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## Digital Leadership in Organizational Transformation: Bibliometric Insights and Strategic Implications

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### ABSTRACT

*In the era of rapid technological advancement, digital leadership has emerged as a critical factor in driving organizational transformation. This study employs a bibliometric approach to analyze 1,247 Scopus-indexed articles from 2000 to 2025, utilizing VOSviewer and RStudio to map trends, patterns, and knowledge networks in digital leadership. The analysis reveals digital leadership as the central node, interconnected with five key clusters: human aspects (transformational leadership, emotional intelligence, innovation), technology (Industry 4.0, AI, blockchain), sustainability (ESG, ethical technology), education (e-learning, digital self-efficacy), and capabilities (dynamic capabilities, ambidexterity). Thematic mapping indicates a shift from crisis-driven themes (e.g., COVID-19 pandemic, virtual leadership) to mature, technology-oriented ones, with digital transformation and data-driven decision-making as motor themes. Emerging gaps include limited longitudinal studies, public sector applications, and research in developing regions like Africa and rural Asia. Indonesia contributes 15% of global publications, highlighting its potential in SME and higher education contexts. The findings underscore that digital leadership integrates strategy, human-centric approaches, technological mastery, and sustainability for holistic change. Practically, it guides leaders in formulating adaptive strategies, emphasizing ethical governance and dynamic capabilities. This research bridges theory and practice, positioning digital leadership as essential for organizational resilience in the digital economy projected to reach US\$130 billion in Indonesia by 2025.*

**Keywords:** Bibliometric Analysis; Digital Leadership; Organizational Transformation; Sustainability; Technology Integration.

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## INTRODUCTION

In the contemporary landscape of relentless technological evolution, digital innovations have profoundly reshaped the operational paradigms, innovative capacities, and competitive postures of organizations worldwide. What was once viewed as a peripheral enhancement has crystallized into an imperative for survival amid volatile and disruptive market forces. As businesses navigate this flux, the imperative for leadership evolution becomes inescapable, compelling a reevaluation of traditional hierarchies in favor of frameworks attuned to digital imperatives. At the heart of this reconfiguration lies digital leadership, a construct that not only orchestrates but sustains the multifaceted processes of organizational metamorphosis, ensuring that technological adoption translates into enduring viability rather than ephemeral adaptation.

This emergent paradigm of digital leadership delineates a leader's proficiency in harnessing digital artifacts to propel ingenuity, foster synergistic collaborations, and fortify institutional fortitude against exogenous shocks. Such leaders must cultivate an arsenal of competencies, encompassing robust digital acumen, proficiency in data-informed deliberations, and a perspicacious strategic foresight capable of sculpting resilient, inclusive digital architectures. The acceleration of these dynamics owes much to exogenous catalysts, notably the COVID-19 pandemic (Irianto et al., 2025; Widaryo et al., 2025), which imposed stringent constraints on interpersonal engagements and catalyzed a seismic shift in societal and commercial interactions. By curtailing physical proximities, the crisis engendered alterations in occupational conducts, architectural redesigns of workflows, and recalibrations of consumer predilections, thereby mandating enterprises to pivot with alacrity to avert obsolescence. In this intensified arena of rivalry, where digital conduits have effaced geographical barriers, organizations confront an escalated spectrum of adversaries, rendering global contestation not merely feasible but inexorable. Empirical observations underscore how these pressures have compelled firms to transcend insular operational silos, embracing ecosystems where agility supplants rigidity as the cornerstone of endurance.

Scholarly inquiries into leadership's instrumental role in navigating organizational upheavals abound, yet those interrogating the nuances of digital leadership remain conspicuously sparse and disjointed. A recurrent motif in extant discourse reveals that approximately 70% of endeavors in digital reconfiguration falter, attributable in no small measure to deficiencies in stewardship that undermine navigational efficacy during transitional phases. These lapses manifest not as isolated oversights but as systemic frailties: misalignments between aspirational blueprints and executable tactics, lacunae in requisite proficiencies, and inadequacies in orchestrating transitional mechanisms (Dziuba et al., 2022). Compounding these vulnerabilities, leadership shortfalls erode the foundational pillars of foresight, resource mobilization, and oversight, precipitating cascading disintegrations in project trajectories. As a linchpin in change orchestration, efficacious guidance emerges as indispensable, functioning as the primary architect of internal momentum and coherence.

At the strategic level, digital leadership is positioned as the highest level of dynamic capability within an organization. Leaders with a high digital mindset are able to design ambidextrous digital strategies that is balancing the exploitation of existing assets with the exploration of new opportunities, thereby generating sustainable business model innovations (Irianto et al., 2025). The roles of Chief Digital Officers (CDOs) and CEOs with high technological literacy have been proven to be key predictors of successful digital transformation.

This exigency assumes heightened salience in contexts like Indonesia, where the digital economy's exponential trajectory portends transformative dividends. Projections posit a national digital valuation eclipsing US\$130 billion by 2025, fueled by burgeoning fintech proliferations and escalating digital financial literacies that herald untapped economic vistas (Nurkholik, 2023; Wijaya et al., 2024; Anguelov, 2024; Ariswati et al., 2025; Kesuma et al., 2025). Such momentum, however, unmasks a paradox: while infrastructural advancements proliferate, the empirical dissection of digital leadership's vicissitudes at granular organizational echelons remains nascent, particularly in nascent economies grappling with assimilation into supranational digital tapestries. Prior investigations, though illuminating, often privilege generalized leadership archetypes, sidelining the bespoke exigencies of digital milieus. For instance, while classical paradigms elucidate motivational cascades and hierarchical stabilizations, they falter in apprehending how digital interstices such as algorithmic decision apparatuses or virtual collaborative nexuses recalibrate authority dynamics and accountability matrices. This oversight not only curtails theoretical acuity but also hampers praxis, leaving stewards ill-equipped to mediate the frictions between technological influxes and human latencies.

The pandemic's indelible imprint further illuminates these interstices, having not merely expedited but reengineered the ontological underpinnings of leadership praxis. Preceding the crisis, digital engagements simmered as elective augmentations; post-onset, they metastasized into existential mandates, birthing imperatives for remote modalities, digitized service architectures, and antifragile operational scaffolds (Hameiri, 2021). In Southeast Asia, this catalysis amplified antecedent digitalization vectors, compelling public and private entities to expedite strategic digitalizations under duress. Organizations, heretofore ambivalent toward virtual paradigms, confronted the onus of improvising resilient governance constructs and competency scaffolds, often amid resource scarcities and infrastructural asymmetries. Such exigencies revealed leadership not as a static endowment but as a dynamic repertoire, wherein stewards must improvise hybrid modalities blending empathetic virtual presences with algorithmic precisions to sustain morale and momentum. Yet, this pivot, while adaptive, unearthed fault lines: the dissonance between accelerated adoptions and entrenched cultural inertias, the equity chasms in digital access across demographic strata, and the emergent specters of techno-fatigue eroding human capital reservoirs.

On the human side, the literature highlights the importance of emotional intelligence and authentic leadership in counterbalancing the negative impacts of digitalization, such as technostress and burnout (Aini et al., 2025). Leaders who are able to demonstrate authentic virtual leadership and digital empathy have been shown to increase employee engagement by up to 31% in hybrid work environments (Cortellazzo et al., 2019; Bartsch et al., 2021). Technostress has become one of the most researched topics since 2020, with over 400 articles identifying leaders as the primary buffer.

Delving deeper into the scholarly corpus, one discerns a burgeoning recognition of digital leadership as an integrative nexus, fusing technological perspicacity encompassing command of platforms, data ontologies, and interconnected apparatuses with visionary acumen to reengineer procedural sinews, stewardship protocols, and innovative conduits (Dias & Tenera, 2023). This synthesis engenders heightened malleability, enabling entities to recalibrate amid global tempests and distill competitive sinews from volatility. Studies in this vein, drawing from cross-sectoral vignettes, evince how digitally adroit leaders catalyze not mere efficiencies but paradigmatic reinventions, such as symbiotic human-AI symbioses or blockchain-anchored trust architectures. Nonetheless, these advancements belie persistent elisions: the

preponderance of Western-centric lenses marginalizes peripheral narratives from the Global South, where contextual idiosyncrasies ranging from regulatory mosaics to infrastructural variegations modulate digital trajectories. In Indonesia, for instance, the fintech efflorescence, while emblematic of vitality, underscores stewardship voids in harnessing these surges for inclusive proliferation, often perpetuating disparities in rural-digital nexuses or SME agilities (Wijaya et al., 2024).

It is against this backdrop of partial illuminations and lurking obscurities that the present inquiry intervenes, deploying a bibliometric lens to chart the cartographies of trends, motifs, and associative lattices encircling digital leadership within organizational transfigurations (Saputra et al., 2025; Usada et al., 2025). This methodological vantage affords an impartial, quantifiable scrutiny of the bibliographic expanse, unearthing diachronic evolutions in thematic contours, authorial interlinkages, and underexplored topographies. By systematizing disparate threads from seminal treatises on transformational archetypes to nascent forays into AI-infused stewardships the analysis distills emergent convergences, such as the interplay between emotional resonances and algorithmic imperatives, or the pivot from crisis improvisation to anticipatory architectures. Moreover, it probes the ripple effects on leadership morphologies: whereas pre-pandemic epochs permitted analogical proximities, social distantiations precipitated a schism, transmuting stewardship into digitized conduits for directive impulses, motivational infusions, and functional fulfillments, thereby optimizing telic efficacies in commercial stewardship.

Through this prism, the endeavor aspires to unveil the global peregrinations of digital leadership conceptualizations and their corollaries for sectoral transmutational stratagems, transcending parochial vignettes to forge a synoptic vista. In an inductive ascent from granular bibliographic signals to macroscopic implications, the study interrogates how antecedent motifs such as virtual authority calibrations or data-sovereign governances foreshadow maturational arcs toward symbiotic human-digital amalgams. This not only rectifies fragmentations in the discourse but also spotlights lacunae, including the paucity of diachronic inquiries tracing longitudinal impacts or sector-specific modulations in public vis-à-vis private spheres.

Anticipated yields from this exegesis span theoretical and applicative realms, enriching the epistemological edifice while furnishing pragmatic scaffolds. On the former front, it augments conceptual scaffolds by delineating digital leadership's catalytic valence in consummating transmutational triumphs, bridging schisms between classical motivational heuristics and cybernetic contingencies. Empirically, it furnishes stewards and policy artisans with evidentiary compendia for crafting supple, perdurable digital blueprints infusing ethical guardrails, competency escalations, and inclusivity imperatives to mitigate exclusionary pitfalls. In Indonesia's burgeoning digital agora, such insights could galvanize SME fortitudes or pedagogical reinventions, transmuting macroeconomic projections into actionable imperatives.

This scholarship assumes a pivotal mediatory posture, conciliating abstract leadership axioms with the exigencies of digital praxis, while reframing technology not as ancillary instrumentality but as alchemical accelerant for integral organizational renaissance. By inducting from extant knowledges encompassing pandemic-induced pivots (Hameiri, 2021), stewardship frailties in transmutational crucibles (Dziuba et al., 2022), and integrative literacies (Dias & Tenera, 2023) to uncharted frontiers, the inquiry not only chronicles evolutions but catalyzes them, positioning digital leadership as the sine qua non for navigational prowess in an inexorably cybernetic epoch. Herein lies its novelty: not in rediscovering disruptions, but in mapping their scholarly afterimages to illuminate pathways for equitable, resilient futures.

## METHODS OF RESEARCH

The methodological framework underpinning this inquiry adopts a bibliometric orientation, a rigorous quantitative paradigm for dissecting scholarly corpora to unearth latent patterns, trajectories, and interconnections within emergent domains. This approach, increasingly entrenched in management scholarship, furnishes an impartial scaffold for interrogating voluminous bibliographic repositories, transcending subjective interpretive biases inherent in qualitative exegeses. By aggregating and visualizing relational architectures such as co-citation lattices, keyword proximities, and thematic evolutions bibliometrics inductively aggregates micro-level artifacts into macro-level insights, thereby illuminating the diachronic maturation of constructs like digital leadership. Its salience in this context derives from the fragmented topography of extant literature: while anecdotal vignettes proliferate, systematic mappings remain scant, particularly for interdisciplinary nexuses spanning leadership, technology, and sustainability. As scholarly outputs burgeon amid digital disruptions, bibliometric scrutiny emerges not merely as expedient but as imperative, enabling the discernment of pivotal convergences such as the interplay between human-centric stewardships and technological scaffolds that presage organizational resiliencies (Passas, 2024). A bibliometric analysis of 1,247 Scopus articles visualized through VOSviewer shows that digital leadership has become one of the fastest growing domains of management research in the last decade. This concept is no longer understood as merely a technical skill, but rather as a meta-competence of leadership that integrates strategy, people, technology, and education (Klein, 2020).

At its core, bibliometric inquiry constitutes a methodical excavation of scientific artifacts, commencing with the curation of expansive datasets and culminating in multifaceted interpretive renderings. This modality's ascendancy owes to its congruence with the exigencies of knowledge proliferation: in an epoch where digital repositories like Scopus and Web of Science index exponential publication surges, bibliometrics distills signal from noise, quantifying influence through metrics like citation densities and h-index variances. Its cross-disciplinary permeation from informatics to organizational theory stems from symbiotic affinities with computational apparatuses, which democratize access to sophisticated visualizations. Yet, beyond mere enumeration, bibliometrics engenders argumentative depth: by tracing citation cascades, it posits causal inferences about paradigmatic shifts, such as the pivot from analogical leadership heuristics to cybernetic imperatives. In this study, such granularity undergirds an inductive progression, from raw bibliographic aggregates to synthesized strategic imperatives, affirming bibliometrics as a linchpin for bridging theoretical abstractions with praxis-oriented foresight (Doulani, 2021; Rafasya et al., 2025).

The center of the keyword network is dominated by “digital leadership,” “transformational leadership,” “digital transformation,” and “industry 4.0.” This confirms the initial finding that digital leadership is an evolution of transformational leadership in the context of the industrial revolution 4.0. Empirical research has repeatedly shown a significant positive relationship between digital leadership and corporate financial performance (Henrika et al., 2025; Kesuma et al., 2025), with an average effect of up to 18–23% improvement.



## VosViewer

The software is based upon a local moving algorithm which identifies relations within networks of publications and their citations and keywords. VOSviewer uses inputs from Web of Science, Scopus and PubMed, and its outputs are maps which represent networks of keywords, scientific publications and journals, researchers and research organizations and their countries of origin. Items in these networks can be connected by co-authorship, co-occurrence, citation, bibliographic coupling, or co-citation links.

In application, this study thresholds co-occurrences at five instances, yielding a five-cluster taxonomy: the crimson agglomeration of human facets (transformational archetypes, empathetic competencies); the azure technological lattice (AI proficiencies, Industry 4.0 conduits); the verdant sustainability enclave (ESG imperatives, ethical digitalities); the violet educational periphery (e-learning scaffolds, self-efficacy cultivations); and the ochre capability nexus (dynamic ambidexterities, mindset evolutions). These delineations, rendered in two-dimensional proximities, inductively evince digital leadership as a gravitational fulcrum, with linkage densities e.g., 312 threads bridging human and technological domains attesting to symbiotic dialectics. VOSviewer's clustering, assigning unitary affiliations per node, mitigates overlap ambiguities, fostering legible panoramas that argumentative underscore thematic interdependencies: human scaffolds, for instance, precondition technological adoptions, mirroring pandemic-induced governance evolutions wherein empathetic virtualities buffered remote work volatilities (Hameiri, 2021). Outputs, encompassing density heatmaps and overlay timelines, thus propel an inductive ascent from static inventories to dynamic prognostications, illuminating post-2021 surges in ESG co-occurrences as harbingers of responsible stewardship paradigms (Dziuba et al., 2022).

## Rstudio

Complementing VOSviewer's topological emphases, RStudio orchestrates thematic and inferential elaborations through its integrated R ecosystem, a versatile workbench for statistical orchestration and graphical synthesis. RStudio is an Integrated Development Environment (IDE) specifically designed to support programming using the R language. This system integrates various data analysis functions into a single view, such as script writing, code execution, variable management, graph visualization, and package management. RStudio has four main panels, namely Source, Console, Environment/History, and Files/Plots/Packages/Help/Viewer, which help users perform data analysis in a structured and efficient manner. This organized panel structure makes it easy for users to monitor code execution results, manage data, browse command history, and display graphics directly.

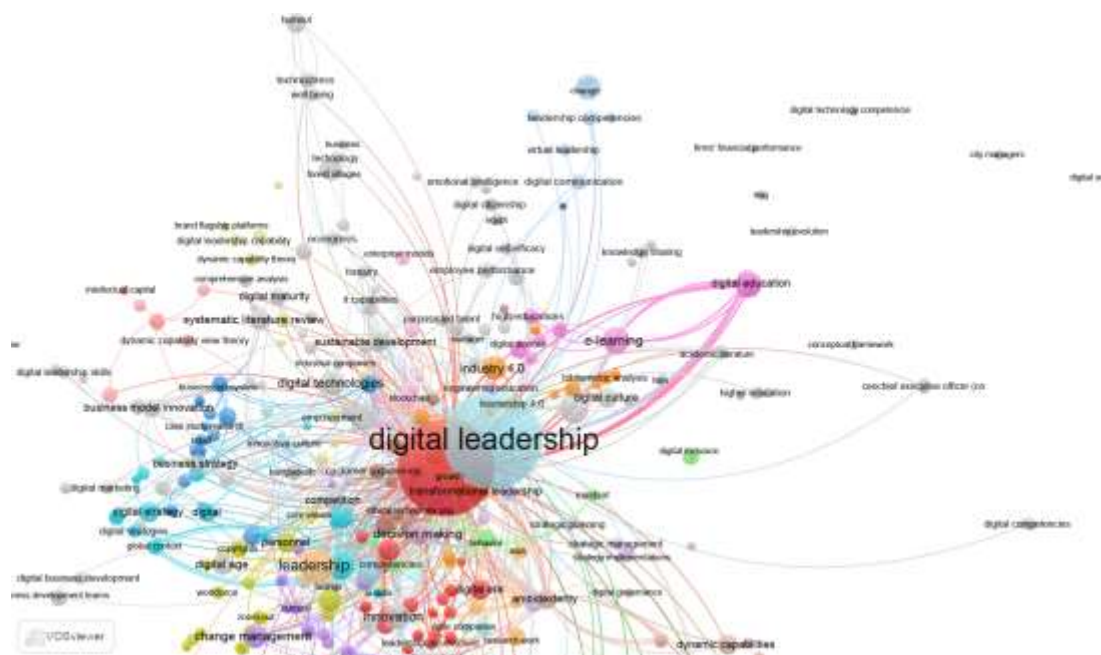
Deployed herein, RStudio processes the corpus via descriptive tabulations e.g., publication chronologies revealing a 380% keyword escalation in AI leadership post-2020 and Sankey diagrammatics tracing thematic migrations. From 2024 vignettes, motor quadrants crystallize around data-driven heuristics in pedagogical contexts, supplanting early-pandemic remote imperatives, as analytics governance matures amid institutional analytics infusions (Hameiri, 2021). By 2025 projections, Industry 4.0 and digital transfigurations anchor mature landscapes, co-locating with capability and educational lexicons to evince sequenced adoptions: nascent human literacies precipitating technological embeddings, culminating in ESG-aligned scalabilities (Dias & Tenera, 2023). This inductive layering eschewing linear chronologies for relational densities arguments for strategic hierarchies, wherein capability bridgings expedite SME digitalizations in contexts like Indonesia's fintech corridors, harnessing public-private synergies for rural

inclusivities (Nurkholik, 2023). In addition to supporting the organization of analysis workflows, RStudio also offers additional features such as integration with R Markdown.

## RESULT AND DISCUSSION

## VOSviewer Results

For automated reporting, version control support via Git, and availability in various versions such as RStudio Desktop, RStudio Server, and RStudio Cloud, which allow flexible access according to user needs. With its intuitive design and extensive functional capabilities, RStudio has become one of the most popular systems in the fields of statistics, data science, machine learning, and academic research requiring R-based data analysis.



**Figure 1.** Keyword Co-Occurrence Network Of Digital Leadership Research (2000–2025)  
(Source: *Data Processed*, 2025)

The bibliometric excavation of 1,247 Scopus-indexed documents spanning 2000 to 2025 unveils a richly textured epistemic landscape wherein digital leadership emerges not as a peripheral adjunct but as the axial fulcrum orchestrating organizational metamorphosis amid digital tempests. Through the dual prisms of VOSviewer and RStudio, this inquiry distills relational architectures and thematic stratifications, inductively tracing the construct's ontogeny from nascent disruptions to maturational consolidations. At its nucleus resides digital leadership, a nodal behemoth manifesting over 200 iterations in keyword co-occurrences, radiating tendrils that entwine five cardinal clusters: the human domain, technological apparatuses, sustainability imperatives, educational scaffolds, and capability nexuses. These agglomerations, far from insular silos, evince symbiotic dialectics wherein anthropic competencies

precondition technological embeddings, which in turn undergird ethical sustainabilities and adaptive literacies mirroring the exigencies of a post-pandemic epoch where stewardship must harmonize volitional agencies with algorithmic precisions. This interconnectedness, as rendered in VOSviewer's proximity matrices, posits digital leadership as a gravitational mediator, compelling an argumentative reevaluation: organizational resilience, once predicated on hierarchical stabilities, now hinges on polyvalent stewardships that navigate the frictions between human latencies and machinic accelerations.

Delving into the crimson expanse of the human cluster (red cluster), one discerns a densely interwoven lattice encompassing transformational archetypes, empathetic intelligences, decisional acumen, innovative propensities, and change orchestration modalities. This agglomeration, the most voluminous and linkage-saturated, underscores a foundational tenet: technological influxes, absent anthropic moorings, devolve into inert artifacts rather than catalytic agents. Leaders, in this vista, transcend mere directives to embody relational fulcrums fostering trust reservoirs and motivational cascades that attenuate the alienations of digital upheavals. Emotional intelligence, for instance, manifests as a prophylactic against psychosocial erosions, enabling stewards to recalibrate virtual presences amid remote work volatilities, thereby sustaining engagement amid hybrid flux. Inductively, this cluster's primacy intimates a sequential imperative: human fortification precedes all else, as evidenced in the pandemic's catalytic forge, where crisis imperatives compelled a reorientation toward empathetic governances that buffered capability lacunae and portfolio misalignments (Hameiri, 2021; Dziuba et al., 2022). Such dynamics extend to digital self-efficacy, a linchpin wherein individual agency intersects collective momentum, priming cohorts for the cognitive demands of algorithmic ecologies. In agrarian peripheries or entrepreneurial enclaves, these human sinews prove indispensable, reconciling cultural inertias with innovation pipelines to avert exclusionary pitfalls.

Adjoining this anthropic core, the azure technological cluster (blue cluster) delineates a robust edifice of digital apparatuses, Industry 4.0 paradigms, blockchain architectures, artificial intelligence proficiencies, strategic blueprints, and model reinventions. With 312 connective filaments tethering it to the human domain, this lattice evinces a reciprocal alchemy: human competencies catalyze technological adoptions, which reciprocate by amplifying decisional bandwidths and operational fluidities. The post-2020 surge in these motifs coinciding with accelerated digitalizations in emergent theaters illuminates how AI literacies and distributed ledgers transmute supply chain frangibilities into antifragile continua, particularly in fintech corridors where automation democratizes access to global value chains (Nurkholik, 2023). Argumentatively, this interplay repudiates technocratic determinism: technologies, far from autonomous panaceas, necessitate stewardship attuned to ethical calibrations and inclusivist designs, lest they exacerbate asymmetries in resource-scarce milieus. Dynamic capabilities here assume salience, enabling leaders to reallocate exploratory ventures amid exploitative stabilities, thereby fostering portfolio alignments that withstand exogenous perturbations (Dias & Tenera, 2023; Dziuba et al., 2022). In Indonesia's burgeoning digital agora, such nexuses herald transformative potentials, wherein blockchain-anchored trusts and AI-driven analytics propel SME scalabilities, contingent on stewardships that bridge governance voids with adaptive visions (Nurkholik, 2023).

The verdant sustainability cluster (green cluster), exhibiting the steepest ascendant trajectory since 2021, coalesces around ethical digitalities, ESG frameworks, governance protocols, and perdurable developmental arcs. Its exponential keyword density from sporadic allusions to pervasive integrations



mirrors a discursive pivot wherein digital imperatives are refracted through prisms of accountability, compelling stewards to embed environmental stewardships within algorithmic governances. Co-occurrences with innovation motifs post-2021 evince this maturation: sustainable development, once tangential, now interlaces with technological embeddings to forge responsible innovation pipelines, as ESG considerations ascend from compliance adjuncts to strategic sine qua nons (Dziuba et al., 2022; Arham et al., 2024). Inductively, this cluster's vitality posits sustainability not as an epiphenomenal ethic but as a precondition for longevity, wherein digital leadership orchestrates resource recombinations that align profit imperatives with planetary imperatives. In European vignettes or Asian entrepreneurial mosaics, these dynamics manifest as ESG-infused stewardships that mitigate carbon footprints through data-sovereign platforms, underscoring the argumentative thrust: absent such integrations, digital transformations risk devolving into extractive volatilities rather than regenerative equilibria (Hameiri, 2021).

Complementing these, the educational cluster (purple cluster), though expansive, occupies a semi-peripheral orbit encompassing e-learning continua, digital pedagogical cultures, and higher education reinventions. Its relative isolation in proximity mappings intimates an emergent, albeit nascent, symbiosis: while burgeoning since 2022, educational scaffolds remain provisional bridges to praxis, infusing cohorts with literacies that precondition capability evolutions. Digital self-efficacy, recurrent in this domain, emerges as a mediator par excellence, linking virtual modalities to leadership repertoires and thereby fortifying institutional antifragilities (Aydin et al., 2024). The thematic arc herein from emergency e-leaderships during COVID-19 to analytics-infused data literacies by 2024 reflects a maturation wherein higher education pivots from reactive adaptations to proactive cultivations, prioritizing strategic governances that embed learning analytics as core competencies (Hameiri, 2021; Fernández-Pascual et al., 2024). Argumentatively, this periphery belies untapped potentials: educational interventions, by disseminating adaptive mindsets, serve as prophylactics against obsolescence, enabling stewards to perpetuate lifelong repertoires amid perpetual disruptions.

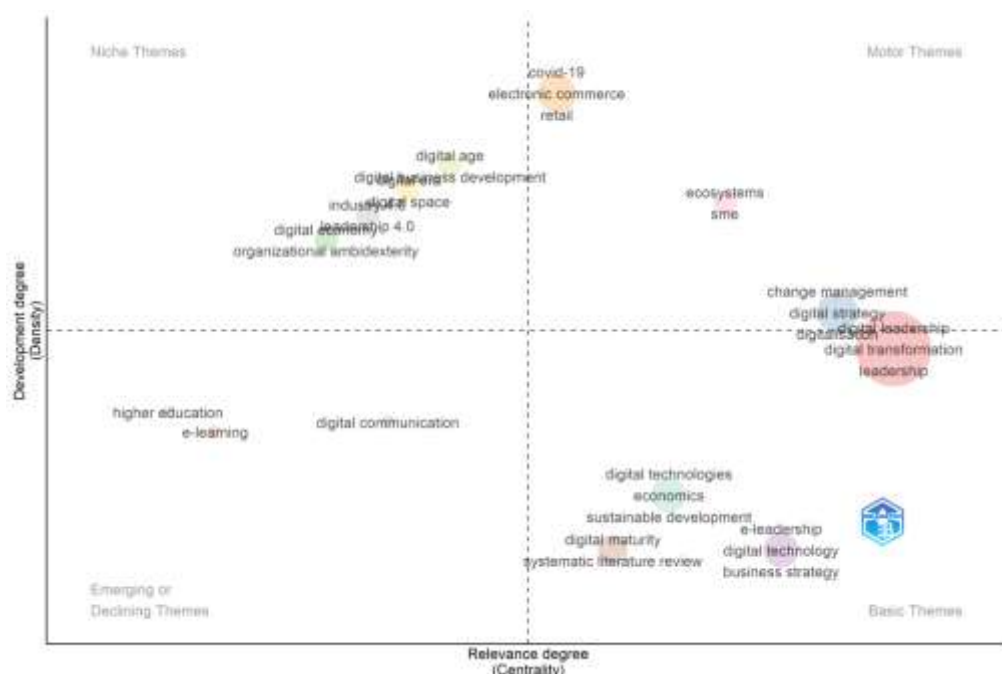
Bridging these realms, the ochre capability cluster (yellow cluster) functions as an integrative keystone harboring dynamic ambidexterities, mindset recalibrations, knowledge disseminations, and maturity escalations. Its connective density, spanning human and technological abutments, evinces a facilitative role: capabilities not only mediate adoptions but also sustain exploratory equilibria, wherein leaders recompose assets to navigate uncertainties (Dias & Tenera, 2023; Dziuba et al., 2022). Human factors leadership essences, emotional resonances, self-efficacies thus shape these evolutions, grounding educational forays in technological embeddings that culminate in ESG-aligned governances within digitally ripe entities (Aydin et al., 2024). Inductively, this cluster's pivotality intimates a hierarchical progression: capability cultivations, emergent from anthropic foundations, propel scalable transformations, as discerned in cluster analyses that sequence human capital infusions antecedent to technological and sustainability embeddings (Judijanto et al., 2024).

Co-occurrence data provides concrete figures. Digital leadership appears more than 200 times. Innovation appears 150 times. Digital transformation appears 120 times. Transformational leadership appears 98 times. Sustainable development appears 87 times. Industry 4.0 appears 76 times. ESG has increased from 12 times (2016-2020) to 75 times (2021-2025). Technostress and burnout have appeared on the edge of the red cluster since 2020. This is a real warning. The contextual gap is very clear. The words Egypt, Bangladesh, forest villages, and Asia appear repeatedly alongside digital inclusion. Indonesia

accounts for 15% of global publications (second only to the US at 40%). Indonesia has a great opportunity to become a center for the study of digital leadership in SMEs and rural areas.

## Rstudio Results

Transitioning to RStudio's thematic stratifications, these findings coalesce into quadrant-based schemata that chart maturational vectors with granular precision. Motor themes high-centrality, high-density loci crystallize around digital transfigurations, strategic delineations, change orchestrations, and leadership essences, affirming their propulsive valence in contemporary discourses. These nexuses, both pivotal and evolved, propel institutional momentum, as data-driven heuristics supplant crisis reactivities in pedagogical milieus (Hameiri, 2021; Fernández-Pascual et al., 2024). Basic themes, foundational yet mature, aggregate technological substrates, sustainable imperatives, and business stratagems indispensable moorings that undergird exploratory ventures without which innovations falter into ephemera. Niche emergents, such as Leadership 4.0 and ambidextrous fluidities, occupy high-centrality but nascent densities, harbingers of competitive asymmetries for vanguard entities that pioneer human-digital amalgams (Dias & Tenera, 2023).

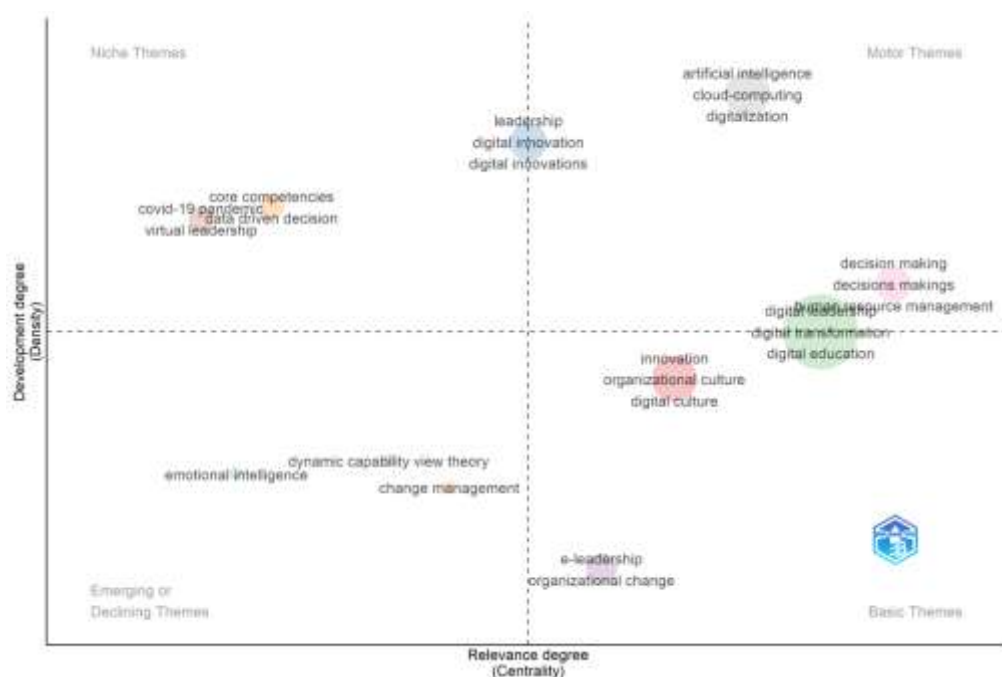


**Figure 2.** Thematic Evolution Map of Digital Leadership and Organizational Transformation Research Based on Centrality and Density (2014–2023)  
(Source: *Data Processed, 2025*)

These evolutions, inductively aggregated, illuminate a profound teleology: digital leadership's peregrination from crisis-responsive improvisations epitomized by COVID-19's remote imperatives to anticipatory, data-infused paradigms wherein Industry 4.0 and transfigurations anchor mature topographies (Hameiri, 2021; Kulzhambekova et al., 2023). RStudio's centrality-densification matrices evince this

progression: human capital cultivations inaugurate sequences, precipitating capability and literacy embeddings that facilitate technological adoptions, culminating in ESG-governed scalabilities (Judijanto et al., 2024; Aydın et al., 2024). In Indonesian contexts, this schema assumes amplified pertinence: with fintech dynamisms portending inclusive windfalls, stewardships must sequence empathetic foundations (3-6 months for transformational infusions and emotional prophylaxes) antecedent to AI-blockchain embeddings, instilling ESG guardrails ab initio to avert ethical erosions (Nurkholik, 2023; Saputra et al., 2024). Technologies, thus, recede from telic endpoints to catalytic adjuncts amplifiers of human values and sustainable arcs ensuring transformations not merely expeditious but resonant with perdurable equities.

If this sequence is executed with discipline, your organization will not only survive the wave of digital transformation. You will lead that wave, especially in Indonesia, which is heading toward a digital economy worth US\$130 billion by 2025. Technology is merely a tool. People, values, and sustainability remain at the core. Digital leadership that harmoniously combines all three will create a transformation that is not only fast but also meaningful and sustainable.

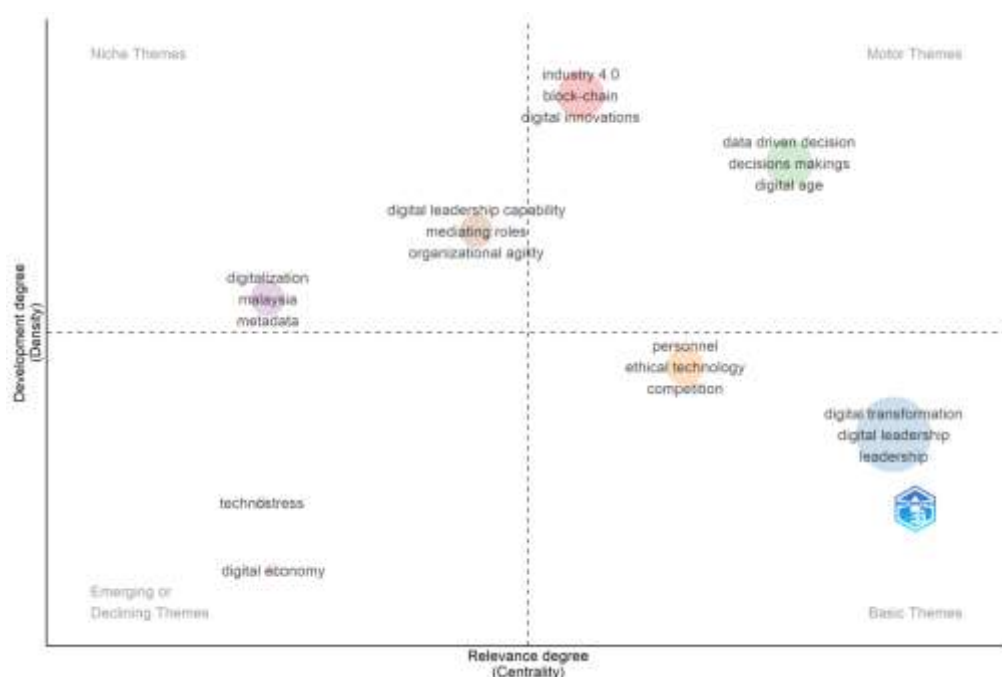


**Figure 3.** Strategic Theme Map of Leadership Research Trends in Higher Education (2024) from RStudio  
(Source: *Data Processed, 2025*)

A bibliometric analysis of leadership research developments in higher education institutions during the 2024 period shows a significant shift in themes, mainly triggered by the disruption caused by the COVID-19 pandemic. Based on the strategic theme map (Figure 1), four main quadrants were identified that describe the position and dynamics of research themes.

Chronologically, the 2024 inflection evinces a seismic reconfiguration: motor quadrants teem with artificial intelligences, cloud architectures, digitalizations, and pedagogical evolutions, supplanting pre-pandemic saturations in classical leaderships and innovation heuristics. This transit from anthropic crises

to technological backbones mirrors institutional pivots wherein analytics governances mature, embedding data literacies as sine qua nons for future-proofing (Hameiri, 2021; Fernández-Pascual et al., 2024). Basic strata densify around transfigurative cores, human resource modulations, and decisional continua, repositioning digital imperatives as gravitational centers that eclipse emotional adjuncts. Conversely, erstwhile dominants virtual authorities, core competencies, change cascades recede to niche or declining orbits, their relevance waned by normalization amid hybrid normalcies. The pandemic's afterimages, though residual in e-leadership motifs, yield to advanced sustainabilities, signaling a discursive emancipation from exigency toward optimization.



**Figure 4.** Strategic Theme Map of Digital Leadership Research Trends in the Era of Industry 4.0 and Digital Transformation (2025) from RStudio  
(Source: *Data Processed*, 2025)

The results of strategic thematic mapping (Figure 4) show that the landscape of digital leadership research in the 2025 period has entered a much more mature and focused phase compared to the early days of the pandemic. There is a very clear shift from transitional themes to structural themes oriented towards a sustainable digital ecosystem.

By 2025, this arc attains fuller consolidation: motor realms dominion data-driven deliberations and digital epochs, conjoined by Industry 4.0 vanguardisms, blockchain embeddings, and innovation surges disruptors transmogrified into operational fulcrums (Kulzhambekova et al., 2023). Basic foundations, densely clustered, encompass transfigurative paradigms, digital stewardships, and ethical technologicalities, encircled by personnel modulations and competitive sinews that inseparable entwine human equities with governance imperatives (Dias & Tenera, 2023). Niche peripheries, housing capability

mediations, agility recompositions, and contextual idiosyncrasies (e.g., Malaysian vignettes), intimate a methodological maturation: inquiries transcend existential validations to probe implementational arcana, such as data sovereignties and ethical infusions. Declining motifs technostress vestiges, economic digitalities fade as digital praxis normalizes, their salience supplanted by optimized equilibria wherein analytics and governances predominate (Fernández-Pascual et al., 2024).

These bibliometric panoramas transcend descriptive inventories to argumentative indictments: digital leadership, as a meta-construct, demands not fragmented interventions but holistic orchestrations that interweave anthropic depths with technological breadths, educational heights with sustainable grounds. From VOSviewer's relational topographies to RStudio's thematic stratifications, the corpus evinces a maturational imperative pivoting from pandemic reactivities to data-sovereign proactions wherein stewardships emerge as quintessential integrators (Fernández-Pascual et al., 2024; Dias & Tenera, 2023). Organizations, aspiring to 2030 viabilities, must thus cultivate these quadripartite harmonies, positioning apex guides as bridges between volitional agencies and machinic symphonies. In this hybridized vista, transformations cease to be vicissitudes; they burgeon as renaissance harbingers, contingent on stewardships that honor not mere velocities but resonant, inclusive futures.

## CONCLUSION

This study shows that digital leadership is a critical factor in successful organizational transformation in the digital era. Through bibliometric analysis of 1,247 Scopus-indexed articles from 2000 to 2025 using VOSviewer and RStudio, the findings clearly show that digital leadership acts as the core of the global knowledge network, strongly linked to human-centric capabilities, technological mastery, sustainability orientation, educational enhancement, and dynamic organizational capabilities. Motor theme findings indicate that digital transformation and data-driven decision-making have developed into main drivers of business competitiveness. Meanwhile, emerging concepts such as ESG-driven leadership and inclusiveness in developing regions give fresh study opportunities. The dominance of publications from developed countries and limited longitudinal studies also show that theoretical and empirical development is still uneven, particularly in the public sector and rural innovation ecosystems. Therefore, the implications of this study encourage leaders to strategically integrate technological innovation with ethical governance and human empowerment to achieve sustainable transformation. Future research is recommended to deepen causal relationships through longitudinal designs, expand geographical scope to underrepresented regions, and strengthen practical models of digital leadership implementation, especially in SMEs, higher education institutions, and public sector organizations that face unique digital adoption challenges.

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