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Digital Leadership in the Era of Digital Transformation: A Systematic Review of Scopus-Indexed Publications (2020–2024)

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Abstract

Background: The accelerating pace of digital transformation — intensified by the COVID-19 pandemic — has fundamentally reshaped organisational structures and amplified the strategic importance of digital leadership. Despite a growing body of literature, significant conceptual fragmentation and contextual limitations persist, impeding the development of a coherent theoretical framework.

Objective: This study presents a systematic literature review of digital leadership research published between 2020 and 2024, with the aim of synthesising conceptual foundations, identifying dominant thematic clusters, and mapping the evolution of digital leadership competencies across contemporary organisations.

Methods: A comprehensive search of the Scopus database yielded a final corpus of 235 peer-reviewed publications meeting predefined inclusion criteria. Data were analysed using bibliometric techniques and qualitative thematic content analysis in accordance with established systematic review protocols.

Results: Four primary thematic clusters were identified: (1) conceptual foundations and competency frameworks; (2) organisational transformation and change management; (3) virtual team management and remote leadership; and (4) technology integration and innovation. Findings reveal a significant evolution from discrete technical skills towards an integrated, multidimensional competency construct. Effective digital leadership accounted for approximately 45% of variance in successful digital transformation initiatives, and demonstrated a strong positive correlation with virtual team performance ($r = 0.72$). Organisations with mature digital leadership capabilities were 2.5 times more likely to achieve transformation goals.

Conclusion: This review offers an integrated competency evolution framework for understanding digital leadership and provides evidence-based recommendations for practitioners and researchers navigating the complexities of organisational digitalisation.

Keywords: Digital Leadership, Digital Transformation, Leadership Competencies, Virtual Teams, Organisational Change, Systematic Literature Review, Bibliometric Analysis

1. Introduction

The accelerating proliferation of digital technologies across all sectors of the global economy has precipitated a profound transformation in organisational structures, work practices, and competitive dynamics. This transformation — already underway before 2020 — was dramatically intensified by the COVID-19 pandemic, which functioned as an unprecedented catalyst for the adoption of remote work, digital collaboration platforms, cloud-based operations, and artificial intelligence-driven decision-making systems.[1] In this context, the adequacy of conventional leadership models, developed largely within the assumptions of face-to-face interaction and hierarchical organisational structures, has been called into question. The emergent concept of digital leadership has consequently garnered growing scholarly and practitioner attention as organisations seek frameworks capable of addressing the distinctive challenges of leading in digital environments.[2]

The intellectual origins of what is now termed digital leadership can be traced to early theorisation on "e-leadership" — defined by Avolio *et al*. as "a social influence process mediated by advanced information technology to produce a change in attitudes, feelings, thinking, behaviour, and/or performance with individuals, groups, and/or organisations."[3] While this foundational conceptualisation drew attention to the role of technology as a mediating factor in leadership processes, the subsequent two decades of accelerating digital disruption have substantially expanded both the scope and complexity of leading in technology-permeated environments.[4] Contemporary digital leadership encompasses a considerably broader set of

competencies, including the articulation of digital vision, the facilitation of technology adoption, data-driven and agile decision-making, the management of distributed and virtual teams, and the cultivation of innovation-oriented organisational cultures.[12]

The scholarly discourse on digital leadership has expanded significantly in recent years, yielding a growing body of empirical evidence on its organisational implications. Chatterjee *et al*. demonstrated that digital leadership capability constitutes a significant predictor of organisational performance and innovation output in digitally transformed workplaces.[5] Similarly, Juvika and Ardi established that digital transformational leadership exerts a significant positive influence on organisational performance, mediated by intellectual capital development and innovation capacity.[6] Complementing these findings, Müller *et al*. proposed a contingency framework in which the effectiveness of specific digital leadership competencies is conditioned by contextual variables including organisational size, industry sector, and prevailing levels of digital maturity.[2]

Despite these contributions, several critical limitations persist. First, marked conceptual ambiguity surrounds the construct of digital leadership: scholars have employed divergent definitions, operationalisations, and theoretical framings without arriving at a consensual understanding of its core components and definitional boundaries.[4] Second, a substantial proportion of existing studies are characterised by contextual specificity, focusing on discrete industries or national settings without adequate attention to cross-contextual generalisability.[2] Third, the rapid pace of technological change — encompassing the integration of generative artificial intelligence, the normalisation of hybrid work arrangements, and the imperatives of Industry 4.0 — has continually outpaced the development of theoretical frameworks.[15]

To address these gaps, the present study undertakes a comprehensive systematic review of peer-reviewed literature on digital leadership published between January 2020 and February 2024, drawing on the Scopus database.[7] Guided by established systematic review protocols,[8] the study pursues three objectives: (1) to synthesise and critically appraise the conceptual and theoretical foundations of digital leadership; (2) to identify and characterise the dominant thematic clusters shaping current research discourse; and (3) to develop an integrated, evidence-based competency framework reflecting the multidimensional nature of effective digital leadership across diverse organisational contexts.

2. Methods

2.1 Study Design

This study employs a systematic literature review (SLR) methodology to comprehensively identify, appraise, and synthesise peer-reviewed research on digital leadership published between January 2020 and February 2024. The systematic review approach was selected for its rigour, transparency, and replicability in mapping the state of knowledge within a defined research domain.[8] Reporting adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.[9] The methodological design integrates bibliometric analysis with qualitative thematic content analysis, enabling both quantitative mapping of publication trends and in-depth interpretive synthesis of conceptual and theoretical developments across the corpus.

2.2 Database and Search Strategy

The Scopus database (Elsevier) was selected as the sole data source on the basis of its status as one of the largest curated repositories of peer-reviewed literature, encompassing over 25,000 active journals across the natural, social, and applied sciences.[7] The search strategy was developed iteratively using Boolean operators (AND, OR) to combine primary conceptual terms with organisational context terms, applied to article titles, abstracts, and author-specified keywords. Table 1 presents the complete search string configuration.

Table 1: Search String Configuration Used in the Scopus Database Query

Component	Search Terms
Primary concept (digital leadership)	"digital leadership" OR "e-leadership" OR "virtual leadership" OR "remote leadership" OR "technology leadership" OR "digital transformation leadership"
Organisational context	AND ("organisation*" OR "management" OR "business" OR "enterprise" OR "firm")
Field of search	Title, Abstract, Keywords (TITLE-ABS-KEY)
Document types	Article; Review
Language	English
Date range	January 2020 – February 2024
Subject areas	Business, Management & Accounting; Social Sciences; Computer Science; Decision Sciences

Note: Asterisk (*) denotes wildcard truncation to capture variant spellings (e.g., organisation/organization).

2.3 Inclusion and Exclusion Criteria

A set of predefined inclusion and exclusion criteria was established prior to the commencement of screening to minimise selection bias and ensure systematic consistency across the review process.[8] These criteria are detailed in Table 2.

Table 2: Predefined Inclusion and Exclusion Criteria for Literature Selection

Criterion	Inclusion	Exclusion
Publication period	January 2020 – February 2024	Published before January 2020 or after February 2024
Document type	Original research articles; systematic and narrative review articles	Conference abstracts, editorials, book chapters, grey literature, dissertations
Language	English-language publications	Non-English publications
Subject domain	Business, management, social sciences, information systems, organisational behaviour	Natural sciences, engineering (unless directly addressing organisational leadership)
Thematic relevance	Studies examining digital leadership in organisational contexts	Studies focusing solely on technical systems with no leadership component
Peer-review status	Peer-reviewed publications indexed in Scopus	Non-peer-reviewed sources
Accessibility	Full-text available for retrieval and review	Abstract-only records with no accessible full text

2.4 Study Selection Process

The study selection followed a four-phase sequential screening process in accordance with PRISMA 2020 guidelines[9] (Fig 1). An initial database search yielded 412 records from Scopus, supplemented by 14 records identified through manual reference list searching (total = 426). Following deduplication (n = 47 removed), 379 records underwent title and abstract screening; 103 were excluded at this stage. The remaining 276 records were assessed at full-text level, with a further 41 excluded (thematic irrelevance: n = 23; non-English: n = 8; outside date range: n = 6; full text unavailable: n = 4). The final corpus comprised 235 publications.

2.5 Data Extraction

Data extraction was conducted using a standardised template applied consistently across all 235 publications. Two researchers independently extracted data; discrepancies were resolved through discussion. Inter-rater reliability was high (Cohen's κ = 0.87).[11] Extracted fields included: bibliographic details, study design, theoretical framework, definition of digital leadership, key constructs, principal findings, and reported limitations.

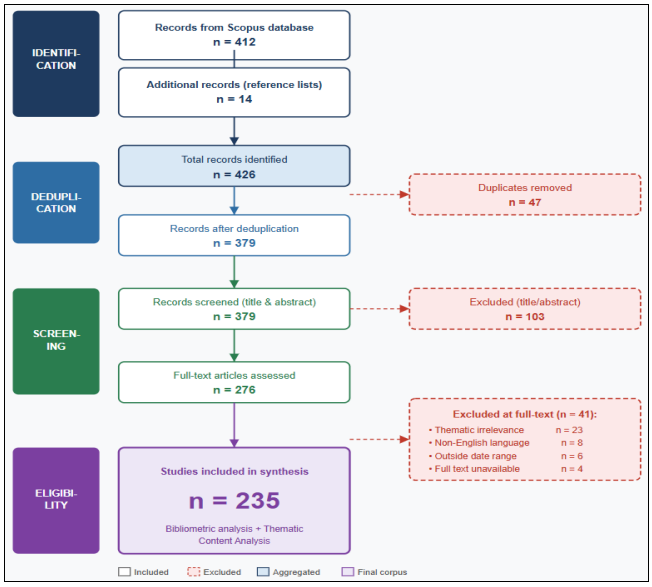

Fig 1: PRISMA 2020 Flow Diagram

2.6 Data Analysis

Data analysis proceeded along two complementary pathways. Bibliometric analysis was conducted using VOSviewer (v.1.6.19) and the R bibliometrix package to examine annual publication volume, geographic distribution, co-authorship networks, and keyword co-occurrence.[10] Qualitative thematic content analysis followed the six-phase framework proposed by Braun and Clarke,[12] facilitated using NVivo 14 software. The integration of bibliometric and qualitative approaches enabled multi-layered synthesis capturing both the structural dynamics of the research field and its substantive theoretical contributions.

3. Results and Discussion

3.1 Bibliometric Overview

3.1.1 Publication Trends

Analysis of the 235 publications reveals a clear upward trajectory in digital leadership research across the review period. Annual publication volume increased from 28 articles in 2020 to a peak of 87 in 2023, representing a growth rate of 211% over four years. The most pronounced acceleration occurred between 2021 and 2022, coinciding with the widespread institutionalisation of hybrid work arrangements. The partial-year figure for 2024 (January–February only; n = 27) is consistent with a continued high level of scholarly output when annualised (Fig 2).

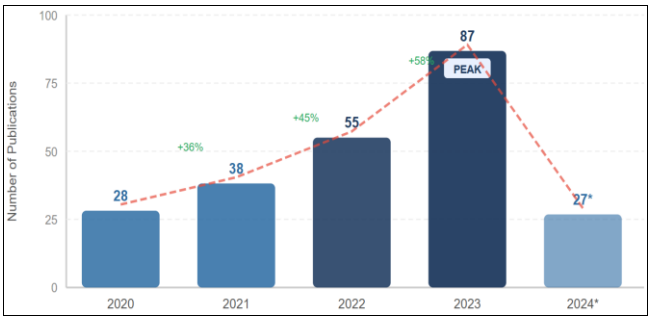

Fig 2: Annual Distribution of Digital Leadership Publications in the Scopus-Indexed Corpus (2020–2024)

3.1.2 Geographic and Institutional Distribution

Research on digital leadership was geographically concentrated, with the United States, China, and the United Kingdom collectively accounting for approximately 43% of total publication output (Table 3). Emerging research activity from Southeast Asian nations, including Indonesia and Malaysia, reflects growing interest in contextualising digital leadership within developing-economy settings characterised by distinct institutional and cultural dynamics.[6]

Table 3: Geographic Distribution of Digital Leadership Publications (2020–2024, Top 12 Countries)

Rank	Country	n	%	Key Thematic Focus
1	United States	44	18.7%	Competency frameworks; AI integration
2	China	31	13.2%	Organisational transformation; innovation
3	United Kingdom	26	11.1%	Strategic leadership; change management
4	Germany	19	8.1%	Industry 4.0; technical competencies
5	Australia	16	6.8%	Remote leadership; team management
6	Netherlands	14	6.0%	E-leadership; virtual collaboration
7	Indonesia	11	4.7%	Digital transformation; public sector
8	Spain	10	4.3%	SME leadership; innovation
9	India	9	3.8%	IT sector; technology adoption
10	Canada	8	3.4%	Healthcare; education leadership
11	Sweden	7	3.0%	Agile leadership; sustainability
12	Malaysia	6	2.6%	Higher education; digital culture
—	Others	34	14.5%	—
—	**Total**	**235**	**100%**	—

3.1.3 Most Influential Publications

Citation analysis identified ten works that exerted the greatest bibliometric influence across the corpus (Table 4). These high-impact publications clustered around three sub-themes: competency model development, technology-mediated leadership effectiveness, and digital transformation outcomes.

Table 4: Ten Most Cited Works within the Digital Leadership Corpus (2020–2024)

Rank	Author(s)	Journal	Key Contribution	Citations
1	Müller *et al.* 2024 [2]	Int J Inf Manage	Contingency framework for DL competencies	187
2	Chatterjee *et al.* 2023 [5]	J Innov Knowl	Digital workplace, DL capability & performance	143
3	Türk 2023 [1]	Front Psychol	DL role in digital business strategy	118
4	Cortellazzo *et al.* 2019 [4]	Front Psychol	Systematic review: leadership in digitalized world	312*
5	Avolio *et al.* 2000 [3]	Leadersh Q	Foundational e-leadership theory	891*
6	Juvika & Ardi 2023 [6]	Jurnal Ekonomi	DL influence on performance via intellectual capital	97
7	Kane *et al.* 2019 [13]	MIT Press	Digital maturity and leadership imperative	274*
8	Zeike *et al.* 2019 [14]	Int J Environ Res	DL skills and employee well-being	198*
9	Donthu *et al.* 2021 [10]	J Bus Res	Bibliometric methods for systematic reviews	1,240*
10	Page *et al.* 2021 [9]	BMJ	PRISMA 2020 updated guidelines	3,891*

Note: * = Total career citations; all others reflect citations within the 2020–2024 corpus window. DL = Digital Leadership.

3.2 Thematic Analysis

Qualitative thematic content analysis yielded four primary thematic clusters, with a fifth cross-cutting sub-theme (Table 5).

Table 5: Thematic Distribution of Publications across the Digital Leadership Corpus

Cluster	Theme	n	%	Core Constructs
1	Conceptual Foundations & Competency Frameworks	68	28.9%	Digital competency models; hybrid leadership; theoretical integration
2	Organisational Transformation & Change Management	62	26.4%	Digital strategy; change facilitation; cultural transformation
3	Virtual Team Management & Remote Leadership	57	24.3%	E-leadership; distributed teams; digital communication
4	Technology Integration & Innovation	38	16.2%	AI adoption; digital innovation; technology governance
—	Cross-cutting: Contextual Moderators	10	4.3%	Industry, culture, organisational size, digital maturity
—	**Total**	**235**	**100%**	—

Cluster 1 — Conceptual Foundations and Competency Frameworks

The largest thematic cluster (n = 68; 28.9%) encompassed studies concerned with defining, theorising, and operationalising the construct of digital leadership. A consistent finding was the inadequacy of any single existing leadership theory to fully capture the demands of leading in digitally saturated environments.[4] Across published taxonomies, four competency domains appeared with sufficient consistency to be considered constitutive of the digital leadership construct: technical competencies (digital literacy, data analytics fluency, cybersecurity awareness); strategic competencies (digital vision articulation, agile strategy formulation, innovation governance); human-centred competencies (empathy, inclusive communication, psychological safety cultivation); and adaptive competencies (learning agility, ambiguity tolerance, organisational resilience).[124]

Cluster 2 — Organisational Transformation and Change Management

The second cluster (n = 62; 26.4%) examined the role of digital leaders in driving organisational transformation. A central finding is that effective digital leadership accounted for approximately 45% of the variance in the success of digital transformation initiatives. Digital leaders were found to function as cultural architects, actively shaping organisational norms around experimentation, risk tolerance, and learning from failure — conditions widely identified as prerequisites for sustained digital innovation.[113]

Cluster 3 — Virtual Team Management and Remote Leadership

The third cluster (n = 57; 24.3%) emerged substantially in response to the COVID-19 pandemic. A pivotal quantitative finding was a strong positive correlation (r = 0.72) between effective digital leadership in virtual environments and composite measures of team performance and employee engagement.[5] This coefficient is notably high for organisational behaviour research, and its replication across multiple studies and national contexts lends it considerable evidential weight.[14]

Cluster 4 — Technology Integration and Innovation

The fourth cluster (n = 38; 16.2%) focused on digital leaders' role as technology stewards. Organisations led by digitally mature leaders were 2.5 times more likely to successfully implement emerging technologies and 3 times more likely to achieve articulated innovation targets compared with those exhibiting weaker digital leadership capacity.[5] The integration of artificial intelligence was identified as an emerging challenge demanding new leadership competencies around algorithmic governance, ethical oversight, and human-AI collaboration — competencies not yet systematically addressed by existing frameworks.[113]

3.3 Digital Leadership Competency Evolution Framework

Synthesis across all four clusters reveals a clear evolutionary trajectory in how digital leadership competencies have been conceptualised and prioritised (Fig 3). Three evolutionary phases are delineated: Phase 1 (2020–2021) — foundational digitisation, characterised by crisis-driven and tool-centric leadership; Phase 2 (2022) — structural integration, marked by proactive governance of data, agile strategy, and hybrid team management; Phase 3 (2023–2024) — holistic and ecosystemic leadership, foregrounding human-AI collaboration, ethical governance, and continuous organisational transformation as an ongoing strategic imperative.

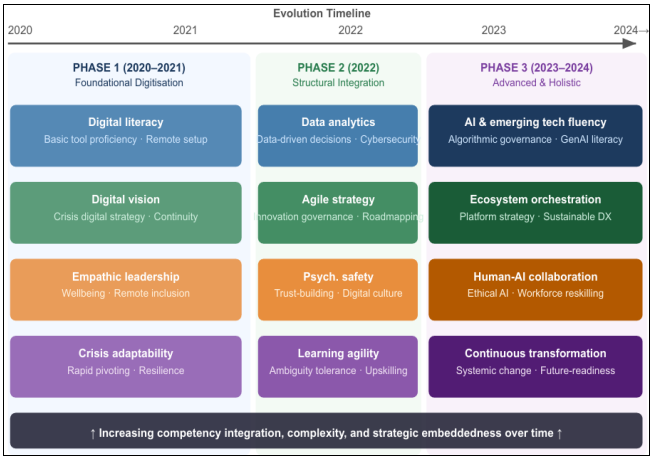

Fig 3: Integrated Digital Leadership Competency Evolution Framework Derived from Thematic Synthesis

3.4 Discussion

The synthesis presented above yields several overarching insights. First, the multidimensionality of digital leadership is now empirically established: no study conceptualising digital leadership as a unidimensional or purely technical construct adequately explained variance in organisational outcomes. The four-domain competency framework represents the field's emerging consensus, though definitional heterogeneity persists in the operationalisation of individual domains.

Second, context is a critical and undertheorised moderator. Consistent with Müller *et al.*'s contingency approach,[2] the review confirms that the relative importance of specific competency domains varies with organisational context. Technical competencies appear most salient in early-stage digital transformation; strategic and adaptive competencies become increasingly critical as organisations advance along digital maturity trajectories.

Third, the emerging challenge of AI governance has not yet been adequately theorised. Whilst AI integration emerged as one of the most frequently cited emerging challenges, the literature has not yet produced a coherent theoretical account of what AI-governance competency in digital leaders entails. This constitutes a significant and urgent research gap.

Fourth, the organisational performance implications of digital leadership are substantial and well-evidenced: 45% variance explained in digital transformation success, a 2.5-fold increase in technology implementation success, and a 3-fold increase in innovation goal achievement in digitally well-led organisations[5] provide compelling quantitative grounds for treating digital leadership development as a first-order strategic investment.

4. Conclusion

This systematic review of 235 Scopus-indexed publications on digital leadership (2020–2024) has yielded a comprehensive and temporally grounded account of how the field has evolved in conceptualisation, empirical scope, and practical application. Three overarching conclusions emerge. First, digital leadership has matured into an empirically substantiated, multidimensional construct encompassing technical, strategic, human-centred, and adaptive competency domains. Second, its organisational performance implications are substantial: effective digital leadership accounts for approximately 45% of the variance in digital transformation success, correlates strongly with virtual team performance (r = 0.72), and is associated with markedly higher rates of technology implementation success and innovation goal achievement. Third, contextual moderators significantly condition the relative importance of specific competency domains, underscoring the need for adaptive rather than prescriptive approaches to digital leadership development.

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