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# Network communication culture, digital etiquette, online community of university teachers and students: bibliometric mapping of the literature

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***Abstract***. *Introduction*. Online communication and digital etiquette have become essential components of higher education, requiring a thorough understanding of their evolution and current status. *Aim.* This research *aims* to provide a comprehensive overview of the development of scientific thought in network communication and digital etiquette within higher education, offering insights into the current state and future prospects of this field. *Methodology and research methods*. The study employs a bibliometric analysis of metadata from 9,039 articles indexed in the Web of Science from 1975 to 2024. Quantitative bibliometric methods are utilised to describe and visualise the evolution of the field over 49 years, examining publication growth dynamics, author productivity, and the social, intellectual, and conceptual structures. *Results*. The research findings indicate a consistent increase in publication activity, particularly notable since 2019, with contributions across various disciplines, including education, computer science, communication studies, sociology, psychology, and management. The research community exhibits a global character, with the USA, China, and the UK at the forefront of authorship. The study identifies twelve key research themes that dominate scientific discourse, ranging from contemporary educational approaches in the digital age to the co-creation of value in the digital environment. *Scientific novelty*. This comprehensive analysis provides a unique perspective on the evolution and current state of research in network communication culture and digital etiquette within higher education. By identifying key themes and

trends, the study deepens our understanding of the development of this field and its interdisciplinary nature. *Practical significance*. The research provides valuable insights for educators, researchers, and policymakers in higher education regarding strategies for enhancing online communication practices and digital etiquette.

***Keywords:*** bibliometric review, VOSViewer, network communication culture, digital etiquette, online community, teachers and students of the university

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# Культура сетевого общения, цифровой этикет, онлайн-сообщество преподавателей и студентов университета: библиометрическое картирование литературы

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***Аннотация***. *Введение.* Онлайн-коммуникация и цифровой этикет стали неотъемлемыми компонентами высшего образования, требуя всестороннего понимания их эволюции и текущего состояния. *Цель* исследования – предоставить целостный обзор развития научной мысли в области сетевой коммуникации и цифрового этикета в высшем образовании, предлагая понимание текущего состояния и перспектив развития этой области. *Методология и методы*. В исследовании применяется библиометрический анализ метаданных 9039 статей, индексированных в Web of Science с 1975 по 2024 гг. Используются количественные библиометрические методы для описания и визуализации эволюции области за 49 лет при изучении динамики роста публикаций, продуктивности авторов, а также социальных, интеллектуальных и концептуальных структур. *Результаты* показывают устойчивый рост публикационной активности, особенно заметный с 2019 г., с вкладом из различных дисциплин, включая образование, информатику, коммуникационные исследования, социологию, психологию и менеджмент. Исследовательское сообщество демонстрирует глобальный характер, по количеству авторов лидируют США, Китай и Великобритания. Выявлено 12 ключевых исследовательских тем, доминирующих в научном дискурсе, от современных подходов к образованию в цифровую эпоху до совместного создания ценности в цифровой среде. *Научная новизна*. Всесторонний анализ предоставляет уникальную перспективу эволюции и текущего состояния исследований в области культуры сетевого общения и цифрового этикета в высшем образовании. Выявляя ключевые темы и тенденции, исследование способствует более глубокому пониманию развития области и ее междисциплинарного характера. *Практическая значимость*. В работе предложены ценные идеи для педагогов, исследователей и политиков в системе высшего образования, информация о стратегиях улучшения практик онлайн-коммуникации и цифрового этикета.

***Ключевые слова***: библиометрический обзор, VOSViewer, культура сетевого общения, цифровой этикет, онлайн-сообщество, преподаватели и студенты вуза

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## Introduction

The relevance of studying network communication culture and digital etiquette [1] is driven by the intensive digitalisation of the educational process and the growing role of online interaction in academic environments. M. Castells explores this transformation in depth [2]. J. van Dijck's research demonstrates how educational technologies and platforms continue to rapidly evolve [3], compelling university faculty and students to adapt their communicative behaviour to the specificities of digital educational spaces. This adaptation becomes a key factor in ensuring effective learning, professional development, and the formation of productive academic relationships.

The digital landscape of higher education has given rise to a complex network communication culture, with digital etiquette at its core. H. Jenkins, M. Ito and D. Boyd note that this etiquette forms the foundation for ethical and productive online

interactions between faculty and students [4]. By guiding behaviour in digital academic settings, it fosters an environment of mutual respect and upholds academic integrity.

The scientific community currently faces several challenges in researching network communication culture, digital etiquette, and online academic communities. According to D. Lupton, I. Mewburn and P. Thomson, these challenges stem from the rapidly evolving digital environment, which complicates efforts to establish a unified theoretical framework [5]. C. Fuchs further emphasises the fragmented nature of existing research [6]. Despite these obstacles, our study aims to broaden our understanding of these phenomena within the university context.

To achieve this goal, the research employs a bibliometric approach, analysing the development of the field over nearly five decades. This method examines publication trends, identifies prominent researchers and institutions, and maps the structure of the field. A. van Raan suggests that bibliometric mapping provides an objective means of identifying knowledge flows and patterns within the field [7]. As I. Zupic and T. Čater demonstrate, this approach reveals the scientific foundations of the discipline, emerging thematic areas, and gaps in the existing literature [8].

## Literature Review

***Conceptual Foundations: Network Communication Culture, Digital Etiquette, and Online Communities***

There is no universal consensus on the definitions of network communication culture, online communities, and digital etiquette. According to D. Boyd, these terms have been used interchangeably or with overlapping meanings in digital communication studies for a considerable time [9]. However, recent research has begun to distinguish these concepts as separate but interrelated constructs. Two main perspectives on their relationship are prevalent in the literature. H. Rheingold notes that the integrative approach considers network communication culture as an overarching concept that encompasses both online communities and digital etiquette. In this view, online communities are seen as manifestations of network communication culture, while digital etiquette represents its normative aspect [10]. The discrete approach, conversely, treats these concepts as distinct entities that interact and influence each other. N. K. Baym suggests that network communication culture shapes the formation of online communities, which in turn develop their own digital etiquette norms [11]. These norms may then feed back into and modify the broader network communication culture. H. Jenkins, M. Ito, D. Boyd [4] and N. K. Baym [11] emphasise that understanding the interplay between these concepts is crucial for comprehending the dynamics of digital social interactions.

***Conceptualisation of Network Communication Culture: An Interdisciplinary Approach***

The understanding of network communication culture is formed on the basis of theoretical and paradigmatic foundations from various scientific disciplines. This

field of knowledge has evolved through the integration of research from social sciences, humanities, and computer sciences.

According to N. K. Baym, in social sciences, where the main focus is on studying social interactions, network communication is viewed as a multifaceted phenomenon [11]. The sociological approach to researching online communities and digital etiquette aims to analyse the nature of interactions in virtual space and develop structured methods for forming behavioural norms in the internet environment.

M. Castells notes that sociologists have historically considered network communication culture as a social phenomenon shaped by the collective practices, norms, and values of online community participants [2].

S. Turkle emphasises that research on the culture of online communication in the humanities encompasses a wide range of aspects, including linguistic, cultural, and ethical, which influence the formation of cognitive processes, emotional reactions, and behavioural patterns in the digital environment [12]. D. Crystal observes that linguistic science has a rich history of studying the language features of online communication. Linguists primarily focus on analysing and describing innovative forms of digital interaction, which can both facilitate effective communication and become sources of conflict in virtual space [13].

T. Gillespie states that approaches in computer science complement social and humanities research by examining the influence of technological platforms and algorithms on the formation of online communication culture. While humanities focus on linguistic and cultural aspects, computer sciences pay attention to the technical side, which plays a significant role in determining the nature of online interactions [14]. As J. Preece, H. Sharp and Y. Rogers point out, researchers in the field of human-computer interaction are interested in how the design of interfaces and the functionality of social platforms affect communication patterns and the formation of online communities [15].

J. van Dijck suggests that, despite the diversity of theories, principles, and methodological approaches to understanding network communication culture across various disciplines, these fields recognise that online communication has a technological foundation, which is realised within a social context. He tends to view digital etiquette as a dynamic phenomenon, constantly evolving alongside technological and societal developments [3].

D. Boyd [9] and T. Bucher [16] emphasise that the interdisciplinary nature of this field has led to rich and nuanced understandings of online community dynamics and digital etiquette. Media studies scholars have explored how platform affordances shape user behaviour and community norms, while information scientists have examined the role of algorithms in curating online experiences and influencing digital social norms.

According to D. Miller and H. A. Horst, the field of digital anthropology has made significant contributions by applying ethnographic methods to study online cultures and communities, providing deep insights into the rituals, customs, and unwritten rules that govern various online spaces [17].

N. Seaver notes that as the digital landscape continues to evolve, new challenges and opportunities for research emerge. The rise of artificial intelligence and machine learning, for example, is opening up new avenues for studying how automated systems influence and potentially reshape online communication norms [18].

***The Importance of Context in Network Communication Culture***

Z. Papacharissi emphasises that context plays a fundamental role in studying network communicative culture, digital etiquette, and online communities in academic environments, noting that virtual spaces create unique contexts that influence communicative practices [19]. According to C. Greenhow, S. M. Galvin and K. B. Staudt Willet, this is particularly evident in academic settings, where digital platforms are transforming traditional forms of scholarly discourse [20].

B. Stewart indicates that digital etiquette in academic online spaces is shaped by both established norms of scientific communication and new contextual factors, demonstrating how scholars adapt their behaviour on social media, balancing professional image with the informality of online interactions [21].

The study conducted by E. Wenger, N. White and J. D. Smith on virtual communities of practice illustrates how contextual factors influence knowledge exchange and collaboration in digital spaces [22]. D. Lupton, I. Mewburn and P. Thomson observe that a contextual understanding of digital platforms is necessary for effective management of academic identity online [5].

According to C. Costa, considering context allows for a deeper understanding of the nuances of network communicative culture in academic environments, including the analysis of platform-specific norms, interdisciplinary differences, and cultural peculiarities [23].

## Methodology, Materials and Methods

***Research Purpose and Objectives***

This research endeavour aims to examine the progression and current landscape of scholarship in the domains of online communication culture, digital etiquette, and virtual communities involving university educators and students. Through a comprehensive analysis and visual representation of literature spanning the past 49 years, this study aims to illuminate the growth trajectory of the field, assess research productivity, and explore the social, intellectual, and conceptual evolution of the subject matter. This in-depth exploration is designed to offer a nuanced understanding of how this area of study has developed and matured over time, providing valuable insights into its transformation and current state.

The main objectives of the study are:

1. To trace the genesis of research in the field under consideration from 1975 to 2024, identifying the growth trajectory.

2. To identify key journals, research directions, authors, and countries that have made the most significant contributions to the development and dissemination of scientific knowledge in this field.

3. To describe the networks of scientific collaboration between authors and countries, revealing the social structure of the field.

4. To identify scientific disciplines that form the intellectual foundation of research on the studied phenomenon.

5. To substantiate the main thematic areas of research over the 49-year period under review, reflecting the conceptual structure of the field.

Thus, the study seeks to provide a comprehensive overview of the development of this field, covering its quantitative growth, qualitative changes, key participants, and main trends.

***Materials and Methods***

The research dataset spanning the last 49 years was obtained from three Web of Science (WoS) indices: the Science Citation Index Expanded (SCI-Expanded), the Social Sciences Citation Index (SSCI), and the Arts & Humanities Citation Index (A&HCI).

The choice of the WoS database was determined by several important factors:

- historical coverage: WoS provides unique data on publications and citations dating back to 1900.
- interdisciplinarity: WoS covers a wide range of scientific disciplines, representing over 22,778 journals.
- rigorous journal selection: only high-quality peer-reviewed journals are included in the database, ensuring data reliability.
- citation analysis tools: WoS provides powerful tools for citation analysis, helping to assess the impact of publications and authors.
- citation indices: the database includes various indices that facilitate search and analysis.

The methodological design used in this study is visually presented in Figure 1 and described in detail in the subsequent sections.

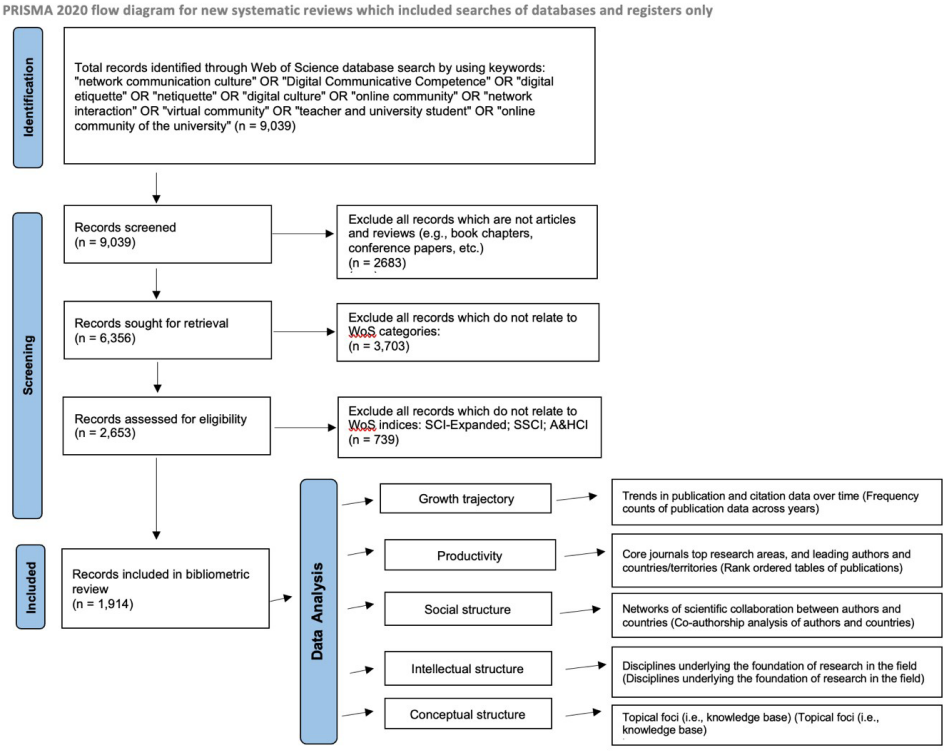



Fig. 1. Methodological design

***Information Retrieval Strategy***

Within the framework of this study, a comprehensive search strategy was employed to construct a representative corpus of documents pertaining to the research problem. The process of identifying relevant publications was executed in multiple stages, commencing with the definition of key terms and concluding with the filtration of results based on predetermined criteria.

The initial phase encompassed pilot testing of search queries utilising the terms "network communication culture", "digital etiquette", and "online community". However, this approach yielded a limited number of results ($n$ = 2,037 publications), which, after filtration, was reduced to $n$ = 123 documents, deemed insufficient for conducting a comprehensive bibliometric analysis.

M. Heitmayer, R. Schimmelpfennig [24], K. Furgang [25], and G. Chiles [26] note that in the course of further optimisation of the search strategy, synonymous terms widely employed in international publications were identified. For instance, instead of "digital etiquette", the term "netiquette" is frequently used, while according to E. Özkan Alakaş [27] and N. A. Mothafar, J. Zhang, A. Alsoffary et al. [28], "network communication culture" is often replaced by the more prevalent concept of "digi-

tal culture". Consequently, an expanded list of keywords was formulated: "network communication culture", "online community", "digital etiquette", "netiquette", "digital culture", "virtual community", "network interaction", "teacher and university student", "digital communicative competence", and "online community of the university".

To maximise the coverage of relevant publications, the logical operator OR was employed between keywords, enabling an increase in the number of potentially relevant documents to $n$ = 9,039.

The temporal range of the study spanned from 1975 to 2024 inclusively, with no language restrictions imposed. Following the application of the criterion – articles and article reviews (books, book chapters, and conference proceedings were excluded) – the total number of identified publications amounted to $n$ = 6,356.

The subsequent selection criterion was based on Web of Science (WoS) categories ("Communication", "Information Science Library Science", "Computer Science Information Systems", "Education Educational Research", "Psychology Multidisciplinary", and "Sociology"), resulting in $n$ = 2,653 publications.

The application of criteria based on WoS domains (Social Sciences Citation Index (SSCI), Science Citation Index Expanded (SCI-Expanded), and Arts & Humanities Citation Index (A&HCI)) determined the final dataset for bibliometric analysis – $n$ = 1,914.

The following bibliometric information was extracted from each scientific publication: article title, year of publication, name of the periodical, citation index, authors' identification data, their institutional affiliation, and geographic location. In addition to this, research abstracts, author-provided descriptors, and lists of references were accumulated.

***Data Analysis Procedures***

In this study, a comprehensive bibliometric approach was applied for a thorough analysis of the evolution and current state of the field under investigation. Quantitative indicators, including the dynamics of publication activity and citation rates, were calculated in chronological order. Additionally, ranked lists were compiled, reflecting the productivity of the field, taking into account key periodicals, research directions, leading scientists, and countries.

According to D. Hernández-Torrano, L. Ibrayeva, J. Sparks et al., the bibliometric analysis was carried out using VOSViewer software, which allows for the visualisation and construction of bibliometric maps [29].

In this tool, analytical units are represented as nodes, whose size correlates with their significance, and spatial positioning indicates the degree of similarity with other nodes. Inter-node connections are denoted by lines, the thickness of which is proportional to the intensity of relationships. The colour coding of nodes indicates their cluster affiliation.

N. J. van Eck, L. Waltman, E. C. M. Noyons point out that the algorithm for constructing bibliometric maps in VOSViewer includes three sequential stages: nor-

malisation of differential node characteristics, projection onto a two-dimensional plane, and clustering of nodes [30].

To investigate the social structure of the scientific field, a co-authorship analysis was conducted at the level of individual researchers and countries/territories. The intellectual structure of the discipline was examined through co-citation analysis of periodicals, where clusters of frequently cited journals were interpreted as fundamental subdisciplines of the field under study. The conceptual structure of the field was elucidated through an analysis of co-occurrences of author keywords. In this study, clusters of co-occurring keywords represent thematic foci addressed in the literature over the past 49 years.

In this work, artificial intelligence tools (Claude AI) were used to optimise and translate the text, ensuring more accurate conveyance of meaning, stylistic correctness, and improvement of the overall quality of presentation.

## Results and Discussion

***Evolutionary Dynamics of Research Activity: A Bibliometric Analysis of Publication Trends and Citation Patterns in the Field of Study***

The quantitative assessment of the development of the scientific discipline was carried out through an analysis of publication activity dynamics and citation patterns. The conducted bibliometric study revealed that the corpus of relevant publications included in the analysed dataset comprised 1,914 items. The total citation count for this dataset reached 61,766 mentions, corresponding to an average citation index of 32.27 per publication. This indicator serves as a quantitative measure of the influence and resonance of scientific works in the field under consideration. The high average citation rate indicates a significant contribution of the research to the development of scientific knowledge and its relevance to the academic community.

The trajectory of growth in the number of publications on the research problem from 1975 to September 2024 demonstrates a gradual increase in scholarly interest in studying network communication culture, digital etiquette, and online communities of university teachers and students over the past 49 years.

The evolution of the research field can be divided into three stages. During the inception stage (1980–1994), the number of publications grew slowly: from 1975–1984, there were no publications; in 1985, the first article was published; the next one appeared only in 1990, and in 1994, two more publications emerged. Between these periods, there were no WoS-indexed publications. The fermentation stage (1995–2018) was characterised by a noticeable increase in the number of publications in this field. In the take-off stage (2019–2020), the number of annually published reports in this area increased nearly 200-fold, reaching 268 articles per year. Subsequent years demonstrate a steady growth in the number of publications: in 2021, 349 articles were published with 8,542 citations, and in 2022, 346 articles with 9,374 citations. These dynamics indicate the increasing relevance and significance of the research topic in the scientific community.

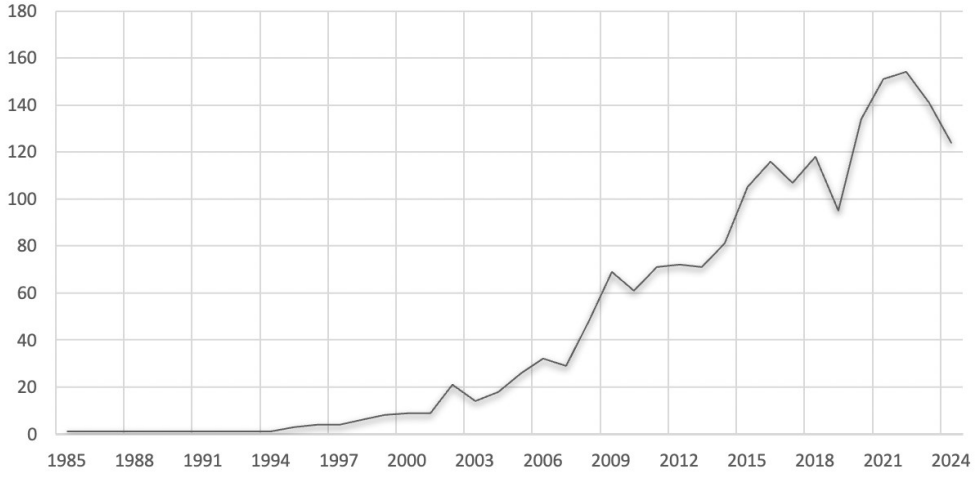



Fig. 2. Publication trends in research on network communication culture, digital etiquette, and university online communities

***Productivity I: Core Journals and Research Areas***

Analysis of the distribution of publications across Web of Science categories demonstrates the interdisciplinary nature of research in the field of network communication culture and digital etiquette in online communities of higher education teachers and students (Table 1).

Table 1

Leading research areas, ranked by number of publications

| Research areas | Records | % of 1,914 |
|---|---|---|
| Education & Educational Research | 213 | 11.12 |
| Information Science & Library Science | 210 | 10.97 |
| Computer Science, Information Systems | 203 | 10.60 |
| Communication | 194 | 10.13 |
| Sociology | 155 | 8.09 |
| Psychology, Multidisciplinary | 147 | 7.68 |
| Management | 96 | 5.01 |
| Telecommunications | 88 | 4.59 |
| Psychology, Experimental | 81 | 4.23 |
| Computer Science, Interdisciplinary Applications | 60 | 3.13 |

An analysis of scientific publications revealed the predominance of the "Education & Educational Research" category (11.12% of the total, $n$ = 1,914), underscoring the critical importance of studying networked communication culture, digital etiquette, and online communities in education. Research demonstrates that the COVID-19 pandemic has catalysed the transformation of academic interaction, accelerating the formation of new digital etiquette norms and the development of virtual educational communities. Educators and students have emerged as key sub-

jects in the educational process, actively adapting to new forms of networked communication.

The categories "Information Science & Library Science" (210 entries, 10.97%) and "Computer Science, Information Systems" (203 entries, 10.60%) occupy the second and third positions respectively, indicating the fundamental significance of technological infrastructure and information systems in the field under study. This statistical data evinces the close integration of educational practices with advanced technological solutions, where the internet serves as a key facilitator of networked interactions. The high representativeness of these categories emphasises the inextricable link between pedagogical innovations and the development of digital technologies that enable the functioning of modern educational ecosystems and the formation of new communication patterns within the academic community.

The significant representation of the "Communication" category (10.13%, $n$ = 194) points to the fundamental role of communication processes in shaping digital etiquette. The substantial proportion of publications in the categories "Sociology" (8.09%, $n$ = 155) and "Psychology, Multidisciplinary" (7.68%, $n$ = 147) attests to the importance of socio-psychological factors in online interactions. The presence of "Management" (5.01%, $n$ = 96) and "Telecommunications" (4.59%, $n$ = 88) categories in the top 10 highlights the complexity of the topic, integrating aspects of management and technological infrastructure within the educational context.

Table 2

Core journals ranked by number of records

| Source titles | Records | % of 1,914 |
|---|---|---|
| Computers in human behaviour | 91 | 4.74 |
| New media & society | 76 | 3.96 |
| Internet research | 39 | 2.03 |
| Information communication & society | 34 | 1.77 |
| Information & management | 30 | 1.56 |
| Decision support systems | 25 | 1.30 |
| Computers & education | 22 | 1.14 |
| Information systems research | 21 | 1.09 |
| Journal of computer-mediated communication | 20 | 1.04 |
| Telematics and informatics | 19 | 0.99 |

The total number of journals included in the analysis of publication activity is $n$ = 580. Analysis of the data presented in Table 2 allows for the identification of key periodicals dominating the publication of research on the topics of networked communication culture, digital etiquette, and online communities of university faculty and students. The journal "Computers in Human Behaviour" (4.74% of publications) leads in this field, which is attributable to its focus on studying digital behaviour and etiquette in the context of human-computer interaction. "New Media & Society" (3.96%) examines the social aspects of new media, which is critically important for understanding the formation of networked communication culture in the academic environment.

"Internet Research" (2.03%) and "Information Communication & Society" (1.77%) provide platforms for discussions on the impact of internet technologies on the formation of online communities in educational contexts. "Information & Management" (1.56%) and "Decision Support Systems" (1.30%) emphasise managerial aspects of information systems, which is relevant to the organisation and moderation of online communities of faculty and students.

"Computers & Education" (1.14%) specialises in the integration of technologies into the educational process, investigating the specifics of digital interaction in academic environments. The "Journal of Computer-Mediated Communication" (1.04%) focuses on the particularities of mediated communication, which is directly related to the formation of networked communication culture and digital etiquette in online communities of university faculty and students.

The combination of these publications creates a comprehensive system for disseminating scientific results, encompassing technological, social, and educational aspects of networked communication culture and digital etiquette in the context of higher education online communities.

***Productivity II: Leading Authors and Countries/Territories***

1,914 publications in the dataset were published by a total of 2,228 authors from countries around the world. Table 3 presents the researchers with the highest number of publications in this field. Chiu Chao-Min, Huang Hsin-Yi, Cheng Hsiang-Lan, and Hsu Jack Shih-Chieh are the most productive researchers with 134 publications (7% of the total), followed by Priharsari Diah, Abedin Babak, and Mastio Emmanuel with 121 publications (6.3%). The authors listed belong to different geographical groups and work at various universities worldwide (National Sun Yat Sen University, Soochow University, University of Technology Sydney, Brawijaya University, Peking University, Wuhan University, Tianjin University, and others). Other productive researchers work in higher education institutions in the USA and Vietnam. Analysis of the productivity of authors and countries showed that research on network communication culture, digital etiquette, and online communities of university teachers and students is conducted in various locations around the world, with a clear predominance of countries in the Asia-Pacific region.

Table 3

Leading authors ranked by number of records

| Authors | Organisation | Country | Records |
|---|---|---|---|
| Chiu Chao-Min; Huang Hsin-Yi; Cheng Hsiang-Lan; Hsu Jack Shih-Chieh | National Sun Yat Sen University; Soochow University; Centres For Disease Control - Taiwan | Taiwan | 134 |
| Priharsari Diah; Abedin Babak; Mastio Emmanuel | University of Technology Sydney; Brawijaya University | Australia; Indonesia | 121 |
| Jin Wei; Sun Yongqiang; Wang Nan; Zhang Xi | Peking University; Wuhan University; Tianjin University | China | 80 |

| | | | |
|---|---|---|---|
| Wang Hua; Chung Jae Eun; Park Namkee; McLaughlin Margaret L.; Fulk Janet | State University of New York (SUNY) System; University of Oklahoma System; University of Southern California | USA | 77 |
| Le Quynh Hoa; Tan Luc Phan; Hoang Thu-Hang | Ho Chi Minh City University Economics | Vietnam | 74 |
| Zhang Jing; Guo Wei; Zhao Nan; Wang Jinliang; Wang Lei; Liang Ruoyu | Tianjin University; Tianjin University of Technology & Education; Jiangnan University | China | 68 |
| Hung Kineta; Li Stella Yiyan; Tse David K. | Hong Kong Baptist University; City University of Hong Kong; University of Hong Kong | Hong Kong | 67 |
| Bliuc Ana-Maria; Betts John; Vergani Matteo; Iqbal Muhammad; Dunn Kevin | Western Sydney University; Monash University; Deakin University; Victoria University | Australia | 47 |
| Lee EunKyung | Kyung Hee University | South Korea | 41 |
| Van Cleaf Kara Mary | Fordham University | USA | 39 |

The analysis of the geographical distribution of scientific publications in the studied field demonstrates significant variability in the contributions of different countries and territories (Table 4).

Table 4

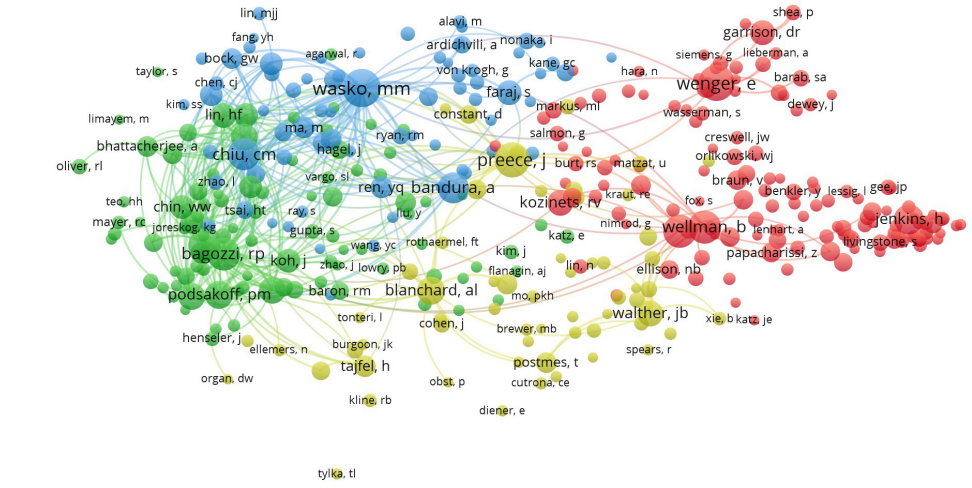
Leading countries/territories ranked by number of record

| Countries/territories | Records | % of 1,914 |
|---|---|---|
| USA | 180 | 9.40 |
| China (Hong Kong and Taiwan) | 129 | 6.73 |
| UK (England, Scotland, Wales) | 96 | 5.01 |
| Australia | 39 | 2.03 |
| Canada | 36 | 1.88 |
| Germany | 24 | 1.25 |
| Netherlands | 19 | 0.99 |
| South Korea | 18 | 0.94 |
| Japan | 17 | 0.88 |

The United States holds the dominant position, generating 180 records, which accounts for 9.40% of the total sample ($n$ = 1,914). China, including Hong Kong and Taiwan, maintains the second place with 129 records (6.73%). The United Kingdom, comprising England, Scotland, and Wales, rounds out the top three with 96 records (5.01%). They are followed by Australia (39 records, 2.03%) and Canada (36 records, 1.88%). The European region is represented by Germany (24 records, 1.25%) and the Netherlands (19 records, 0.99%). The East Asian region is further supplemented by South Korea (18 records, 0.94%) and Japan (17 records, 0.88%). This distribution reflects the global nature of research in the field under consideration, with a notable concentration of scientific activity in North America, East Asia, and Europe.

***Social Structure: Networks of Scientific Collaboration***

Scientific collaboration is recognised as an indicator of quality research and a means of increasing research productivity and academic impact, expressed in citations. Analysis of 364 authors from various countries revealed four main clusters of scientific collaboration (Figure 3).




VOSviewer

Fig. 3. Collaborative research networks between researchers. Only researchers with five or more publications were considered in the analysis ($n$ = 364)

The red cluster ($n$ = 139) focuses on research into communities of practice, social networks, online learning, and digital culture. Etienne Wenger and Barry Wellman lead this direction, which also actively involves D. Randy Garrison, Ann Lieberman, Sasha A. Barab, John Dewey, John W. Creswell, Wanda J. Orlikowski, Virginia Braun, and Henry Jenkins.

The green cluster ($n$ = 93) concentrates on research in technology adoption, consumer behaviour in online environments, and research methodology. Chao-Min Chiu, Richard P. Bagozzi, and Philip M. Podsakoff are key figures in this area, along with Anol Bhattacherjee, Richard L. Oliver, Moez Limayem, Hsiu-Fen Lin, Ling Zhao, Wynne W. Chin, and Hsien-Tung Tsai.

The blue cluster ($n$ = 72) focuses on knowledge management, knowledge sharing in online communities, and virtual teams. Molly McLure Wasko plays a leading role in this direction, which also includes work by Mingfeng Lin, Yulin Fang, Gee-Woo Bock, Shirley Taylor, Chao-Jung Chen, Ritu Agarwal, Maryam Alavi, Alexandre Ardichvili, and Georg von Krogh.

The yellow cluster ($n$ = 60) is oriented towards research on social networks, online communities, and social cognitive theory. Jenny Preece and Albert Bandura are the main theorists in this direction, which also includes works by David Constant, Yuqing Ren, Elihu Katz, and Joseph B. Walther.

The identified clusters reflect the diversity of research directions in the field of collaboration, covering technological, social, and educational aspects.

Analysis of the presented network of joint research between countries and territories reveals a complex structure of international scientific collaboration, consisting of 10 main clusters (Figure 4).

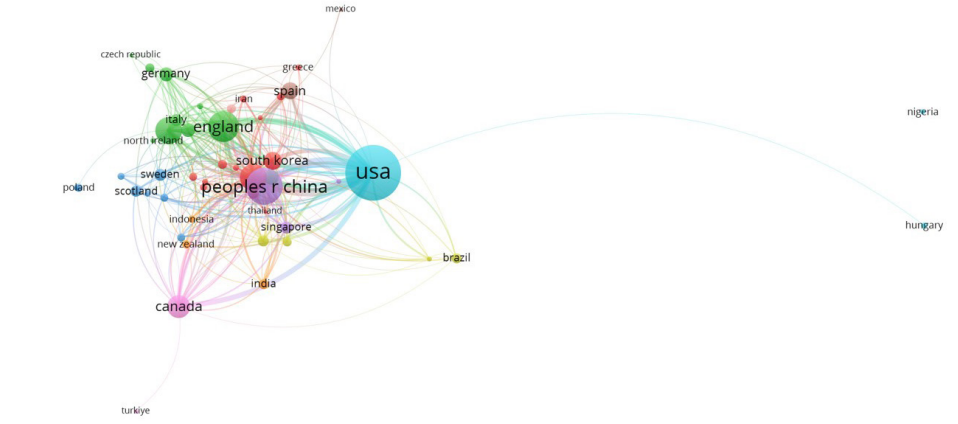



Fig. 4. Collaborative research networks between countries and territories. Only countries with 20 or more publications were considered in the analysis ($n$ = 49)

The United States of America occupies a central position in this network, indicating its dominant role in the global scientific landscape. The USA demonstrates the most intensive connections with China (designated as “peoples r china”), England, Canada, and South Korea, while also maintaining extensive links with European scientific centres.

The second most significant cluster forms around England, which acts as a key node in the European scientific network, closely interacting with Germany, Italy, and other EU countries, while simultaneously maintaining strong transatlantic ties with the USA. Germany, in turn, forms a separate cluster characterised by strong intra-European connections and stable collaboration with American researchers.

Canada forms a distinct cluster, characterised by a strong orientation towards the USA and moderate links with European scientific centres, highlighting its unique position at the intersection of North American and European research spaces.

China represents a major node, demonstrating intensive cooperation with the USA and acting as a centre of attraction for other Asian countries such as South Korea, Singapore, and Thailand, indicating China’s growing role in the global scientific ecosystem.

The European research space is further structured by smaller clusters formed around Spain, Italy, and Sweden, each demonstrating its specific patterns of international collaboration.

South Korea stands out as the centre of an Asian cluster, maintaining close ties with both the USA and China, reflecting its strategic position in the scientific landscape of East Asia.

India forms a separate, though less pronounced cluster, characterised by predominant connections with English-speaking countries and the USA, which may indicate historical and linguistic factors in the formation of scientific collaborations.

This network structure clearly demonstrates the global nature of modern scientific research, where the USA plays a central coordinating role, and regional clusters form around major scientific powers in Europe and Asia. It is particularly worth noting the intensity of connections between English-speaking countries (USA, England, Canada), which may be due to linguistic commonality and historical factors. This study underscores the importance of international collaboration in modern science and identifies key centres and axes of scientific interaction at the global level.

***Intellectual Structure: Disciplines Underlying the Foundations of the Field***

The analysis of the intellectual structure of the studied field reveals a multifaceted and interconnected ecosystem of disciplines forming its fundamental foundations (Figure 5).

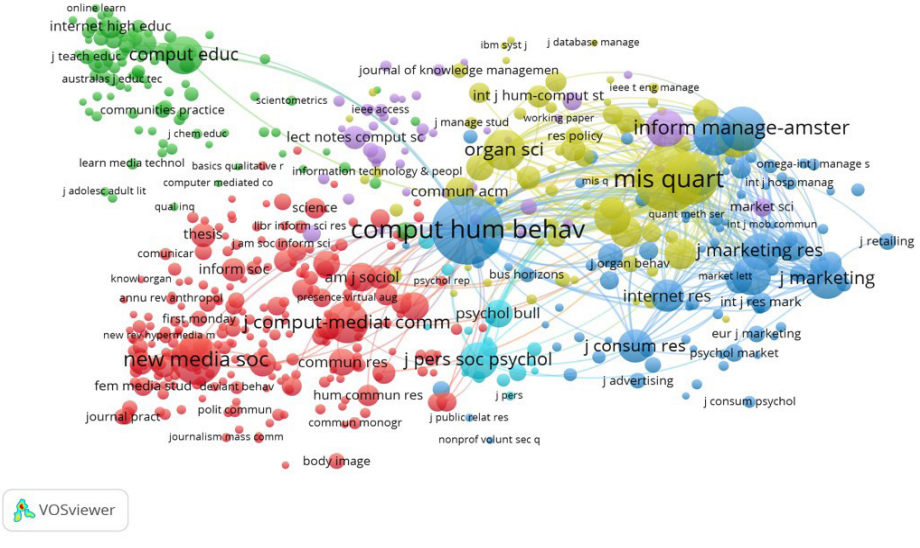



Fig. 5. Map of clustered network journals based on co-citation data. Only publications with 50 or more citations were considered in the analysis ($n$ = 593)

The cluster "Comput hum behave" (Computer Science and Human Behaviour) occupies a central position in this structure, indicating its key integrative role in synthesising technological and behavioural aspects of research.

Information management ("Inform manage-amster") and computer education ("Comput educ") exert significant influence on shaping the disciplinary landscape, highlighting the importance of managing information flows and educational technologies within the context of the digital transformation of society.

The "New media soc" (New Media and Sociology) cluster reflects a growing interest in studying the social implications of digital media, while the presence of marketing research ("J marketing res", "J marketing") underscores the significance of analysing consumer behaviour in the digital environment.

Organisational sciences ("Organ sci") and management information systems ("MIS quart") demonstrate the close relationship between technological innovations and the transformation of organisational structures and processes. The psychological component ("J pers soc psychol") indicates the necessity of considering individual and socio-psychological factors when studying human-technology interactions.

Computer-mediated communication ("J comput-mediat comm.") and internet research ("Internet res") form distinct yet interrelated domains, focusing on the study of digital communication specifics and the internet as a global phenomenon.

This intellectual structure clearly demonstrates the interdisciplinary nature of the field under investigation, integrating methodological approaches and theoretical concepts from computer science, social sciences, psychology, education, management, and marketing. The central position of "Comput hum behave" emphasises that the core of research in this area is the study of complex interactions between technological systems and human behaviour, which forms the conceptual basis for understanding the dynamics of digital society and economy development.

The diversity and interconnectedness of the identified disciplinary clusters indicate the necessity for a comprehensive, systemic approach to studying information technologies and their impact on various aspects of human activity. This structure not only reflects the current state of the research field but also provides valuable insights for determining promising directions for further interdisciplinary research in the domain of human-society-technology interactions.

***Conceptual Structure: Topical Foci Addressed in the Literature Over the Last 49 Years***

In the course of the study, 217 concepts were analysed, forming 12 clusters that reflect various aspects of network communication culture, digital etiquette, and online communities of educators and university students (Figure 6).

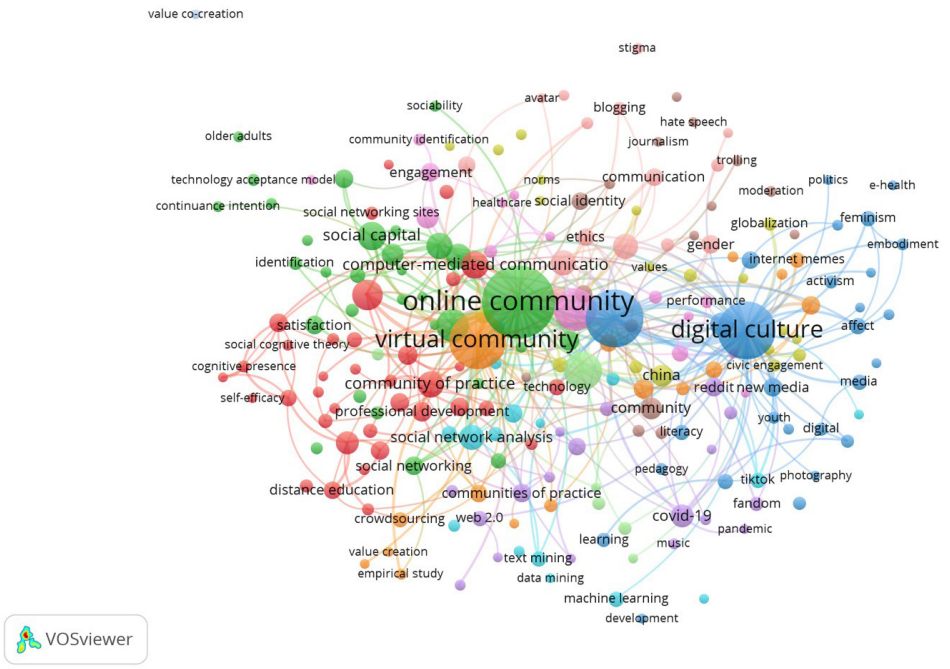



Fig. 6. Topical foci in research on network communication culture, digital etiquette, and online communities of university educators and students. Only keywords with 25 or more occurrences were considered in the analysis (n = 217)

Cluster 1 (*n* = 36, red) encompasses various aspects of the modern educational process, which increasingly relies on digital technologies, online interaction, and collaborative learning methods. We have designated this cluster as "Contemporary Approaches to Learning and Education in the Digital Era", as exemplified in the work of N. M. Hijazi, M. Aloqaily and M. Guizani [31].

Cluster 2 (*n* = 31, green) includes concepts reflecting technological, psychological, and social factors that influence the formation, functioning, and development of virtual educational communities. These factors determine the nature of interaction, level of engagement, and effectiveness of communication in the digital learning environment. This cluster, labelled as "Factors Influencing Participation and Interaction in Online Communities", is represented in studies such as those by H. Zhao and C. Wagner [32].

Cluster 3 (*n* = 28, blue) reflects a wide spectrum of social, cultural, and educational aspects transforming under the influence of digital technologies. New forms of interaction, self-expression, and learning are emerging in the virtual space, necessitating the development of new competencies and ethical norms for effec-

tive communication and collaboration in the academic environment. This cluster, termed "Digital Transformation of Society and Education", is illustrated in research by A. J. Lakshmi, A. Kumar, M. S. Kumar et al. [33].

Cluster 4 ($n$ = 19, yellow) covers a broad range of global phenomena, research methods, and concepts influencing the formation and functioning of online communities in the educational environment. It includes issues of anonymity, digital inequality, cultural norms and values, as well as methodologies for studying network interaction. This cluster, named "Global Aspects and Research of Digital Communication", is explored in works such as those by Q. Huang and S. Xia [34].

Cluster 5 ($n$ = 18, purple) reflects diverse social, cultural, and research aspects of virtual community functioning. It includes research methods (ethnography, case studies), interaction platforms (blogs, Reddit, Web 2.0), cultural phenomena (fandom, masculinity), and current contexts (COVID-19, pandemic). This cluster, designated as "Sociocultural Aspects and Research Methods of Online Communities", is exemplified in the study by Y. Xiao, Y. Yang, H. Xu et al. [35].

Cluster 6 ($n$ = 16, turquoise) encompasses key aspects of social network functioning and analysis, including technological tools, ethical issues, forms of interaction, and research methods. These factors influence the formation of behavioural rules, communication culture, and governance mechanisms in educational online communities. This cluster, termed "Technologies and Issues of Social Networks in Digital Space", is represented in research by C. A. Warden, J. F. Chen and J. O. Stanworth [36].

Cluster 7 ($n$ = 16, orange) demonstrates contemporary forms of collaborative creativity, knowledge sharing, and content creation in virtual space, requiring the development of new interaction norms, respect for intellectual property, and skills for participating in collective projects. This cluster, labeled as "Collaborative Creativity and Innovation in Digital Culture", is explored in works such as those by A. F. Karakaya and H. Demirkan [37].

Cluster 8 ($n$ = 16, brown), "Social Aspects and Challenges of Online Communication", covers a wide range of social phenomena and issues in the digital environment, as well as challenges and methods for their analysis and regulation. These factors influence the formation of communication culture, ethical norms, and mechanisms for maintaining a healthy atmosphere in educational online communities, as demonstrated in research by F. Galante, L. Vassio, M. Garetto et al. [38].

Cluster 9 ($n$ = 15, pink), "Technological Tools and Methods for Developing Online Communities", encompasses technological solutions and methodological approaches for creating and supporting effective online communities. This cluster contributes to increasing participant engagement, improving interaction quality, and enhancing knowledge exchange in the educational environment, as shown in studies by D. Foung, L. Lin and J. Chen [39].

Cluster 10 ($n$ = 15, lilac), "Identity and Self-Expression in Digital Space", addresses issues of personal identity formation and expression in the virtual environment, as well as social and ethical aspects of online communication. This cluster

requires participants in educational communities to develop digital literacy skills, critical content analysis, and adherence to ethical norms, as illustrated in research by M. Saud, R. Ida, M. Mashud et al. [40].

Cluster 11 ($n$ = 6, light green), "Foundations and Challenges of Digital Communication", encompasses fundamental elements of digital interaction, behavioural rules, characteristics of social interactions online, and contemporary technological and ethical challenges, as explored in works by S. Yu [41].

Cluster 12 ($n$ = 1, light blue), "Collaborative Value Creation in the Digital Environment", reflects a key principle of modern online interaction in the educational sphere, where instructors and students jointly participate in knowledge creation, educational content development, and innovative idea generation, as demonstrated in research by Q. Cai, J. Wu, T. Wu et al. [42].

Thus, the analysis of the identified 12 clusters demonstrates the multifaceted and interdisciplinary nature of research in the field of network communication culture, digital etiquette, and online communities of university faculty and students. Key research themes include: contemporary approaches to education in the digital era, factors influencing online interaction, digital transformation of society, global aspects of digital communication, sociocultural aspects of online communities, social network technologies, collaborative creativity, social challenges of online communication, technological tools for community development, digital identity and self-expression, as well as collaborative value creation in the digital environment.

## Conclusion

This study presents a comprehensive bibliometric analysis of scientific publications in the field of network communication culture, digital etiquette, and online communities of university faculty and students over the past 49 years. The results demonstrate a significant increase in interest in this subject area, particularly in the last decade, indicating the emerging nature of this research field. The interdisciplinary nature of the research has been revealed, integrating advances in education, computer science, communication, sociology, and psychology. The geographical distribution of research activity indicates the dominance of the United States and China, which shapes certain perspectives for the development of scientific discourse in this field.

Thematic analysis has identified a wide range of research directions, including the transformation of educational approaches in the digital era, factors of online interaction, global aspects of digital communication, sociocultural features of online communities, and technological tools for their development. However, the study also uncovered several challenges in examining the research subject. There is a fragmentation of the research community, characterised by insufficient collaboration between various scientific groups. International cooperation is limited by geographical, cultural, and linguistic barriers. Methodological limitations associated with the predominant use of English-language sources and journal articles may lead to inadequate representation of research from non-English speaking countries

and other formats of scientific publications. There is a potential imbalance in coverage of issues caused by the dominance of certain geographical regions in research activity. The interdisciplinary nature of research and differences in methodological approaches create difficulties in forming a unified theoretical base.

Despite these limitations, the conducted bibliometric analysis provides valuable information about the current state and development trends of research in the field of network communication culture, digital etiquette, and online communities in the academic environment. Further research could be directed towards overcoming the identified problems and expanding the geographical and methodological coverage of analysed publications, which will deepen the understanding of this field and contribute to its further development.

## References

1. Abdigapbarova U., Arzymbetova S., Imankulova M., Zhiyenbayeva N., Tapalova O. Monitoring virtual interactions of teachers and students in social networks. *Heliyon*. 2024;10(19):e37559. doi:10.1016/j.heliyon.2024.e37559
2. Castells M. *The Rise of the Network Society.* 2nd ed.Wiley-Blackwell; 2010. 656 p. Accessed November 10, 2024. https://www.wiley.com/en-us/The+Rise+of+the+Network+Society%2C+2nd+Edition-p-9781405196864
3. Van Dijck J. *The Culture of Connectivity: A Critical History of Social Media.* Oxford: Oxford University Press; 2013. 240 p. Accessed November 10, 2024. https://global.oup.com/academic/product/the-culture-of-connectivity-9780199970773
4. Jenkins H., Ito M., Boyd D. *Participatory Culture in a Networked Era.* Cambridge: Polity Press; 2016. 160 p. Accessed November 10, 2024. https://www.politybooks.com/bookdetail?book_slug=participatory-culture-in-a-networked-era--9780745660700
5. Lupton D., Mewburn I., Thomson P., eds. *The Digital Academic: Critical Perspectives on Digital Technologies in Higher Education.* London: Routledge; 2018. 188 p. doi:10.4324/9781315473611
6. Fuchs C. *Social Media: A Critical Introduction.* London: Sage; 2019. 448 p. Accessed November 10, 2024. https://us.sagepub.com/en-us/nam/social-media/book257171
7. van Raan A.F. Measuring science: basic principles and application of advanced bibliometrics. In: Glänzel W., Moed H.F., Schmoch U., Thelwall M., eds. *Springer Handbook of Science and Technology Indicators*. Cham: Springer; 2019:237–280. doi:10.1007/978-3-030-02511-3_10
8. Zupic I., Čater T. Bibliometric methods in management and organization. *Organizational Research Methods*. 2015;18(3):429–472. doi:10.1177/1094428114562629
9. Boyd D. *It's Complicated: The Social Lives of Networked Teens*. New Haven: Yale University Press; 2014. 296 p. Accessed November 10, 2024. https://yalebooks.yale.edu/book/9780300166316/its-complicated
10. Rheingold H. *The Virtual Community: Homesteading on the Electronic Frontier*. Cambridge: MIT Press; 2000. 447 p. Accessed November 10, 2024. https://mitpress.mit.edu/9780262681210/the-virtual-community
11. Baym N.K. *Personal Connections in the Digital Age*. Cambridge: John Wiley & Sons; 2015. 240 p. Accessed November 10, 2024. https://williamwolff.org/wp-content/uploads/2015/08/baym-ch1-2015.pdf
12. Turkle S. *Alone Together: Why We Expect More from Technology and Less from Each Other*. New York: Hachette UK; 2017. 400 p. Accessed November 10, 2024. https://www.mediastudies.asia/wp-content/uploads/2017/02/Sherry_Turkle_Alone_Together.pdf

13. Crystal D. *Internet Linguistics: A Student Guide*. London: Routledge; 2011. 192 p. doi:10.4324/9780203830901
14. Gillespie T. *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions that Shape Social Media*. New Haven: Yale University Press; 2018. 296 p. doi:10.12987/9780300235029
15. Preece J., Sharp H., Rogers Y. *Interaction Design: Beyond Human-Computer Interaction*. 4th ed. Chichester: John Wiley & Sons; 2015. 584 p.
16. Bucher T. *If...Then: Algorithmic Power and Politics*. Oxford: Oxford University Press; 2018. 200 p.
17. Miller D., Horst H.A. *Digital Anthropology*. London: Berg; 2012. 318 p.
18. Seaver N. Knowing algorithms. In: Vertesi J., Ribes D., eds. *Digital STS: A Field Guide for Science & Technology Studies*. Princeton: Princeton University Press; 2019:412–422. doi:10.2307/j.ctvc77mp9.30
19. Papacharissi Z. The virtual geographies of social networks: a comparative analysis of Facebook, LinkedIn and ASmallWorld. *New Media & Society*. 2009;11(1-2):199–220. doi:10.1177/1461444808099577
20. Greenhow C., Galvin S.M., Staudt Willet K.B. What should be the role of social media in education? *Policy Insights from the Behavioral and Brain Sciences*. 2019;6(2):178–185. doi:10.1177/2372732219865290
21. Stewart B. Open to influence: what counts as academic influence in scholarly networked Twitter participation. *Learning, Media and Technology*. 2015;40(3):287–309. doi:10.1080/17439884.2015.1015547
22. Wenger E., White N., Smith J.D. *Digital Habitats: Stewarding Technology for Communities*. Portland: CPsquare; 2009. 228 p.
23. Costa C. The habitus of digital scholars. *Research in Learning Technology*. 2013;21. doi:10.3402/rlt.v21i0.21274
24. Heitmayer M., Schimmelpfennig R. Netiquette as digital social norms. *International Journal of Human–Computer Interaction*. 2024;40(13):3334–3354. doi:10.1080/10447318.2023.2292160
25. Furgang K. *Netiquette: A Student's Guide to Digital Etiquette*. New York: Rosen Publishing Group; 2017. 48 p.
26. Chiles D. *Internet Etiquette: Netiquette Fundamentals*. Vol. 2. CreateSpace Independent Publishing Platform; 2016. 210 p.
27. Özkan Alakaş E. Digital transformational leadership and organizational agility in digital transformation: structural equation modelling of the moderating effects of digital culture and digital strategy. *The Journal of High Technology Management Research*. 2024;35(2):100517. doi:10.1016/j.hitech.2023.100517
28. Mothafar N.A., Zhang J., Alsoffary A., Masoomi B., Abdo A.B., Alhady O.S. Digital social responsibility towards digital education of international higher education students' institutions: Digital culture as mediator. *Heliyon*. 2024;10(17). doi:10.1016/j.heliyon.2024.e24898
29. Hernández-Torrano D., Ibrayeva L., Sparks J., Lim N., Clementi A., Almukhambetova A., et al. Mental health and well-being of university students: A bibliometric mapping of the literature. *Frontiers in Psychology*. 2020;11:1226. doi:10.3389/fpsyg.2020.01226
30. Van Eck N.J., Waltman L., Noyons E.C.M., Buter R.K. Automatic term identification for bibliometric mapping. *Scientometrics*. 2010;82:581–596. doi:10.1007/s11192-010-0173-0
31. Hijazi N.M., Aloqaily M., Guizani M. Collaborative IoT learning with secure peer-to-peer federated approach. *Computer Communications*. 2024;228:107948. doi:10.1016/j.comcom.2024.107948
32. Zhao H., Wagner C. Crossing the chasm: understanding users' motivational differences based on stages of online community. *Information & Management*. 2024;61(8):104050. doi:10.1016/j.im.2024.104050

33. Lakshmi A.J., Kumar A., Kumar M.S., Patel S.I., Naik S.L., Ramesh J.V.N. Artificial intelligence in steering the digital transformation of collaborative technical education. *The Journal of High Technology Management Research.* 2023;34(2):100467. doi:10.1016/j.hitech.2023.100467
34. Huang Q., Xia S. Preparing learners for digitally mediated academic communication: digital multimodal practice in students' knowledge dissemination videos. *Journal of English for Academic Purposes*. 2024;71:101429. doi:10.1016/j.jeap.2024.101429
35. Xiao Y., Yang Y., Xu H., Li S. Empirical insights into the interaction effects of groups at high risk of depression on online social platforms with NLP-based sentiment analysis. *Data and Information Management*. 2024;8(4):100080. doi:10.1016/j.dim.2024.100080
36. Warden C.A., Chen J.F., Stanworth J.O. The role of social networks in digital learning gamification: learner communication preferences and performance effects. *Learning and Instruction*. 2024;92:101911. doi:10.1016/j.learninstruc.2024.101911
37. Karakaya A.F., Demirkan H. Collaborative digital environments to enhance the creativity of designers. *Computers in Human Behavior*. 2015;42:176–186. doi:10.1016/j.chb.2014.03.029
38. Galante F., Vassio L., Garetto M., Leonardi E. Modeling communication asymmetry and content personalization in online social networks. *Online Social Networks and Media*. 2023;37:100269. doi:10.1016/j.osnem.2023.100269
39. Foung D., Lin L., Chen J. Reinventing assessments with ChatGPT and other online tools: opportunities for GenAI-empowered assessment practices. *Computers and Education*: *Artificial Intelligence.* 2024;6:100250. doi:10.1016/j.caeai.2024.100250
40. Saud M., Ida R., Mashud M., Yousaf F.N., Ashfaq A. Cultural dynamics of digital space: democracy, civic engagement and youth participation in virtual spheres. *International Journal of Intercultural Relations*. 2023;97:101904. doi:10.1016/j.ijintrel.2023.101904
41. Yu S. Covert communication by means of email spam: a challenge for digital investigation. *Digital Investigation*. 2015;13:72–79. doi:10.1016/j.diin.2015.04.007
42. Cai Q., Wu J., Wu T., Chang P.C., Mardani A. The impact of digital leadership on hidden champions' competitive advantage: a moderated mediation model of ambidextrous innovation and value co-creation. *Journal of Business Research*. 2024;182:114819. doi:10.1016/j.jbusres.2024.114819

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