

Digital Literacy, Digital Engagement, and Digital Culture in Business and Management Research: A Scientometric Analysis

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ABSTRACT

Digital literacy, digital engagement, and digital culture have become increasingly important for organizational digital capability and sustainable business development. However, the intellectual structure and evolution of this research field within business and management remain insufficiently understood. This study addresses this gap through a scientometric analysis of 369 English-language publications indexed in the Lens database between 2020 and 2025. Using the analytical logic of Bibliometrix implemented in Python, publication trends, collaboration networks, keyword co-occurrence, document co-citation, and thematic evolution were examined to reveal the development of this research field. The findings indicate that research on digital literacy, digital engagement, and digital culture has expanded rapidly while becoming increasingly mature and multidisciplinary. The field has evolved from emphasizing individual digital competencies toward broader organizational perspectives, highlighting the growing importance of digital engagement and digital culture in strengthening organizational digital capability. This study provides a comprehensive overview of the intellectual landscape of research on digital literacy, digital engagement, and digital culture in business and management and offers valuable insights for researchers, managers, and policymakers seeking to support sustainable organizational digital development.

Keywords: Digital culture, Digital engagement, Digital literacy, Organizational Digital Capability, Scientometric analysis

1. INTRODUCTION

The accelerating pace of digital transformation has fundamentally reshaped the competitive landscape of modern organizations, compelling firms to rethink how they create value, manage resources, and sustain long-term competitiveness (Vial, 2019; Verhoef et al., 2021). The widespread adoption of emerging digital technologies—including artificial intelligence (AI), big data analytics, cloud computing, the Internet of Things (IoT), and digital platforms—has transformed not only operational processes but also strategic decision-making and organizational management practices (Nambisan et al., 2019; Verhoef et al., 2021). Consequently, competitive advantage is no longer determined solely by technological investment; instead, it increasingly depends on an organization's ability to develop, integrate, and leverage digital capabilities across different functional and managerial levels (Warner & Wäger, 2019; Kraus et al., 2022). Accordingly, business and management research has gradually shifted its attention from technology adoption toward the organizational capabilities that enable successful digital transformation, emphasizing that firms require not only digital infrastructure but also digitally competent employees, active digital engagement, and supportive organizational cultures to achieve sustainable innovation and superior organizational performance (Nambisan et al., 2019; Verhoef et al., 2021). Within this context, digital literacy, digital engagement, and digital culture have emerged as three interrelated research areas that collectively contribute to the development of organizational digital capabilities. As scholarly interest in these topics continues to grow, a systematic understanding of their intellectual

development and evolving research landscape has become increasingly important for advancing business and management research.

Building upon the growing emphasis on digital transformation, business and management research has increasingly shifted its focus from digital technologies to the human and organizational capabilities required to realize their strategic value. Within this context, digital literacy, digital engagement, and digital culture have emerged as three closely interconnected research themes that collectively support organizational digital transformation and competitiveness. Digital literacy equips employees and managers with the competencies to effectively utilize digital technologies, while digital engagement reflects the active participation and collaborative behaviors through which digital value is created (Kozanoglu & Abedin, 2021; Nambisan et al., 2017). At the organizational level, digital culture fosters openness to technological change, continuous learning, and innovation, creating an environment that enables organizations to sustain digital transformation and long-term competitiveness (Warner & Wäger, 2019; Verhoef et al., 2021). Together, these interconnected research themes have attracted growing scholarly attention across business and management disciplines, highlighting the need for a systematic understanding of their intellectual development and evolving research landscape.

Despite the growing body of research on digital literacy, digital engagement, and digital culture, the existing literature remains dispersed across different theoretical perspectives, organizational contexts, and research streams. Most studies have examined these themes independently, focusing on specific aspects of digital transformation, employee capabilities, organizational behavior, or innovation management, with limited efforts to integrate their collective intellectual development within the business and management domain (Donthu et al., 2021; Verhoef et al., 2021). As a result, current knowledge lacks a comprehensive understanding of how these interconnected research themes have evolved, what intellectual foundations have shaped their development, and which emerging directions are likely to influence future research. This knowledge gap highlights the need for a systematic scientometric analysis to map the intellectual structure, research evolution, and future development of digital literacy, digital engagement, and digital culture in business and management research.

To address this knowledge gap, the present study conducts a comprehensive scientometric analysis of research on digital literacy, digital engagement, and digital culture within the business and management domain. The study systematically maps the intellectual landscape of this research field, revealing its knowledge structure, intellectual evolution, and emerging research directions. By integrating dispersed knowledge and uncovering the field's intellectual development, this study provides a comprehensive foundation for future theory development, research advancement, and evidence-informed managerial decision-making in the digital era.

Building upon the identified knowledge gap, this study aims to provide a comprehensive understanding of the intellectual development of research on digital literacy, digital engagement, and digital culture within the business and management literature. Specifically, the study seeks to examine publication trends and the growth trajectory of the field, identify the most influential journals, authors, institutions, and countries, explore its intellectual and conceptual structure, and reveal the major research themes and their evolution over time. In addition, the study aims to identify emerging research topics and future research directions, thereby providing a comprehensive knowledge base to support future theory development and empirical research in business and management.

This study contributes to the business and management literature in several important ways. First, it provides a comprehensive synthesis of research on digital literacy, digital engagement, and digital culture, offering an integrated understanding of the intellectual development and knowledge structure of these interconnected research areas. Second, by identifying major research themes,

emerging topics, and existing knowledge gaps, the study advances theoretical understanding and provides a robust knowledge foundation for future theory development and empirical research in this field. Finally, the findings offer valuable insights for both researchers and practitioners by highlighting the evolving role of digital capabilities in organizations and providing evidence-informed directions for future academic research and managerial practice.

2.METHODOLOGY

2.1 Research Design

This study employed a scientometric review design to systematically map and evaluate the intellectual development of research on digital literacy, digital engagement, and digital culture within the business and management domain. Scientometric analysis provides a quantitative and visual approach for examining the structure, evolution, and emerging trends of a research field through bibliographic data. Compared with traditional narrative literature reviews, it enables a more objective and comprehensive assessment of publication patterns, influential contributors, collaboration networks, and thematic development, thereby offering a holistic understanding of the intellectual landscape of a research domain (Donthu et al., 2021).

To achieve the research objectives, the review integrates two complementary analytical components: performance analysis and science mapping. Performance analysis is used to evaluate the productivity and influence of the literature, whereas science mapping explores the relationships and structures within the research field. Together, these analytical components provide a systematic framework for the review and guide the subsequent analyses presented in this study.

2.2 Literature Search and Selection

The bibliographic records analyzed in this study were retrieved from the Lens Scholarly Search database, a multidisciplinary scholarly platform that provides comprehensive bibliographic metadata, including publication information, author affiliations, keywords, citation records, and reference lists. Lens was selected as the primary data source because of its extensive scholarly coverage and its ability to provide high-quality bibliographic information suitable for scientometric analysis.

A systematic literature search was conducted to identify publications related to digital literacy, digital engagement, and digital culture within the business and management domain. To improve the comprehensiveness of the search and minimize the omission of relevant studies, synonymous terms associated with digital literacy were incorporated into the search strategy. The final search query was formulated as follows:

Search query

("digital literacy"
OR "digital competence"
OR "digital capability"
OR "digital skills"
OR "digital engagement"
OR "digital culture")

AND

(business
OR management
OR organization
OR organisational
OR enterprise
OR workplace
OR employee)

The search was restricted to English-language publications published between 2020 and 2025. Following the retrieval process, the resulting records were manually screened by examining their titles, abstracts, and keywords to ensure their relevance to the objectives of this study. Publications that were unrelated to the business and management domain or did not address the core research themes were excluded. Consequently, a final dataset of 369 publications was retained for subsequent scientometric analysis.

Although the search strategy targeted business- and management-related research, the retrieved publications encompass multiple disciplines, including business, computer science, psychology, healthcare, and social sciences. This interdisciplinary distribution reflects the broad application of digital literacy, digital engagement, and digital culture across organizational, technological, and societal contexts. Nevertheless, business-related research represents a major component of the final dataset, confirming the suitability of the retrieved publications for addressing the objectives of this study.

2.3 Scientometric Analysis Procedures

The scientometric analysis was conducted using Bibliometrix, an open-source R package for comprehensive bibliometric analysis developed by Aria and Cuccurullo (2017). The analyses were performed through the Biblioshiny web interface, which provides an interactive platform for data processing, visualization, and science mapping. Bibliometrix was selected because it integrates descriptive bibliometric analysis and science mapping techniques within a unified analytical framework, making it well suited for examining the development and knowledge structure of a research field.

Following established scientometric methodologies, this study combined performance analysis and science mapping analysis. Performance analysis was conducted to evaluate publication trends, publication sources, authors, institutions, countries, and citation performance, thereby assessing the productivity and academic impact of research on digital literacy, digital engagement, and digital culture in business and management. Science mapping analysis was employed to investigate the conceptual and intellectual structure of the field through collaboration network analysis, keyword co-occurrence analysis, co-citation analysis, and thematic evolution analysis.

The combination of performance analysis and science mapping provides a comprehensive understanding of the research landscape by identifying publication patterns, collaboration characteristics, research hotspots, and the evolution of thematic knowledge. The findings derived from these analyses are presented in the following section.

Table 1. Overview of the Scientometric Analyses

Analytical Approach	Analysis	Objective
Performance Analysis	Publication Trends	Examine the growth of research output
	Source Analysis	Identify influential publication sources
	Author Analysis	Identify leading researchers

Analytical Approach	Analysis	Objective
Science Mapping	Citation Analysis	Evaluate academic impact
	Collaboration Network Analysis	Examine collaboration patterns
	Keyword Co-occurrence Analysis	Identify research hotspots
	Co-citation Analysis	Identify the intellectual structure of the field
	Thematic Evolution	Explore thematic development

3. RESULTS

3.1 Publication Trends

Figure 1 presents the annual scientific production of research on digital literacy, digital engagement, and digital culture in the business and management domain between 2020 and 2025. The dataset comprised 369 publications retrieved from the Lens Scholarly Search database. The annual distribution of publications reveals marked fluctuations in research output over the six-year period.

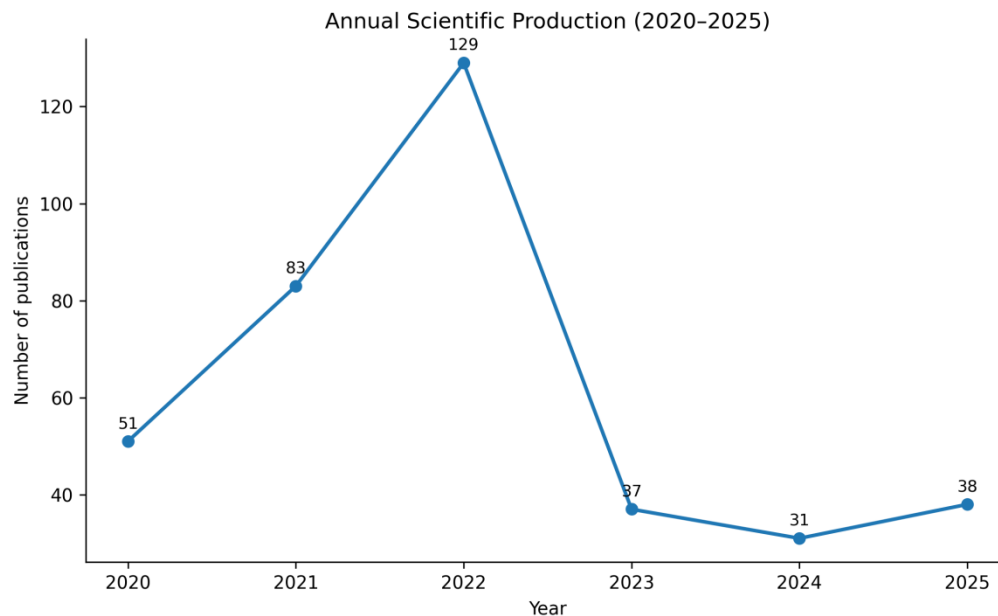


Figure 1. Annual Scientific Production (2020–2025)

As shown in Figure 1, publication output increased substantially during the first three years. The number of publications rose from 51 in 2020 to 83 in 2021, representing an increase of 62.7%. Research output increased further to 129 publications in 2022, which was the highest annual total recorded during the study period. Publications from 2022 accounted for 35.0% of the entire dataset.

Following the peak in 2022, annual publication output decreased sharply to 37 publications in 2023 and declined further to 31 in 2024. A modest recovery was observed in 2025, when the number of publications increased to 38. Despite this recovery, the annual output in the final three years remained below the levels recorded in 2021 and 2022.

Overall, the dataset indicates an initial period of rapid publication growth between 2020 and 2022, followed by comparatively lower publication output during 2023–2025. Although publication output declined after reaching its peak in 2022, research activity remained continuous throughout the study period, indicating sustained scholarly interest in digital literacy, digital engagement, and digital culture within the business and management domain.

3.2 Influential Sources, Authors, and Countries

To identify the major contributors to the development of research on digital literacy, digital engagement, and digital culture in business and management, a performance analysis was conducted at the source, author, and country levels. The results provide an overview of the most productive publication outlets, the leading authors, and the countries contributing to the literature during the study period.

3.2.1 Influential Sources

Table 2 presents the ten most productive publication sources identified in the dataset. Sustainability was the leading publication outlet with 15 articles, followed by the International Journal of Environmental Research and Public Health and PLOS ONE, each publishing eight articles. JMIR Formative Research ranked fourth with seven publications, while Scientific Reports and the Journal of Medical Internet Research each contributed six articles. Heliyon, Frontiers in Public Health, and Zenodo each published five articles, whereas Procedia Manufacturing ranked tenth with four publications. Overall, the results suggest that research on digital literacy, digital engagement, and digital culture has been disseminated across a wide range of publication outlets rather than concentrated in a limited number of journals.

Table 2. Top 10 Most Productive Publication Sources

Rank	Source	Publications
1	Sustainability	15
2	International Journal of Environmental Research and Public Health	8
3	PLOS ONE	8
4	JMIR Formative Research	7
5	Scientific Reports	6
6	Journal of Medical Internet Research	6
7	Heliyon	5
8	Frontiers in Public Health	5
9	Zenodo	5
10	Procedia Manufacturing	4

3.2.2 Influential Authors

Table 3 presents the ten most productive authors in the dataset. K Lee was the most prolific author, contributing eight articles during the study period. Leanna Woods and Clair Sullivan ranked second with six publications each. Rebekah Eden, Trisha Greenhalgh, Sarah Rybczynska-Bunt, Z Shao, and Y

Feng each published five articles. Rebecca Rosen and Richard Byng completed the top ten with four publications each. Overall, the findings indicate that scholarly contributions were distributed among a relatively broad group of authors, with no single researcher dominating the field.

Table 3. Top 10 Most Productive Authors

Rank	Author	Articles
1	K Lee	8
2	Leanna Woods	6
3	Clair Sullivan	6
4	Rebekah Eden	5
5	Trisha Greenhalgh	5
6	Sarah Rybczynska-Bunt	5
7	Z Shao	5
8	Y Feng	5
9	Rebecca Rosen	4
10	Richard Byng	4

3.3 Collaboration Network Analysis

Figure 2 illustrates the author collaboration network derived from the co-authorship relationships identified in the 369 publications. In the network, each node represents an author, node size is proportional to the number of publications, and link thickness reflects the frequency of co-authorship. Different node colours indicate distinct collaboration clusters. To improve visualization clarity, only authors with at least three publications and co-authorship links appearing in at least two publications were included, while isolated authors were excluded. The visualization thresholds were applied solely for graphical presentation, whereas the collaboration analysis was conducted using the complete dataset of 369 publications.

As visualised in Figure 2, the filtered collaboration network comprises 19 authors connected by 111 co-authorship links and forms two major collaboration clusters. The larger cluster is centred on Trisha Greenhalgh, Sarah Rybczynska-Bunt, and Joseph Wherton, who maintain extensive collaborative relationships with Rebecca Rosen, Richard Byng, Lucy Moore, Laiba Husain, Sietse Wieringa, Stuart Faulkner, and several other researchers. The dense pattern of links within this cluster reflects frequent and sustained collaboration among its members.

The second collaboration cluster comprises Leanna Woods, Clair Sullivan, Rebekah Eden, and Rhona Duncan. Among these authors, the strongest collaborative relationships were observed between Leanna Woods, Clair Sullivan, and Rebekah Eden, with each author pair co-authoring five publications. Although this cluster contains fewer researchers than the first, repeated co-authorship links indicate consistent collaboration among its members.

Overall, the co-authorship network suggests that collaboration in this research field is concentrated within a limited number of established research teams rather than being broadly distributed across the author community. Furthermore, no collaboration links were observed between the two displayed clusters under the selected visualization thresholds, suggesting that collaboration among the most productive authors remained primarily organised within individual research teams rather than across different collaboration groups.

Node size = number of publications | Link width = number of co-authored publications | Colour = connected collaboration cluster

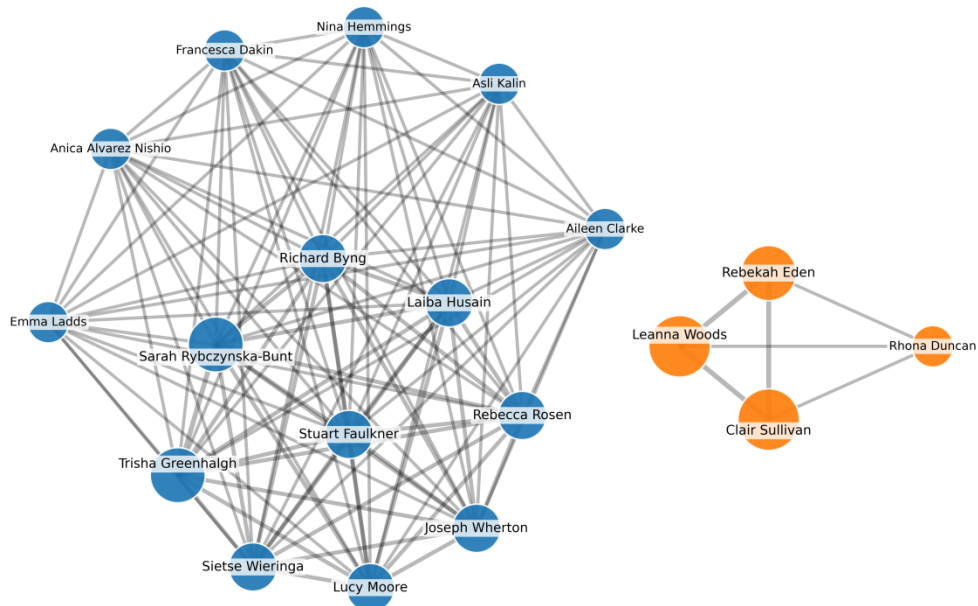


Figure 2. Author Collaboration Network

Note: Node size represents the number of publications, link thickness indicates the frequency of co-authorship, and node colour denotes the collaboration cluster. The network includes authors with at least three publications and co-authorship links occurring in at least two publications. Visualization thresholds were applied solely to improve figure readability, while the collaboration analysis was performed using the complete dataset of 369 publications.

3.4 Keyword Co-occurrence Analysis

Figure 3 presents the keyword co-occurrence network constructed from the author keywords of the 369 publications. Keyword co-occurrence analysis was conducted to identify the principal research themes and the relationships among them. In the network, each node represents a keyword, node size is proportional to its occurrence frequency, and link thickness reflects the strength of keyword co-occurrence. Different node colours denote the thematic clusters identified through community detection. To improve network readability, only keywords occurring in at least four publications were included in the visualisation. The visualisation thresholds were applied solely for graphical presentation, whereas the keyword co-occurrence analysis was performed using the complete dataset of 369 publications.

As visualised in Figure 3, the keyword co-occurrence network comprises 45 keywords connected by 181 co-occurrence links and forms five thematic clusters. The most prominent keywords include digital capability, digital transformation, COVID-19, digital health, and digital literacy, which occupy central positions in the network and maintain extensive connections with other research topics. Their central positions indicate that these concepts constitute the principal research themes within the current knowledge structure.

One prominent thematic cluster is centred on digital capability and digital transformation, together with closely related keywords such as digital maturity, digitalization, Industry 4.0, digital innovation, SMEs, and digital leadership. This cluster reflects research associated with

organisational digital transformation, capability development, technological innovation, and digital adoption within business and management contexts.

Another prominent cluster is organised around digital literacy, with strong associations to higher education, digital competence, digital divide, information literacy, e-learning, and qualitative research, reflecting studies related to digital competencies, education, and workforce capability development. A further thematic cluster is centred on digital health and COVID-19, linking to keywords such as telemedicine, electronic health record, artificial intelligence, machine learning, medical education, and public health, demonstrating the close relationship between digital technologies and healthcare-oriented research. The remaining clusters include bridging concepts such as technology, framework, learning, education, and implementation, which connect the major research themes across the network.

Overall, the keyword co-occurrence network demonstrates that research on digital literacy, digital engagement, and digital culture has developed around interconnected themes of digital transformation, organisational capability, education, and digital health. The dense connections among the five thematic clusters indicate that these research themes are closely related and collectively represent the current intellectual structure of the field.

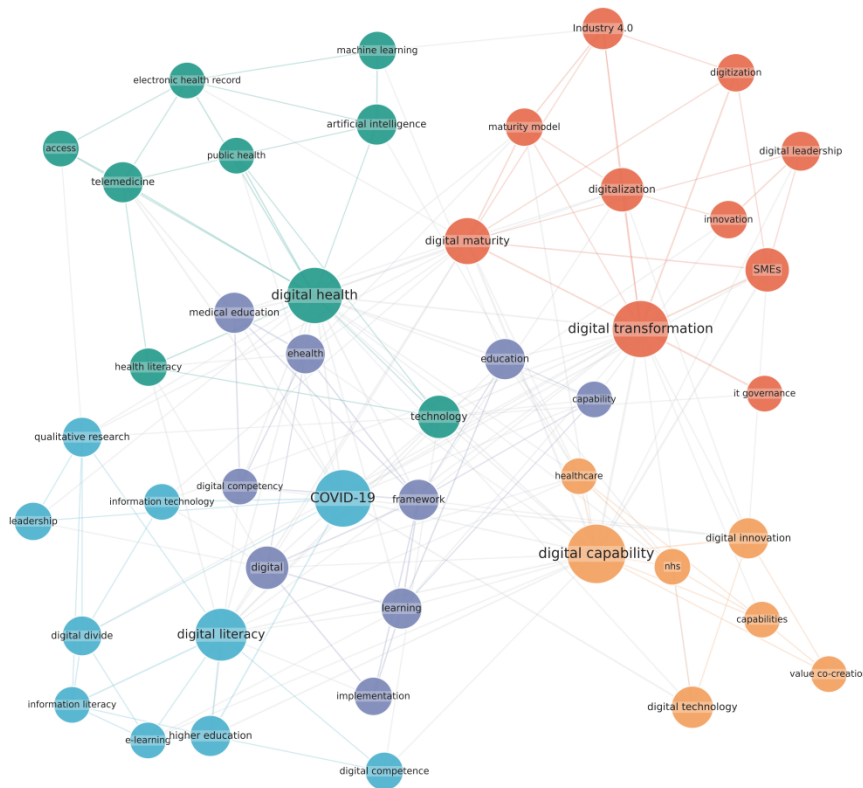


Figure 3. Keyword Co-occurrence Network.

Note: Nodes represent author keywords, node size is proportional to keyword occurrence frequency, link thickness indicates the strength of keyword co-occurrence, and node colour denotes the thematic cluster identified through community detection. Keywords with a minimum occurrence of four were included in the visualisation. Association-strength normalisation was applied to construct the network, while the analysis was performed using the complete dataset of 369 publications.

3.5 Co-citation Analysis

Figure 4 presents the document co-citation network constructed from the reference metadata available in the retrieved publications. Applying a minimum cited-reference frequency threshold of four resulted in a network comprising 96 nodes and 1,086 co-citation links, which were organized into five major clusters after removing one isolated node to improve visualization. The network represents the intellectual structure underpinning research on digital literacy, digital engagement, and digital culture within business and management.

The co-citation network exhibits a well-connected knowledge structure with substantial interconnections among the five clusters. Rather than forming isolated research streams, the clusters are linked through frequently co-cited references, indicating that this research domain has progressively integrated complementary theoretical perspectives. The observed co-citation patterns suggest that influential studies have been widely shared across multiple research themes, reflecting the cumulative development of the field and the growing convergence of related research areas.

Overall, the document co-citation network demonstrates that research on digital literacy, digital engagement, and digital culture is supported by a mature and multidisciplinary intellectual foundation. The integration of knowledge from management, information systems, education, digital transformation, and related disciplines provides a robust theoretical basis for the continued development of this research field. These co-citation relationships establish the intellectual foundation upon which the thematic evolution of the literature has developed, as presented in the following section.

Figure 4. Document Co-citation Network of the Retrieved Publications

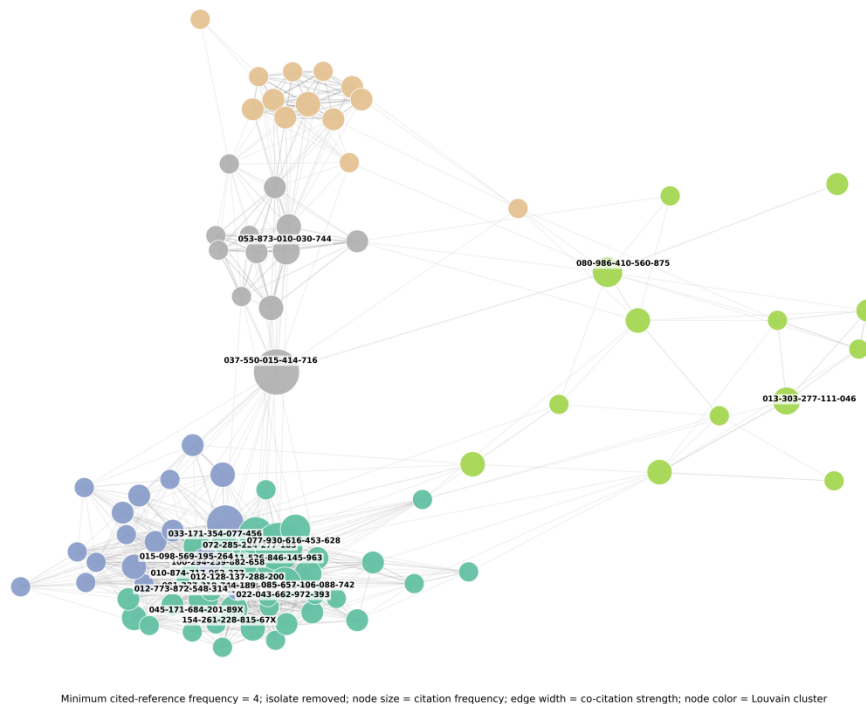


Figure 4 Reference Co-citation Network

Figure 4. Reference co-citation network. Nodes represent cited references appearing in at least four retrieved publications. Node size is proportional to citation frequency, edge thickness represents co-

citation strength, and node colors indicate Louvain communities. One isolated node was removed to improve visualization.

3.6 Thematic Evolution

Figure 5. Thematic Evolution of Digital Literacy, Digital Engagement, and Digital Culture Research

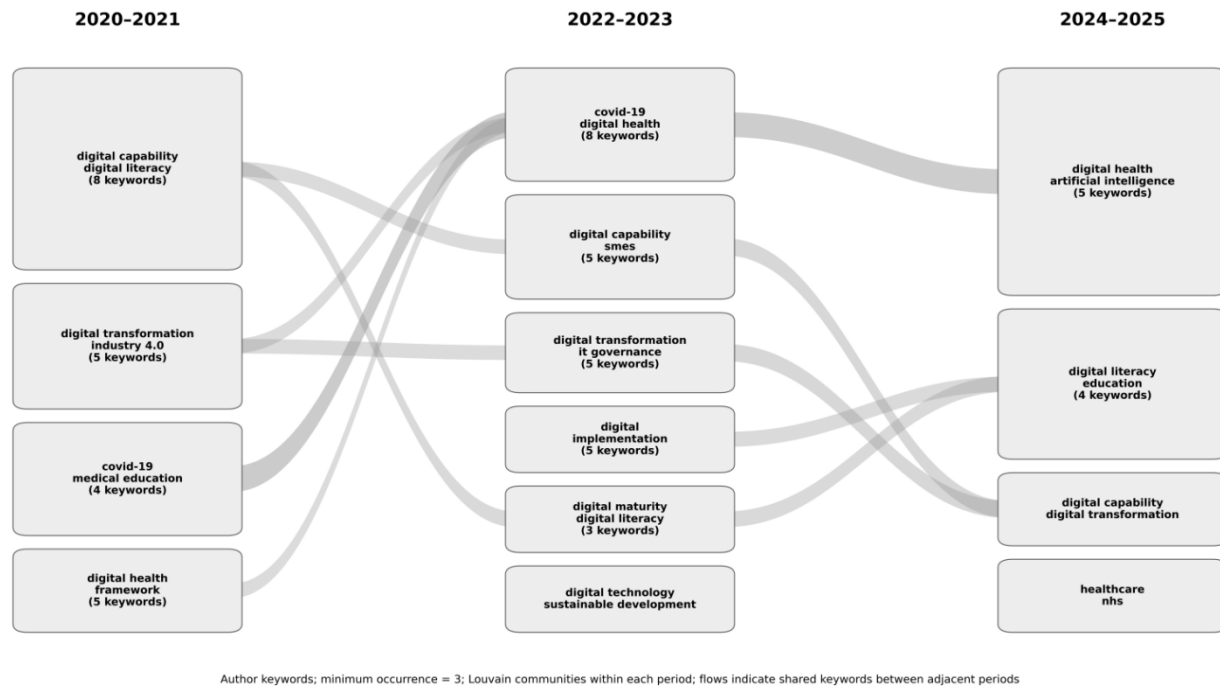


Figure 5. Thematic Evolution of Digital Literacy, Digital Engagement, and Digital Culture Research
Figure 5. Thematic evolution based on author keywords across three consecutive periods (2020–2021, 2022–2023, and 2024–2025). Themes were identified using Louvain community detection with a minimum keyword occurrence threshold of three. Flows between adjacent periods represent shared keywords, illustrating the continuity and evolution of major research themes.

Figure 5 presents the thematic evolution of research on digital literacy, digital engagement, and digital culture across three consecutive periods. Applying a minimum keyword occurrence threshold of three identified 4, 6, and 4 major themes for 2020–2021, 2022–2023, and 2024–2025, respectively. A total of 11 thematic links connected adjacent periods, revealing the continuity and evolution of the major research themes.

The thematic structure evolved from a relatively concentrated set of foundational topics during 2020–2021 to a more diversified research landscape in 2022–2023, before becoming increasingly consolidated in 2024–2025. Several core themes persisted throughout the three periods, while new themes associated with organizational digital transformation, digital engagement, and digital culture gradually emerged and became more prominent. The evolution paths indicate that research has expanded beyond individual digital competencies toward broader organizational and managerial applications of digital technologies.

Overall, the thematic evolution demonstrates a progressive shift from studies emphasizing fundamental digital capabilities to a more integrated research agenda encompassing organizational digital transformation, digital innovation, and digitally enabled business practices. These findings

complement the document co-citation analysis by illustrating how the intellectual foundations of the field have developed into evolving research themes over time.

4. DISCUSSION

4.1 Principal Findings

The findings of this study provide a comprehensive understanding of the development of research on digital literacy, digital engagement, and digital culture in business and management between 2020 and 2025. By integrating publication trends, collaboration patterns, knowledge structures, and thematic evolution, three principal findings can be identified.

First, the field has experienced rapid expansion and gradually evolved into a mature research domain. Although publication output increased substantially during the early years of the review period, the thematic evolution indicates that the research agenda has become increasingly stable and coherent. This transition suggests that digital literacy is no longer viewed solely as an individual competency but has become an important organizational capability supporting digital transformation and long-term competitiveness.

Second, the intellectual structure of the field has become increasingly multidisciplinary. The keyword co-occurrence and document co-citation analyses demonstrate strong connections among business, management, information systems, education, and digital transformation research. Rather than developing as separate research streams, these areas have progressively converged to establish a more integrated knowledge base, reflecting the growing complexity of digital capability development in organizational settings.

Third, the research focus has shifted from individual digital skills toward broader organizational perspectives. While early studies primarily emphasized digital literacy and digital competence, more recent research increasingly addresses digital engagement, digital culture, and organizational digital transformation. This evolution suggests that scholars now recognize that successful digital initiatives depend not only on employees' digital capabilities but also on organizational environments that encourage participation, collaboration, and continuous learning.

Overall, the findings indicate that research on digital literacy, digital engagement, and digital culture has entered a more mature stage characterized by conceptual integration and expanding organizational relevance. This evolution provides the foundation for examining the theoretical contributions of the field and its implications for business and management practice.

4.2 Theoretical Implications

The findings of this study provide several theoretical implications for research on digital literacy, digital engagement, and digital culture within business and management. Rather than being independent research topics, the scientometric evidence suggests that these three concepts have become increasingly interconnected as the field has evolved. Their convergence reflects a gradual shift from fragmented research perspectives toward a more integrated understanding of organizational digital capability.

First, the evolution of research indicates that digital literacy should no longer be viewed solely as an individual competency. While earlier studies primarily emphasized employees' digital knowledge and skills, recent research increasingly positions digital literacy as a strategic organizational capability that supports digital transformation, innovation, and long-term competitiveness. This

shift broadens the theoretical scope of digital literacy beyond personal competence and highlights its role in enabling organizational change.

Second, the growing prominence of digital engagement suggests that possessing digital capabilities alone is insufficient to achieve organizational outcomes. The thematic evolution demonstrates increasing scholarly attention to employee participation, collaboration, and interaction within digital environments. This finding implies that digital engagement functions as an important mechanism through which digital capabilities are translated into organizational practices and organizational performance.

Third, the emergence of digital culture as a major research theme reflects a broader theoretical transition toward organizational-level perspectives. Rather than focusing exclusively on technology adoption or digital skills, recent studies increasingly emphasize the organizational values, norms, and learning environments that support digital innovation and continuous organizational development. This development suggests that digital culture provides the contextual foundation for effectively integrating digital literacy and digital engagement within organizations.

Overall, the findings indicate that digital literacy, digital engagement, and digital culture should be understood as complementary dimensions of organizational digital capability rather than isolated constructs. This integrated perspective contributes to a more comprehensive understanding of how organizations develop and sustain digital capabilities while providing a theoretical foundation for future research examining the relationships among these three dimensions.

4.3 Practical Implications

The findings of this study provide several practical implications for organizations, managers, and policymakers seeking to strengthen digital capabilities in an increasingly digital business environment.

For organizations, the results suggest that digital transformation should not be viewed solely as the adoption of new technologies. The thematic evolution of the literature indicates that organizational success increasingly depends on developing digital literacy, promoting digital engagement, and fostering a supportive digital culture. Investments in technology are therefore unlikely to achieve sustainable outcomes unless they are accompanied by continuous capability development and organizational learning.

For managers, the findings highlight the importance of creating work environments that encourage employee participation in digital initiatives. Rather than focusing exclusively on improving individual digital skills, managers should also establish organizational practices that promote collaboration, knowledge sharing, and digital participation. Such practices can facilitate the effective application of digital capabilities and strengthen employees' readiness for continuous digital change.

For policymakers, the growing convergence of digital literacy, digital engagement, and digital culture suggests that future digital development strategies should extend beyond digital skills training. Public policies supporting organizational digital capability, lifelong learning, and digital workplace innovation may contribute to more sustainable organizational digitalization across industries. Encouraging collaboration among governments, educational institutions, and businesses may further strengthen the digital capabilities required for long-term economic and organizational development.

Overall, the findings emphasize that digital literacy, digital engagement, and digital culture should be developed simultaneously as complementary organizational resources. Adopting this integrated perspective may help organizations improve their capacity to respond to ongoing digital change and maintain long-term competitiveness.

4.4 Future Research Directions

The findings of this study highlight several promising directions for future research. As the field continues to evolve, future studies should move beyond describing digital capabilities and focus on explaining the mechanisms through which digital literacy, digital engagement, and digital culture contribute to organizational performance and digital development.

First, future research should examine the relationships among digital literacy, digital engagement, and digital culture through integrated theoretical frameworks. Although these concepts have become increasingly interconnected, their interactions and causal pathways remain insufficiently understood. Empirical studies exploring their combined influence on organizational outcomes would provide a more comprehensive understanding of organizational digital capability.

Second, greater attention should be paid to emerging digital technologies, particularly artificial intelligence and data-driven decision-making. As these technologies become increasingly embedded in business operations, future studies should investigate how they reshape digital competencies, employee engagement, and organizational culture in different managerial contexts.

Third, comparative and longitudinal research is needed to capture the dynamic nature of organizational digitalization. Cross-country, cross-industry, and longitudinal studies would improve understanding of how organizational contexts influence the development of digital capabilities over time and help identify the factors contributing to successful digital innovation and sustainable organizational development.

Finally, future research should strengthen methodological diversity by combining scientometric approaches with systematic literature reviews, qualitative investigations, and empirical studies. Such integration would provide deeper theoretical explanations while validating the research trends identified through bibliometric evidence.

Overall, the continued evolution of digital literacy, digital engagement, and digital culture suggests that future research should adopt a more integrated and multidisciplinary perspective. Advancing research in these areas will contribute to a more comprehensive understanding of how organizations build sustainable digital capabilities and achieve successful organizational digitalization.

5. CONCLUSION

This study examined the development of research on digital literacy, digital engagement, and digital culture in business and management through a scientometric analysis of 369 English-language publications retrieved from the Lens database between 2020 and 2025. By integrating publication trends, collaboration networks, knowledge structures, and thematic evolution, the study provides a comprehensive overview of the intellectual development of this research field and identifies its major characteristics and evolving research priorities.

The findings indicate that research on digital literacy, digital engagement, and digital culture has expanded rapidly while becoming increasingly mature and conceptually integrated. The intellectual structure of the field has evolved from relatively fragmented research streams toward a multidisciplinary knowledge base linking business, management, information systems, education, and digital innovation. At the same time, thematic evolution demonstrates a clear shift from studies emphasizing individual digital competencies toward broader organizational perspectives, reflecting the growing importance of digital engagement and digital culture in strengthening organizational digital capability. Collectively, these findings suggest that sustainable digital development depends

not only on employees' digital competencies but also on organizational environments that foster participation, collaboration, and continuous learning.

This study contributes to the literature by providing a systematic synthesis of the intellectual landscape of a rapidly evolving research domain. Rather than treating digital literacy, digital engagement, and digital culture as independent research topics, the findings demonstrate their increasing convergence within business and management research. Consequently, the study offers a valuable reference for researchers seeking to understand the evolution of this field while also providing practical insights for organizations and policymakers aiming to strengthen organizational digital capability and support sustainable digital development.

Despite these contributions, several limitations should be acknowledged. First, the analysis was limited to publications indexed in the Lens database, and relevant studies indexed exclusively in other databases may not have been captured. Second, only English-language publications were included, which may have excluded valuable research published in other languages. These limitations should be considered when interpreting the findings.

Overall, this study demonstrates that digital literacy, digital engagement, and digital culture have become fundamental and interconnected dimensions of organizational digital capability. By revealing the intellectual structure, collaboration patterns, and thematic evolution of this rapidly evolving research field, the study provides a comprehensive foundation for advancing business and management research while offering valuable insights into how organizations can strengthen digital capability in the digital era.

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