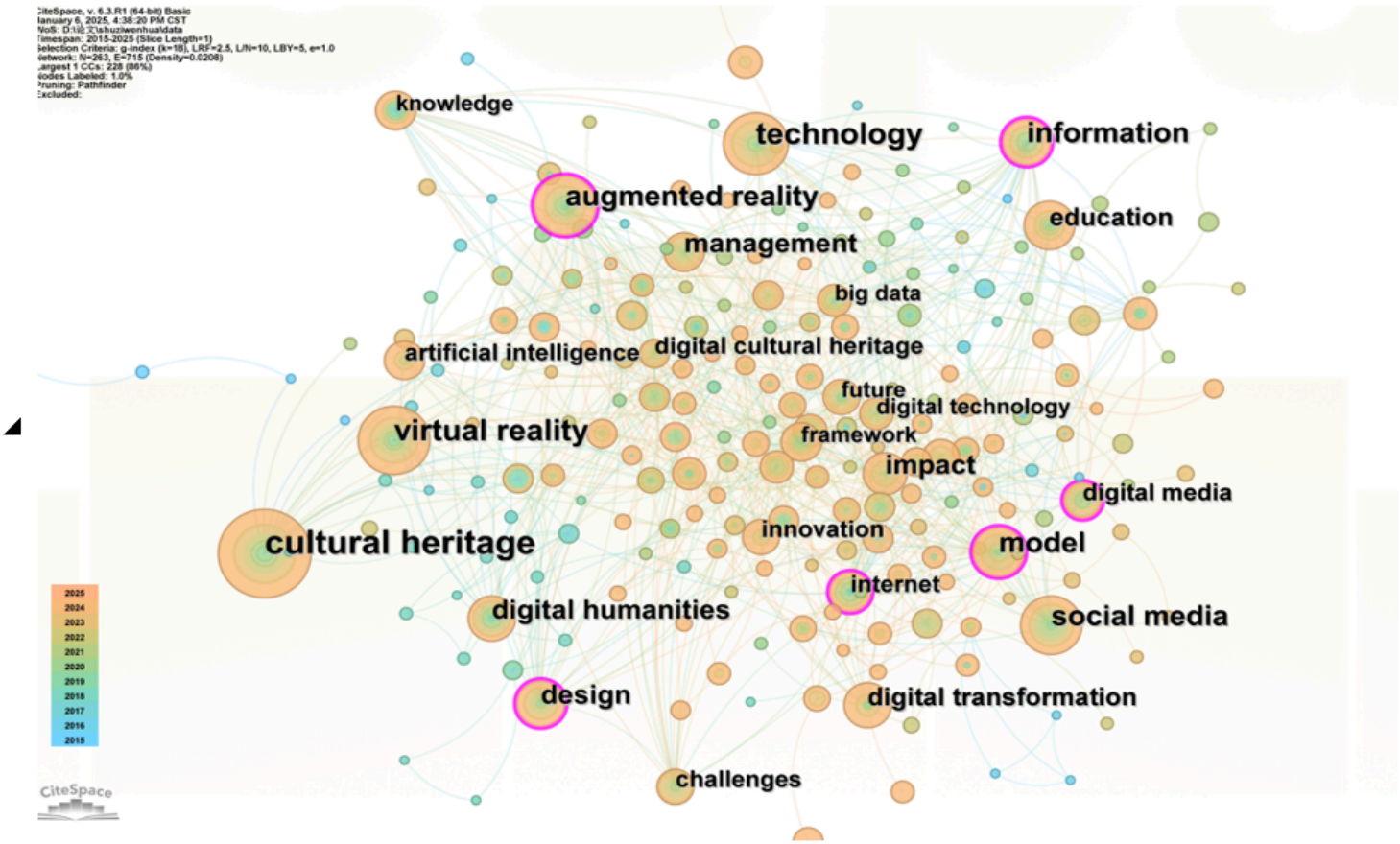


Figure 4

Digital culture keyword co-occurrence mapping



Figure 5

Digital culture key clusters mapping

Keywords	Year	Strength	Begin	End	2012 - 2025
Cloud Computing	2012	2.98	**2012**	2015	
Big Data	2014	2.95	**2014**	2020	
Virtual Reality	2017	3.33	**2017**	2019	
Digital Rights	2018	3.37	**2017**	2020	
Blockchain	2018	2.22	**2016**	2018	
5G	2020	2.49	**2019**	2020	
Online Education	2020	3.23	**2018**	2023	
Metaverse	2022	2.76	**2021**	2023	
Digital Twin	2023	3.71	**2022**	2023	
Generative Artificial Intelligence	2024	3.11	**2014**	2025	

Figure 6

Keyword highlighting map of digital culture research