

Unveiling the Knowledge Structure of Digital Leadership and AI-Driven Transformation: Global Patterns and Future Directions

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Abstract

The rapid evolution of digital technologies and the growing influence of artificial intelligence (AI) have profoundly reshaped leadership paradigms, organizational strategies, and global innovation ecosystems. This study offers a comprehensive bibliometric analysis of 550 peer-reviewed, Scopus-indexed articles published between 2015 and 2025 to explore emerging trends, key contributors, and thematic developments in the field of digital leadership and transformation. Employing the PRISMA framework and Bibliometrix R-tool, the research identifies influential authors, journals, institutions, and countries, with India, the UK, China, and the USA leading in productivity and citation impact. The findings highlight how themes such as AI-driven decision-making, agile leadership, organizational learning, and ethical governance have gained prominence, particularly during the COVID-19 pandemic, which catalyzed a surge in digital transformation research.

The study also uncovers notable regional imbalances and underrepresentation from Africa and Latin America, underscoring the need for more inclusive global collaboration. By mapping intellectual structures and co-word networks, the research provides a nuanced understanding of how digital leadership is evolving across disciplines and geographies. This review offers actionable insights for scholars, practitioners, and policymakers seeking to navigate the complex intersections of technology, leadership, and organizational change in the digital era.

Keywords: Digital transformation, Strategic Leadership, AI in leadership, and global research trends

JEL classification: M10, M14, M15

Introduction

The accelerating pace of digital transformation, catalyzed by Industry 4.0 technologies such as artificial intelligence (AI), big data, cloud computing, and automation, has disrupted conventional organizational structures and leadership paradigms across sectors. In today's digitally volatile, uncertain, complex, and ambiguous (DVUCA) environments, organizations are compelled to adopt agile, data-driven, and technology-integrated leadership models. These emerging forms of techno-leadership redefine strategic agility, organizational learning, and innovation capability (Farias et al., 2021; Verhoef et al., 2021). Digital transformation is no longer a reactive response but a core strategic function that informs business continuity, talent development, and stakeholder engagement across industries, including healthcare, education, manufacturing, and government.

Among the most disruptive forces fueling digital transformation is artificial intelligence. AI technologies, including machine learning, natural language processing, and predictive analytics, have redefined the very fabric of leadership by enhancing decision-making, forecasting strategic trends, and enabling real-time adaptability. AI facilitates digital transformation through real-time insights, pattern recognition, and automation of complex tasks that formerly relied on human intervention (Dwivedi et al., 2023). In addition, AI tools have enabled more intelligent resource allocation, optimized workflows, and predictive modeling, allowing leaders to proactively respond to shifts in dynamic environments (Mikalef et al., 2019).

As Joshi et al. (2025) argue, AI is not merely an operational tool—it is a transformative force that enhances both the content and delivery of techno-management education, enabling more inclusive, accessible, and adaptive learning ecosystems. AI-driven platforms support adaptive leadership models that personalize learning experiences, automate performance analytics, and improve decision-making capabilities. This aligns with research by Ellikkal & Rajamohan (2024), who show that AI-enhanced learning improves student engagement and academic performance by aligning content delivery with individual learning trajectories. Furthermore, Cardona et al. (2023) emphasize that AI-enabled simulations and virtual environments develop core leadership competencies, including strategic thinking, collaboration, and ethical decision-making.

The integration of AI into leadership development and strategic management signifies a paradigm shift in how innovation, human-AI collaboration, and governance are conceptualized. Organizations are now experimenting with hybrid leadership frameworks that blend human judgment with algorithmic precision to address rapid disruption and ethical complexity (Tortorella et al., 2023). At the same time, AI is contributing to the democratization of education and training, offering equal access to high-quality learning regardless of geography or socioeconomic status (Gudonienė et al., 2023). This potential to level the educational playing field while enhancing personalization makes AI a cornerstone in inclusive leadership development.

Moreover, the convergence of AI with sustainability goals and ethical governance models is reshaping how leadership is practiced in digitally mature organizations. Research by Popenici & Kerr (2017) suggests that ethical AI integration not only improves decision outcomes but also fosters transparency and social responsibility, essential traits for modern digital leaders.

This study builds on these foundational insights by offering a bibliometric and thematic analysis of 550 Scopus-indexed articles published between 2015 and 2025. Using the PRISMA framework and Bibliometrix R-tool, the paper maps intellectual trends, identifies influential contributors, and uncovers emerging research clusters in the fields of digital leadership and strategic transformation. The goal is to provide a comprehensive understanding of how techno-

leadership is evolving globally and how AI continues to reshape management theory and practice. By highlighting underexplored regions and promoting interdisciplinary approaches, this research advances both scholarly discourse and practical frameworks for inclusive digital transformation.

Literature Review

The convergence of digital transformation and leadership has emerged as a pivotal domain of inquiry across management, education, technology, and policy-making sectors. As organizations increasingly integrate technologies such as artificial intelligence (AI), blockchain, cloud computing, and data analytics, leadership models are undergoing a paradigmatic shift—from traditional top-down hierarchies to agile, collaborative, and data-informed structures (Vial, 2019; Verhoef et al., 2021). Digital transformation has been conceptualized not merely as a technological overhaul but as a strategic imperative requiring cultural adaptation, organizational agility, and visionary leadership.

One of the most prominent frameworks in recent scholarship is the reconceptualization of leadership in digital ecosystems. Larson & DeChurch (2020) classify the role of technology in leadership across four interrelated perspectives: technology as context (enabling virtual teams), as sociometric enabler (redefining communication and influence), as a creative tool (supporting innovation through digital co-creation), and as a teammate (through human-AI collaboration). These perspectives suggest that digital leaders must embody hybrid competencies—blending interpersonal influence with technical fluency.

Digital business model transformation (DBMT) represents a core facet of digital leadership literature. Scholars such as Teece (2018) and Matarazzo et al. (2021) argue that managerial human capital—encompassing entrepreneurial orientation, adaptability, and digital literacy—is a decisive enabler of DBMT. Kraus et al. (2021) further contend that data analytics and dynamic capabilities underpin performance gains in digitally intensive firms, reinforcing the idea that leadership is both a strategic and operational asset in transformation contexts.

In the education domain, leadership development is being reengineered through AI-driven platforms that personalize learning trajectories and support evidence-based instructional design. Ellikkal & Rajamohan (2024) and Joshi et al. (2025) demonstrate how AI-enabled learning systems improve engagement, adaptability, and skill relevance among management students. Cardona et al. (2023) expand this discussion by showing that AI-integrated curricula can cultivate future leaders with critical competencies such as ethical reasoning, strategic foresight, and collaborative innovation. At the organizational level, Dwivedi et al. (2023) and Tortorella et al. (2023) highlight how AI enhances employee engagement, fosters psychological safety, and enables continuous performance feedback, thereby transforming the nature of team leadership and HR management.

Broader systemic studies emphasize the role of ethical AI and inclusive digital ecosystems in shaping equitable leadership opportunities. Gudonienė et al. (2023) and Dey (2025) argue that inclusive access to digital tools and ethical AI governance are prerequisites for sustainable digital transformation. These principles are especially relevant in educational and public policy contexts, where equitable access and social justice underpin the legitimacy of digital initiatives.

Recent work by Prasad et al. (2025) introduces the notion of ethical commonsense and tacit knowledge as foundational to effective digital leadership in VUCA environments. Their findings, along with those of Gupta & Jaiswal (2024), highlight the importance of cultivating interdisciplinary competencies in business school curricula to prepare leaders for AI-augmented decision-making and hybrid work environments. As management education evolves, technology leadership training must integrate digital fluency with emotional intelligence and resilience.

Governance-focused research offers additional insight into how leadership must respond to the rapid expansion of digital platforms. Aldemir & Uysal (2025) explore how institutional frameworks and content regulation shape platform governance, while Kang & Sung (2017) emphasize that internal communication and trust in leadership are vital to digital policy implementation. These studies position leadership as a critical mediator between technological change and organizational legitimacy.

The COVID-19 pandemic provided a unique lens through which digital leadership was tested and reshaped. Dwivedi et al. (2020) outline a knowledge creation framework where digital adaptation during crises is driven by cognitive agility and institutional learning. Similarly, Dwivedi et al. (2023) explore the dual role of technologies like ChatGPT as both enablers and disruptors, calling for balanced human-AI collaboration. These findings align with emerging literature on hybrid leadership models that blend strategic direction with machine-augmented execution.

Finally, methodological contributions such as those by Aria & Cuccurullo (2017) and Farias et al. (2021) have enabled researchers to visualize the structure of digital leadership literature through bibliometric mapping and systematic reviews. Their approaches help identify underexplored themes, emerging research clusters, and influential publication trends—informing the current study's design and analysis.

Taken together, the literature reveals that digital leadership is a dynamic and multifaceted construct, shaped by technological advancement, institutional reform, educational innovation, and ethical imperatives (Warner & Wäeger, 2019). It is through this lens that the present study undertakes a bibliometric investigation to chart the intellectual evolution and global contours of digital transformation and AI-driven leadership scholarship.

Research gaps & Objectives

Despite the growing volume of research on digital transformation and leadership, several critical gaps remain unaddressed. First, while numerous conceptual and sector-specific studies have emerged, there is a lack of comprehensive bibliometric analyses that holistically map the intellectual, thematic, and geographic landscape of the field. Existing reviews tend to be fragmented, focusing on niche sectors such as education, healthcare, or strategic management, without capturing the cross-disciplinary evolution and influence of AI on leadership models.

Second, there is limited investigation into the global distribution and collaboration patterns of researchers working at the intersection of digital leadership and AI. Notably, contributions from emerging economies are underrepresented in many high-impact reviews, despite increasing scholarly activity from countries such as India and China. This creates a skewed understanding of the field's development and neglects regional nuances and contextual diversity.

Third, the rapid rise of AI technologies like ChatGPT and generative models has not been systematically reflected in existing bibliometric syntheses. Their impact on leadership behavior, ethical governance, and organizational design is only beginning to be explored, making this a timely and urgent area of investigation.

To address these gaps, this study sets out the following objectives:

- i. Map the evolution and growth trends in digital transformation and leadership research from 2015 to 2025.
- ii. Identify leading authors, journals, institutions, and countries contributing to the field.

- iii. Uncover the intellectual structure, thematic clusters, and keyword trends that define the domain.
- iv. Highlight collaborative patterns and underexplored regions in global digital leadership research.

By pursuing these objectives through a rigorous bibliometric methodology, this study aims to offer a comprehensive, data-driven overview of the digital leadership landscape—informing scholars, practitioners, and policymakers seeking to understand and shape the future of leadership in the AI era.

The study is guided by the following research questions:

- RQ1: What are the key growth trends in research on digital transformation and leadership between 2015 and 2025?
- RQ2: Which authors, journals, institutions, and countries have had the most significant impact in shaping this domain?
- RQ3: What is the intellectual structure of the knowledge base, including major themes and research clusters?
- RQ4: What topics and keywords have been studied most frequently, and how have they evolved over time?

Materials and Methods

This study adopts a bibliometric analysis framework to map the intellectual landscape of digital leadership and transformation literature. Bibliometric techniques enable the quantification of academic output, identification of thematic clusters, and assessment of scholarly impact (Aria & Cuccurullo, 2017). Using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol, the study systematically retrieved and filtered articles indexed in Scopus between 2015 and 2024. The search strategy employed the keywords: "digital leadership," "strategic management," "digital transformation," and "AI-enabled leadership." A total of 878 records were initially retrieved. After applying inclusion criteria focused on peer-reviewed journal articles in business, management, and social sciences, and screening abstracts for relevance, the final dataset comprised 550 articles (refer Table 1).

Table 1 Criteria governing Article Inclusion and Exclusion

Database used for research	Scopus	Total Documents 878	
Search String	("Digital Leadership" AND "Digitalization" OR "Digital Transformation")		
		Excluded	Included
Subject area	"Business, management and accounting," "Economics, econometrics and finance," and "Social sciences"	156	722
Document type	"Articles" only	78	644
Language	"English" only	41	603
Quality screening	Reading the abstracts	53	550
Total Documents included in the Study = 550			

Data were analyzed using the Bibliometrix R package (Aria & Cuccurullo, 2017), which supports co-citation analysis, keyword co-occurrence mapping, and thematic evolution tracking. Citation metrics, author collaborations, journal impact (via H-index), and

geographical distributions were evaluated. This methodology allows a comprehensive understanding of the development, structure, and future directions of research on digital leadership. This bibliometric synthesis is particularly relevant given the fragmented nature of current digital transformation research across domains such as healthcare, education, policy, and enterprise strategy. By integrating dispersed strands of scholarship, the study not only identifies influential authors and publications but also uncovers emergent themes that can guide future research and practice.

Results & Analysis

RQ1: What are the key growth trends in research on digital transformation and leadership between 2015 and 2025?

The research on digital transformation and leadership has followed a well-defined trajectory from foundational studies to crisis-induced expansion and specialization. From 2015 to 2017, research output remained moderate, characterized by foundational works in AI integration and digital transformation frameworks, typically citing 5–10 times per year. A marked growth phase emerged between 2018 and 2019 (Fig 1), with citations increasing to 10–15 annually, driven by the institutionalization of AI and remote leadership paradigms (Fig 2). The COVID-19 pandemic served as a catalytic event, sharply increasing research interest and publication rates. The peak period, spanning 2020–2021, saw citations rise to 15–20 per year, indicating heightened global scholarly activity around topics such as strategic agility, hybrid work models, and platform-enabled leadership. Post-2021, research citations stabilized to 10–15 annually, suggesting saturation in early-stage digital leadership themes and a shift toward emerging areas such as metaverse integration, ethical AI, and sustainability-linked digital strategies.

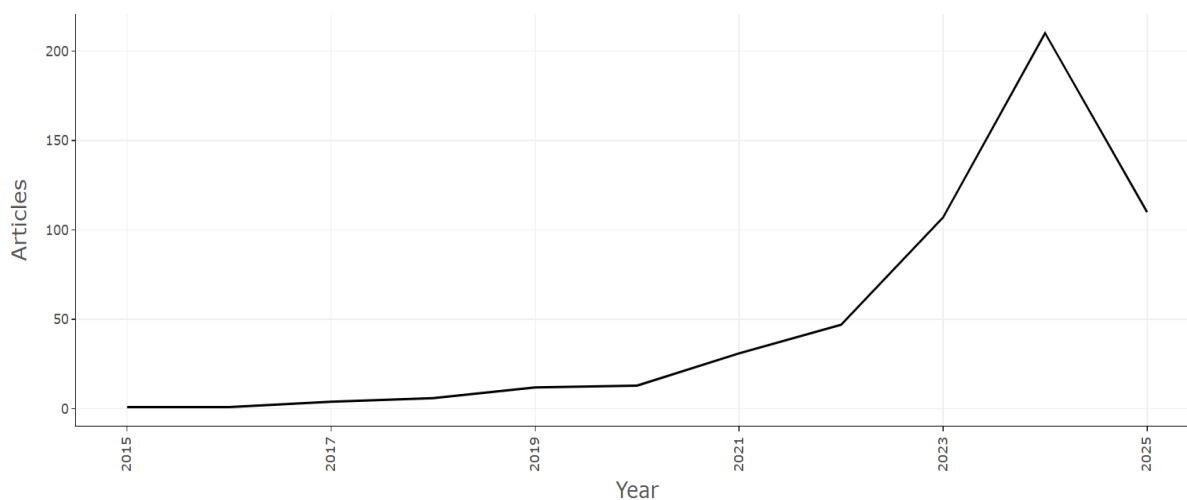


Fig. 1 Annual Scientific Production

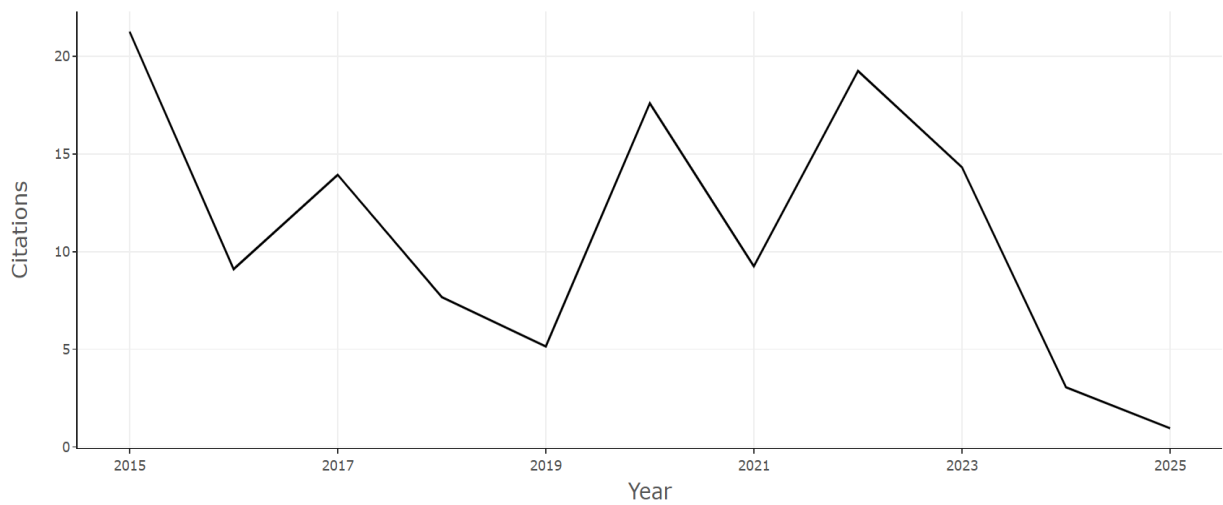


Fig. 2 Average Annual Citation Trends for research in Digital leadership over the past decade

RQ2: Which authors, journals, institutions, and countries have had the most significant impact in shaping this domain?

The most influential contributors include Kumar V, Kumar A, and Gupta S, who have consistently published in domains intersecting digital leadership, AI, and strategic management (Fig 3). Al-Okaly M and Chatterjee S have emerged as regionally focused scholars, contributing primarily from the Middle East and South Asia, respectively. In terms of journals, the *Journal of Business Research* leads with the highest H-index (~12.5), followed by *Technological Forecasting and Social Change* (~10.0) and the *International Journal of Information Management* (7.5–10.0), indicating a strong alignment with digital strategy, data-driven decision-making, and organizational learning (Fig 4).

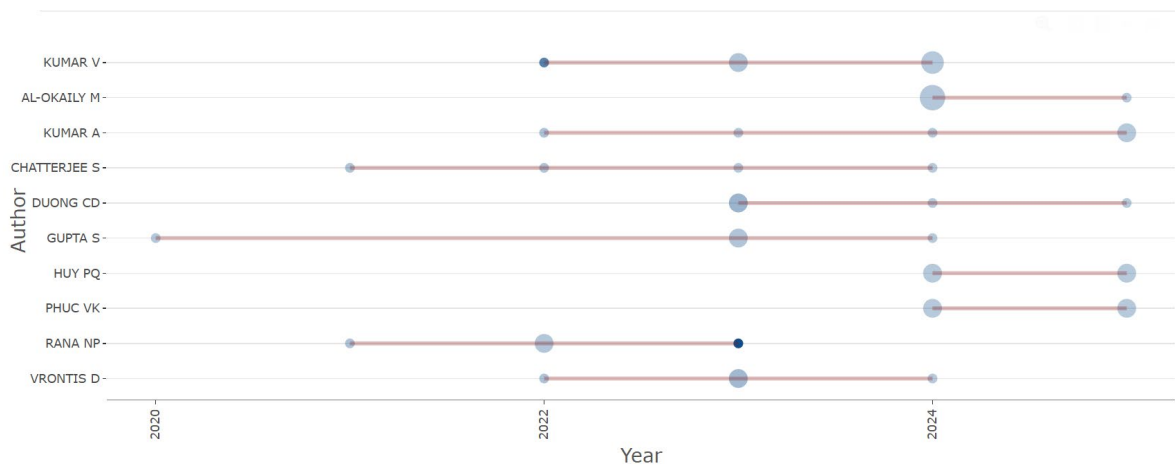


Fig. 3 Author's production over time

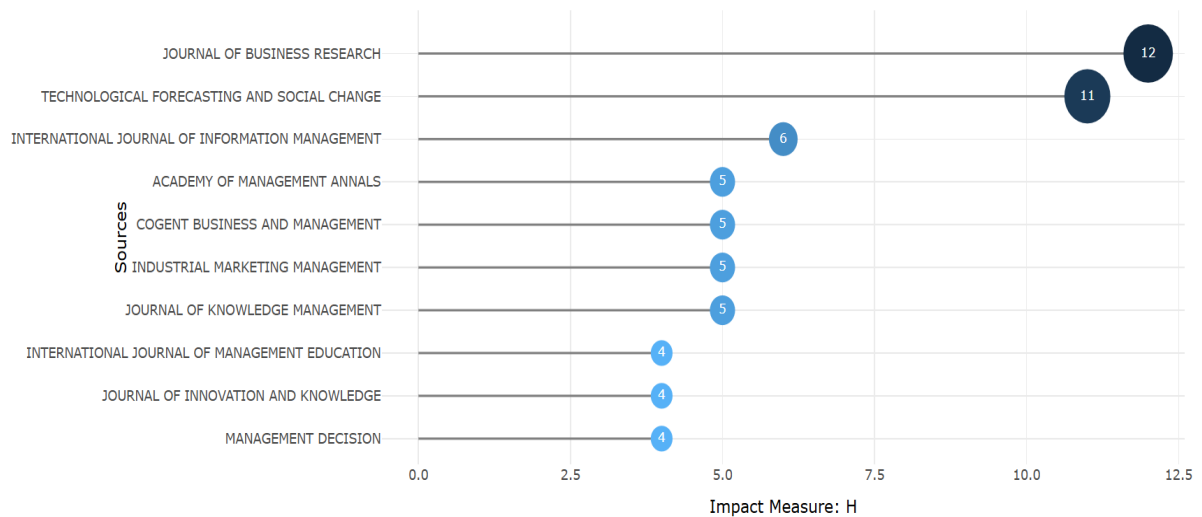


Fig. 4 Academic Journal Ranking as per H-Index

Geographically, India leads in publication frequency, followed by the USA, UK, and China. However, the UK dominates in citation count (~4000), followed by India (~3000), China (~2500), and the USA, reflecting both scholarly output and influence (Fig 5). Emerging academic regions include Indonesia, Malaysia, Jordan, and Saudi Arabia. Notably, Africa remains underrepresented in indexed research, signifying a geographical gap that future collaborations could address. Countries with high Single Country Publications (SCP) like India and China may benefit from increased international collaboration, as seen in countries like the UK and Germany with a higher share of Multiple Country Publications (NCP) (Fig 6 & Fig 7).

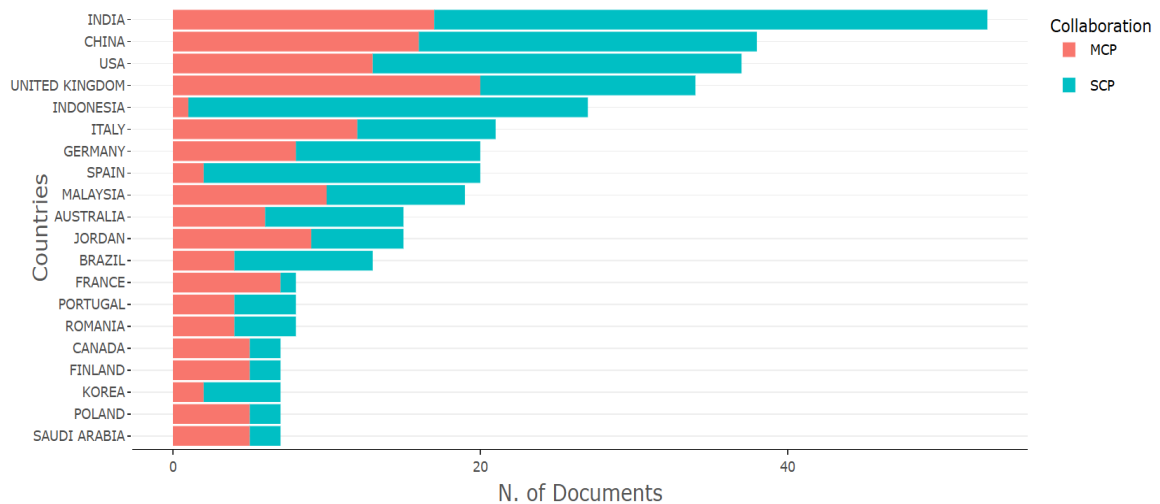


Fig. 5 Country Ranking as per the Relevance in Research Contribution

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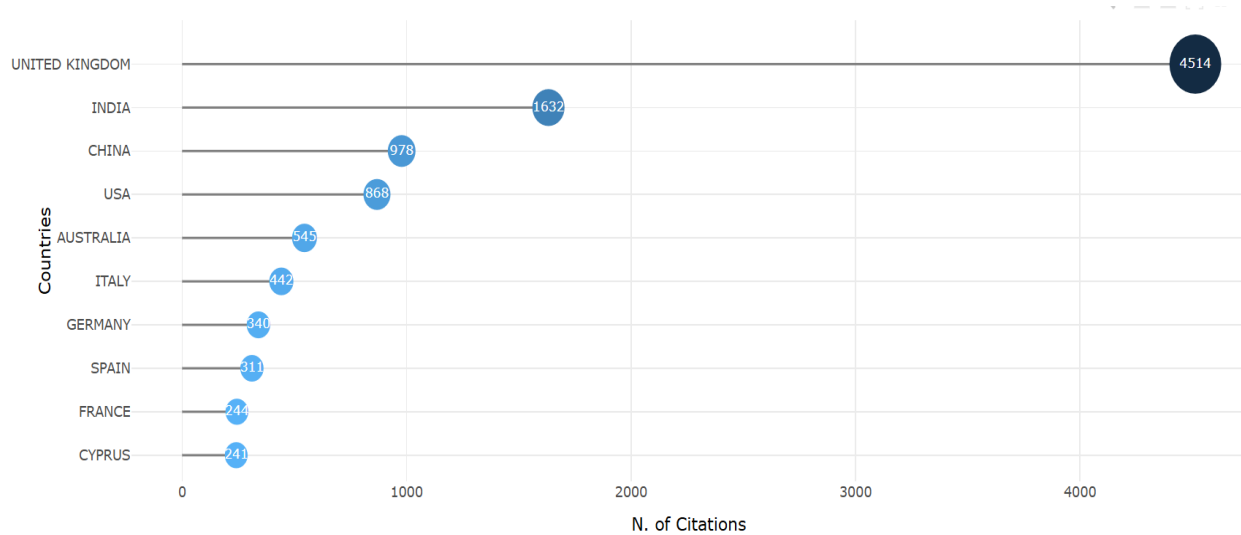


Fig. 6 Most Cited Countries

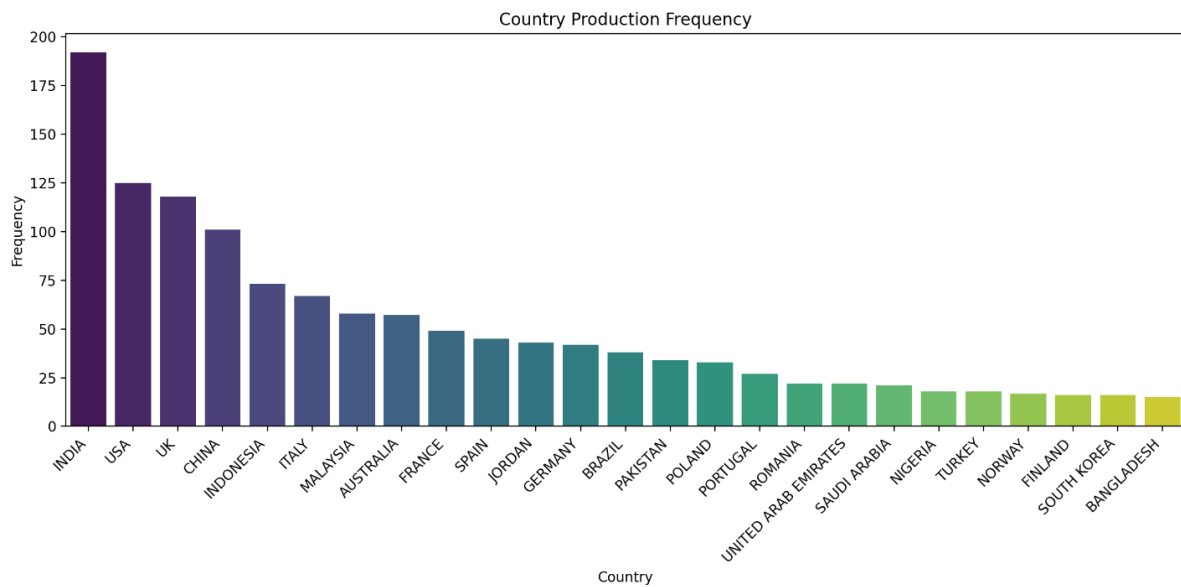


Fig. 7 Countries Most Production

RQ3: What is the intellectual structure of the knowledge base, including major themes and research clusters?

The intellectual structure of digital transformation research reveals tightly linked thematic clusters, with keywords like "decision making" and "artificial intelligence" having the highest betweenness centrality scores (481.76 and 291.60, respectively), making them core connectors across research domains. Other central nodes include "digital transformation," "knowledge management," and "digitalization," suggesting that leadership in digitally transformed environments requires simultaneous capabilities in strategic foresight, technological adoption, and knowledge orchestration (Fig 8 & Fig 9).

Co-Word Network: Thematic Clusters and Central Keywords

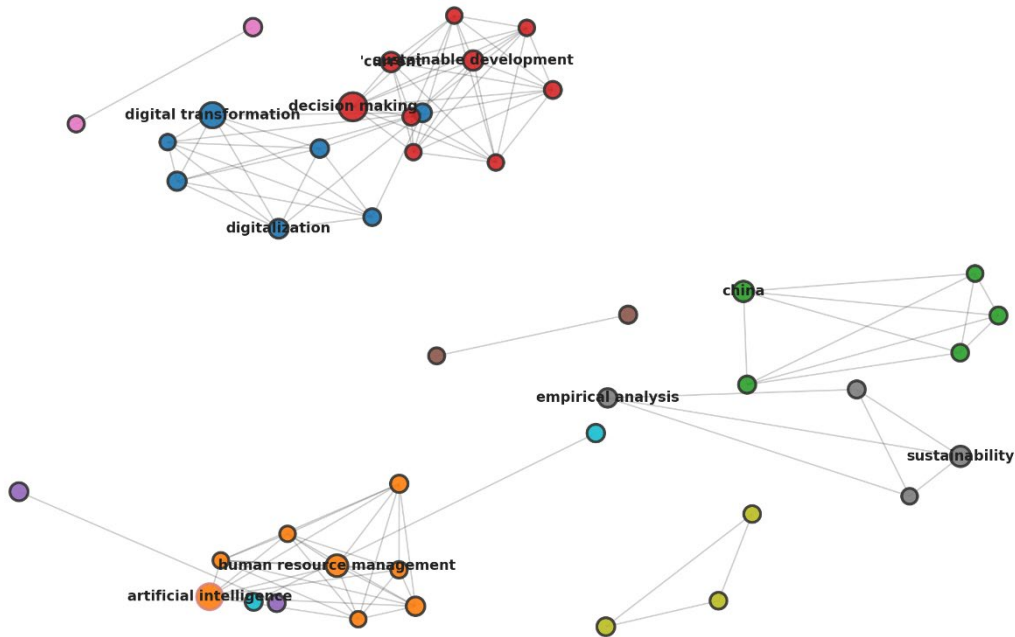


Fig. 8 Co-Word Network: Thematic Clusters and Central Keywords

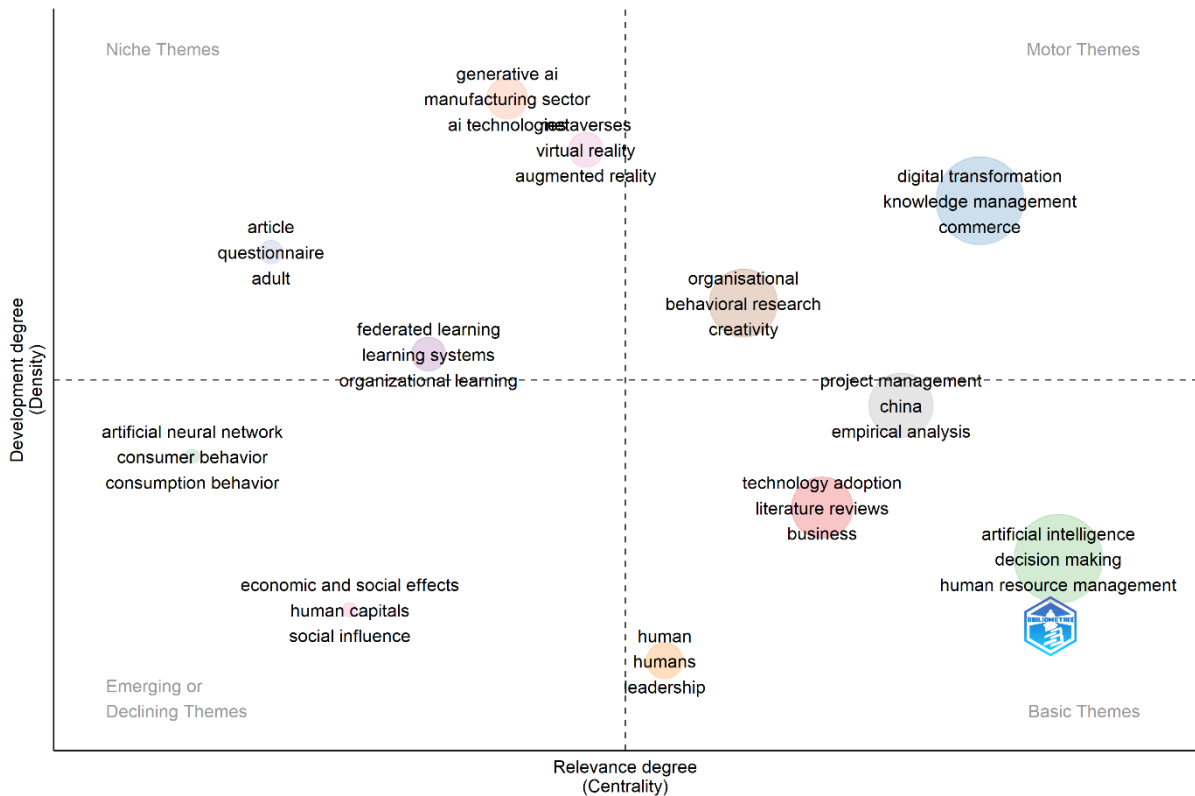


Fig. 9 Thematic Map

The co-word network and thematic analysis reveal four main categories:

Motor Themes	AI-driven decision-making, data analytics, and hybrid work environments
Basic Themes	Digital transformation frameworks, organizational learning, and change management
Niche Themes	Generative AI, virtual/augmented reality, and decentralized AI models
Emerging Themes	ESG-aligned digital strategy, AI ethics, and metaverse leadership

RQ4: What topics and keywords have been studied most frequently, and how have they evolved over time?

The most influential papers often span these intersecting themes, creating a multidisciplinary lens for understanding techno-driven leadership. Collaboration maps further illustrate that India, UK, USA, and China dominate research networks, with the strongest ties observed between India-UK (16 collaborations), India-USA, and USA-China (11 each). European clusters (e.g., UK-France, UK-Finland) and Asia-Pacific alliances (India-Australia, UK-Australia) also reflect the globalization of digital leadership research.

The most frequent research topics include:

AI in Strategic Decision-Making	Addressing how artificial intelligence augments human cognition and accelerates digital transformation.
Leadership in Crisis and Remote Work	Especially prominent during COVID-19, exploring digital leadership's role in sustaining organizational agility.
Digital Governance and Ethics	Growing focus on platform accountability, data privacy, and AI ethics.
Organizational Learning and Innovation Capability	Highlighting how digital transformation drives or is driven by dynamic learning mechanisms.
Interdisciplinary Approaches	Spanning public policy, education, healthcare, and microfinance, emphasizing how digital strategies manifest across sectors.

These findings affirm that digital transformation research is both maturing and diversifying. While early contributions laid the groundwork in AI and digital agility, future directions point toward ethical governance, cross-industry adaptation, and region-specific implementation of leadership models in the digital era.

Discussion

The findings of this bibliometric review underscore a vibrant and evolving research landscape surrounding digital transformation and techno-driven leadership. Since 2015, research activity

has surged—particularly during the COVID-19 pandemic, which acted as an accelerant for digital leadership paradigms. The pandemic-induced shift to remote work, AI-augmented decision-making, and digital team coordination catalyzed a new wave of scholarship, particularly from Asia-Pacific nations such as India and China. This aligns with the growth of entrepreneurial ecosystems and increased public-private investment in digital infrastructure in these regions.

Notably, AI and decision-making emerge as central nodes in the knowledge structure, bridging diverse themes such as knowledge management, employee engagement, and sustainability. The high betweenness centrality of keywords like "artificial intelligence" and "decision making" validates their integrative role. Additionally, regional disparities remain evident; while Europe and North America lead in citations and research depth, countries such as India have gained momentum in research productivity and international collaboration. The dominance of journals like *Journal of Business Research* and *Technological Forecasting and Social Change* reflects a scholarly emphasis on applied, interdisciplinary research. These venues prioritize actionable insights, reinforcing the field's orientation toward organizational relevance. However, the concentration of citations among a limited number of authors and institutions indicates the need for broader representation and collaboration.

Conclusion

This study provides a comprehensive bibliometric and thematic synthesis of digital transformation and leadership research from 2015 to 2025. The findings reveal that digital leadership is a rapidly maturing field, characterized by increasing interdisciplinarity, robust international collaboration, and growing influence from emerging economies such as India and China. The research identifies artificial intelligence, hybrid leadership, and digital agility as central themes that have redefined organizational and educational leadership models, particularly in response to global disruptions like the COVID-19 pandemic.

The analysis underscores that while core contributions have traditionally come from Western nations, significant intellectual momentum is now emerging from Asia-Pacific regions. However, underrepresentation from Africa and Latin America highlights the need for more inclusive global research participation. Journals such as the *Journal of Business Research*, *Technological Forecasting and Social Change*, and *International Journal of Information Management* have played pivotal roles in consolidating the field's scholarly output.

By mapping key contributors, institutions, and thematic clusters, this study offers valuable insights for scholars and practitioners seeking to understand digital leadership's evolving landscape. It emphasizes the importance of ethical AI deployment, agile leadership development, and cross-sectoral integration of digital technologies.

Future research should address existing geographic and methodological gaps by fostering global research networks, developing interdisciplinary frameworks, and examining emerging themes such as AI ethics, metaverse leadership, and digital sustainability. As organizations and academic institutions continue to adapt to digital disruption, cultivating techno-leadership capabilities will be essential to building resilient, inclusive, and forward-looking leadership ecosystems in the AI era.

Theoretical and Practical Implications

Theoretical Implications: This study contributes to the growing literature by offering a comprehensive bibliometric synthesis that identifies the conceptual and thematic foundations of digital transformation leadership. It integrates insights from dynamic capability theory, institutional theory, and human-AI interaction frameworks. By mapping research clusters, this

review deepens our understanding of how digital transformation is being reconceptualized through leadership, organizational learning, and innovation lenses.

Practical Implications: For practitioners, the findings highlight the urgency of integrating AI-driven strategies into leadership development, organizational decision-making, and change management. Leaders must adopt flexible, hybrid leadership models capable of navigating VUCA environments. Institutions, especially in developing economies, should prioritize investment in digital upskilling, ethical AI governance, and cross-sector partnerships to remain competitive and resilient.

Limitations of the Study

The analysis is limited to Scopus-indexed publications, potentially excluding high-quality works from other databases like Web of Science or Google Scholar. Only English-language articles were considered, potentially underrepresenting non-English contributions, especially from non-Anglophone regions. The study captures data until early 2025, omitting very recent shifts or emergent topics. Though the research spans management and social sciences, sector-specific nuances (e.g., education, public health) may be underexplored.

Future Research Scope

To advance the field of digital transformation and leadership, future research should prioritize expanding collaborations in underrepresented regions such as Africa and Latin America, while also pursuing cross-cultural and cross-industry comparative studies on AI adoption in leadership. There is a critical need to explore the ethical, legal, and psychological implications of AI integration, alongside investigating the long-term impacts of digital reskilling and leadership agility on organizational performance. Developing robust AI governance frameworks that cater to both public and private sectors is essential, as is fostering interdisciplinary linkages between digital transformation and behavioural sciences. Additionally, researchers should aim to create metrics that assess the inclusivity and impact of international collaborations and establish global research-sharing protocols to ensure transparency, accessibility, and sustained innovation. The study concludes that digital transformation and techno-leadership research is maturing into a multidisciplinary, globally interconnected field. Strategic leadership frameworks that incorporate ethical AI use, human-centric design, and agile decision-making will be central to navigating future disruptions.

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