

Digital Leadership and Organizational Performance in the Industry 5.0 Era: A Bounded Integrative Synthesis and Propositions for the Mediating Role of Digital Transformation

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ABSTRACT

This article develops a bounded integrative synthesis of digital leadership, digital transformation and organizational performance in the Industry 5.0 context. It is explicitly conceptual rather than an empirical test. The evidence base combines five verifiable studies retained from the original manuscript with six supplementary foundational and peer-reviewed sources on Industry 5.0, digital transformation and digital-transformation leadership. Sources were appraised for topical relevance, methodological transparency and direct contribution to the proposed constructs. The thematic synthesis identifies recurring capability domains—strategic digital vision, technology/data competence, change and collaboration capability, and human-centric leadership—and explains how these may enable digital transformation through strategic alignment, capability development, process redesign and data-driven work. Digital transformation is consequently proposed as a plausible mechanism linking leadership capability to organizational outcomes. Four propositions are advanced for future empirical testing. No respondent-level data, original effect sizes, p-values or mediation statistics are reported. The contribution is a transparent, literature-derived conceptual framework, an indicative measurement architecture and an empirical validation protocol for subsequent research.

Keywords: Digital Leadership; Digital Transformation; Organizational Performance; Industry 5.0; Integrative Literature Synthesis; Conceptual Mediation

INTRODUCTION

Industry 5.0 complements the Industry 4.0 paradigm by emphasizing human-centricity, sustainability and resilience alongside advanced digital technologies. The European Commission frames Industry 5.0 around worker well-being, stakeholder value and resilient industrial systems, while prior scholarship similarly stresses human-machine collaboration and responsible technology use. In this setting, leadership is not merely a matter of adopting technology; it concerns aligning digital possibilities with strategy, workforce capability, organizational learning and responsible change (Breque, De Nul, & Petridis, 2021; Maddikunta et al., 2022; Nahavandi, 2019).

The original manuscript brought together digital leadership, transformation and performance, but it did not document a systematic search or provide respondent-level data. The present revision therefore adopts a bounded

integrative literature-synthesis design. It distinguishes literature-derived patterns from conceptual interpretation and from propositions that require future empirical testing. This positioning avoids treating thematic convergence as statistical evidence and avoids presenting illustrative figures from earlier drafts as original findings.

Research Problem

Organizations frequently invest in digital technologies without achieving equivalent improvements in organizational performance. One explanation is that technology adoption alone is insufficient: leadership must translate technological investment into redesigned processes, digital capabilities, employee adoption and strategic alignment. The unresolved research problem is therefore how digital leadership affects organizational performance and whether digital transformation constitutes the principal mechanism through which this effect occurs in the Industry 5.0 context.

Research Objectives

- RO1: To synthesize recurring digital-leadership capabilities discussed in the bounded evidence base for the Industry 5.0 context.
- RO2: To explain conceptually how digital leadership may facilitate digital transformation.
- RO3: To synthesize how digital transformation is associated in the reviewed literature with organizational performance outcomes.
- RO4: To develop a theoretically coherent proposition that digital transformation may mediate the digital leadership–organizational performance relationship.
- RO5: To specify an indicative measurement and statistical-analysis protocol for future empirical validation.

Research Questions

- RQ1: Which digital-leadership capabilities recur across the bounded literature relevant to Industry 5.0 and digital transformation?
- RQ2: How does digital leadership facilitate digital transformation?
- RQ3: How does digital transformation contribute to organizational performance?
- RQ4: How can the reviewed literature justify a future-testable mediation proposition without claiming statistical mediation?

Research Contribution

The study contributes a clearly delimited conceptual model rather than an empirical claim. It integrates leadership, transformation and performance while incorporating the human-centric orientation of Industry 5.0. It also makes the evidential boundaries explicit: thematic recurrence is treated as conceptual support, and causal or statistically significant effects are reserved for future empirical testing.

LITERATURE REVIEW

A. Industry 5.0 and Organizational Dynamics

Industry 5.0 places human well-being, sustainability and resilience alongside technological advancement. The European Commission's Industry 5.0 formulation and related academic work emphasize that technological value should be assessed together with human and organizational outcomes (Breque et al., 2021; Maddikunta et al.,

2022; Nahavandi, 2019). Accordingly, this article does not reproduce the earlier manuscript's illustrative impact scores as findings; those figures were not generated by an original dataset in the present study.

B. Digital Leadership

Digital leadership is treated here as a multidimensional organizational leadership capability involving strategic direction, technology and data literacy, change enablement, collaboration and people-oriented leadership. Weber, Krehl, and Büttgen (2022) show that technology-driven transformation requires leaders to enact multiple roles and behaviors, while Wang (2024), Merlano (2024), Gyamerah, Afshari, and Asante (2025), and Qiao, Li, and Hong (2024) provide complementary evidence on leadership competencies, transformation capability and employee outcomes. The synthesis therefore treats leadership dimensions as literature-derived categories, not as a validated scale created by this article.

C. Digital Transformation

Digital transformation is conceptualized as an organization-wide process through which digital technologies trigger strategic and structural changes in value creation, processes, capabilities and work practices. This interpretation is consistent with Vial (2019) and Verhoef et al. (2021), who distinguish transformation from isolated digitization. Leadership may enable transformation through strategic alignment, resource commitment, capability building, communication and support for experimentation.

D. Organizational Performance

Organizational performance is conceptualized as multidimensional. Within the bounded literature it includes operational effectiveness, agility and innovation, employee-related outcomes and achievement of strategic goals. Because the present article contains no organizational dataset, it does not estimate performance effects. Future empirical research should operationalize performance using validated multi-item measures appropriate to the study context.

E. Mediating Role of Digital Transformation

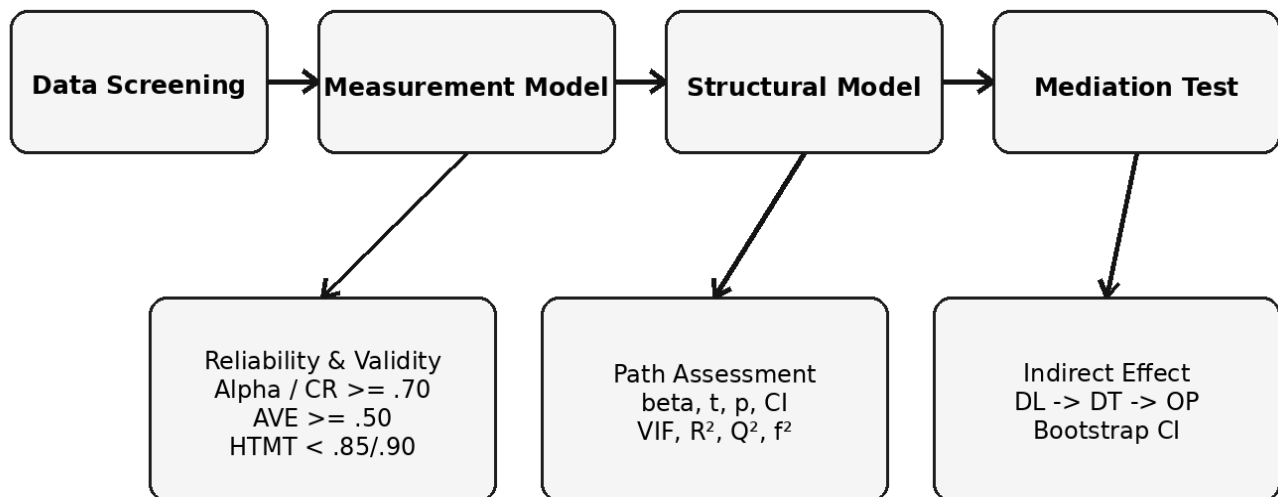
The proposed mediation logic is conceptual and sequential: digital leadership may provide direction, resources, behavioral support and learning conditions for transformation; transformation may then alter processes, information flows, capabilities and decision routines that are associated with organizational outcomes. Empirical studies such as Qiao et al. (2024), Hamzah (2025) and Gyamerah et al. (2025) provide context-specific evidence consistent with parts of this pathway, but the present synthesis does not statistically test the indirect effect.

F. Conceptual Framework and Propositions

The conceptual model proposes future-testable relationships among digital leadership, digital transformation and organizational performance. The statements below are propositions derived from the bounded synthesis; they are not statistically supported hypotheses in the present article.

Table 1. Literature-derived propositions for future empirical testing

Relationship	Proposition for future empirical testing
Digital Leadership → Digital Transformation	P1: Digital leadership is expected to be positively associated with digital transformation in future empirical testing.
Digital Leadership → Organizational Performance	P2: Digital leadership is expected to be positively associated with organizational performance in future empirical testing.
Digital Transformation → Organizational Performance	P3: Digital transformation is expected to be positively associated with organizational performance in future empirical testing.
DL → DT → OP	P4: Digital transformation is proposed as a mediator of the relationship between digital leadership and organizational performance; this indirect effect requires empirical testing.



Recommended SEM analysis sequence for empirical validation

Figure 1. Mediation Model Linking Digital Leadership, Digital Transformation And Organizational Performance.

METHODOLOGY

A. Research Design and Review Positioning

This article uses a bounded integrative literature-synthesis design. It is not presented as a systematic review, meta-analysis or empirical survey study. The purpose is theory development: to clarify constructs, synthesize recurring mechanisms and formulate propositions for subsequent testing. The bounded design is appropriate because the original manuscript supplied a small preselected evidence set without a reproducible database-search record; the revision therefore makes this limitation explicit rather than retroactively claiming PRISMA-style coverage.

B. Evidence Identification, Supplementation and Unit of Analysis

The unit of analysis is the published source. The eight references in the original manuscript were first treated as an inherited candidate set rather than as a systematically selected sample. Bibliographic verification found sufficient publication details for five of those sources (Gyamerah et al., 2025; Hamzah, 2025; Merlano, 2024; Qiao et al., 2024; Wang, 2024). To strengthen conceptual coverage, six supplementary anchor sources were added because they directly address Industry 5.0, digital transformation or digital-transformation leadership (Breque et al., 2021; Maddikunta et al., 2022; Nahavandi, 2019; Vial, 2019; Verhoef et al., 2021; Weber et al., 2022). The resulting bounded corpus comprises 11 verifiable sources. This supplementation improves theoretical grounding but does not convert the study into a comprehensive systematic review.

C. Eligibility, Verification and Quality Appraisal

Sources were included when they (i) addressed at least one focal construct—digital leadership, digital transformation, organizational performance or Industry 5.0; (ii) provided sufficient bibliographic information for source verification; and (iii) offered conceptual, review-based or empirical content relevant to the proposed relationships. Sources with incomplete or unverifiable bibliographic information were not used as evidential anchors in the revised synthesis. Quality appraisal was fit-for-purpose rather than numerical: each source was examined for publication traceability, clarity of research design, relevance to the focal constructs and the degree to which its conclusions were supported by the reported method. Conceptual and review sources were used

primarily for construct definition and theory building; empirical studies were used only for context-specific relational evidence.

D. Thematic Coding and Synthesis Procedure

A structured coding matrix was used with five fields: (1) digital-leadership capability, (2) transformation mechanism, (3) human/organizational mechanism, (4) organizational outcome, and (5) Industry 5.0 implication. First-cycle coding captured source terminology; second-cycle coding grouped conceptually similar codes into higher-order themes. A theme was described as recurring only when it appeared across more than one source. Differences in context, method and construct labels were retained in interpretation rather than treated as statistical heterogeneity. The synthesis therefore reports patterns of conceptual convergence, not pooled effects or significance tests.

E. Thematic Interpretation

The coded evidence was compared across sources to identify convergence and boundary conditions. Recurring concepts were consolidated into higher-order themes and mapped to the proposed mediation framework. Because the corpus contains conceptual, review and empirical studies with different designs, convergence is interpreted as literature-based plausibility rather than statistical significance or causal proof.

F. Proposed Empirical Population and Sampling

For future empirical testing, the target population may comprise managers, supervisors and professional employees working in organizations undertaking substantive digital-transformation initiatives. The sampling frame should be defined for the chosen country and industry before data collection. Sample size should be determined through an a priori statistical power analysis based on the intended SEM model, anticipated effect size, significance level and desired power; a generic respondent range should not substitute for power analysis.

G. Indicative Measurement Framework for Future Testing

The measurement framework below is indicative, not validated by this conceptual study. Future researchers should adapt items from established peer-reviewed scales, including validated digital-transformation leadership measures where contextually appropriate (e.g., Weber et al., 2022), and document content validity, translation procedures if relevant, pilot testing and construct validation before structural testing.

H. Proposed Data Analysis for Future Empirical Testing

Table 2. Constructs and indicative measurement structure

Construct	Indicative Dimensions	Illustrative measurement focus (not validated in this study)
Digital Leadership	Digital vision; digital competence; change leadership; collaboration; ethical/human-centric leadership	Leader communicates digital direction, uses data/technology strategically, supports experimentation and develops people.
Digital Transformation	Technology integration; process digitalization; digital capability; data-driven operations	Extent to which digital technologies are embedded in processes, decisions and business models.
Organizational Performance	Operational efficiency; agility/innovation; employee-related outcomes; overall performance	Improvement in responsiveness, productivity, innovation and achievement of organizational goals.

The empirical phase can be analyzed using SPSS together with AMOS, SmartPLS or another SEM package. Analysis should proceed through data screening and missing-value assessment; respondent demographics; descriptive statistics; common-method-bias diagnostics; internal consistency reliability; convergent and discriminant validity; measurement-model assessment; structural-model testing; and bootstrapped mediation analysis. If covariance-based SEM is used, model fit should be reported using indices such as CFI, TLI, RMSEA

and SRMR. If PLS-SEM is used, reliability, AVE, HTMT, VIF, R-squared, Q-squared, effect sizes and bootstrapped path estimates should be reported.

Ethical Considerations for the Future Empirical Phase

For future respondent-based research, institutional ethics approval should be obtained where required; informed consent, voluntary participation, confidentiality and secure data management should be documented. No respondent-level data were collected or analyzed in the present conceptual synthesis.

Assessment	Statistic	Recommended Criterion	Interpretation
Indicator reliability	Standardized loading	Preferably $\geq .708$; lower items may be retained with theoretical justification	Shows how strongly each indicator represents its construct.
Internal consistency	Cronbach alpha / Composite Reliability	$\geq .70$	Indicates consistency of construct measurement.
Convergent validity	Average Variance Extracted (AVE)	$\geq .50$	Construct explains at least half of indicator variance on average.
Discriminant validity	HTMT	$< .85$ (strict) or $< .90$ (lenient)	Confirms empirical distinction among DL, DT and OP.
Collinearity	VIF	Preferably < 3.3 ; commonly < 5	Checks problematic predictor overlap.

THEMATIC SYNTHESIS FINDINGS

A. Evidence Profile and Boundaries

The revised bounded corpus contains 11 verifiable sources spanning Industry 5.0 framing, digital-transformation theory, digital-transformation leadership and empirical studies of leadership-related transformation outcomes. The evidence is heterogeneous in design and context. It is adequate for conceptual synthesis and proposition development, but it is not a probability sample of the literature and cannot establish population-level effect sizes, statistical significance or causal mediation.

Table 4. Profile of the bounded evidence base

RESULTS / FINDINGS

A. Evidence Profile

The synthesis indicates that digital leadership is multidimensional rather than equivalent to technical expertise. Across the reviewed literature, recurring themes include strategic digital direction, technology/data competence, change enablement, collaboration/networking, employee development and human-centric or ethical judgment. Because these categories are synthesized from heterogeneous sources, they should be interpreted as recurring capability domains rather than as a definitive or exhaustive competency taxonomy.

Table 4. Profile of the eight-source evidence base

Source	Primary Focus	Contribution to Model
Breque, De Nul & Petridis (2021)	Industry 5.0: human-centricity, sustainability and resilience	Provides Industry 5.0 normative framing
Maddikunta et al. (2022)	Industry 5.0 enabling technologies and applications	Supports Industry 5.0 technological and human-collaboration context
Nahavandi (2019)	Human-centric Industry 5.0	Supports human-machine collaboration and human-centric framing

Vial (2019)	Digital transformation review and framework	Provides process-oriented definition of digital transformation
Verhoef et al. (2021)	Digital transformation stages, capabilities and outcomes	Supports capability/process view and performance implications
Weber, Krehl & Büttgen (2022)	Digital transformation leadership roles and validated scale	Strengthens theoretical and measurement grounding for digital leadership
Wang (2024)	Executive digital leadership	Supports leadership competency development
Merlano (2024)	Digital leadership and transformation review	Supports leadership as an enabler of transformation
Qiao, Li & Hong (2024)	Digital leadership, transformation and employee outcomes	Provides empirical evidence consistent with mediation-related mechanisms
Gyamerah, Afshari & Asante (2025)	Leadership, digital capabilities and strategy in SMEs	Provides empirical evidence on leadership, capabilities and transformation
Hamzah (2025)	Digital leadership, transformation and organizational performance	Provides context-specific empirical evidence consistent with proposed mediation logic

Across the bounded corpus, leadership is commonly positioned as an enabling condition for transformation through strategic alignment, resource commitment, communication, capability development, empowerment and support for experimentation. This pattern provides conceptual support for Proposition 1; it does not demonstrate a statistically significant path in the present study.

B. Digital Leadership Is a Multidimensional Capability

The reviewed literature associates digital transformation with changes in processes, data use, technology integration, organizational capabilities, innovation and employee outcomes. The earlier manuscript's illustrative percentages are omitted from the revised findings because they are not original empirical results generated by this study. The synthesis supports a conceptual expectation that transformation can contribute to organizational outcomes, while the magnitude and significance of that relationship remain empirical questions.

C. Leadership Enables Transformation Through Alignment and Capability Building

Several sources are consistent with a sequential pathway in which leadership enables transformation and transformation is associated with organizational or employee outcomes. This makes digital transformation a theoretically plausible mediator. However, Proposition 4 remains untested in the present article; statistical mediation can only be evaluated using respondent-level data and an indirect-effect procedure such as bootstrapping.

D. Digital Transformation Provides the Operational Mechanism for Performance Improvement

The third finding is that transformation changes the way organizational work is executed. The source manuscript associates transformation with efficiency, employee engagement, improved decision-making, cloud and digital technology adoption and overall performance. The illustrative chart in the source manuscript reports improvements of 25% in efficiency, 30% in employee engagement, 20% in decision-making, 90% adoption of cloud technologies and 35% overall organizational performance improvement. These values are retained only as illustrative figures from the source document and are not presented as statistically validated findings of this study. The thematic evidence nevertheless supports H3 at the conceptual level.

E. Digital Transformation Is a Plausible Mediating Mechanism

Across the reviewed sources, digital leadership is repeatedly associated with stronger transformation capability, while transformation is associated with improved strategic, employee and operational outcomes. The pattern supports the proposed indirect pathway Digital Leadership → Digital Transformation → Organizational

Performance. However, H4 remains a hypothesis until an empirical sample is analyzed with a bootstrapped indirect-effect test.

The synthesis suggests a mechanism-based interpretation of digital leadership: leadership may create value when strategic direction and people-oriented behaviors are translated into organizational transformation. This interpretation is consistent with digital-transformation scholarship that emphasizes changes in capabilities, structures, processes and value creation rather than technology adoption alone (Vial, 2019; Verhoef et al., 2021). Because the evidence base is bounded and heterogeneous, the discussion is intentionally framed in terms of conceptual plausibility rather than universal effects.

The Industry 5.0 lens broadens the performance discussion beyond productivity by foregrounding human-centricity, resilience and sustainability (Breque et al., 2021; Maddikunta et al., 2022). The proposed framework therefore treats employee-related and responsible-technology outcomes as relevant complements to operational and innovation outcomes. Future empirical work should specify which performance dimensions are being tested rather than combine them into an undefined global construct.

Research Question	Synthesis Finding
RQ1	Within the bounded corpus, recurring domains include strategic digital vision, technology/data competence, change enablement, collaboration and human-centric leadership; these are not claimed to be exhaustive.
RQ2	Digital leadership facilitates transformation through strategic alignment, resource commitment, employee capability development, communication and change sponsorship.
RQ3	Digital transformation contributes through process redesign, data-driven decisions, technology integration, agility and innovation.
RQ4	The literature provides conceptual and context-specific empirical support for a mediation mechanism, but the present study does not test statistical mediation.

The proposed model connects digital-leadership research with process-oriented accounts of digital transformation. Its theoretical contribution is not the assertion of a proven mediation effect, but the specification of a mechanism that can be falsified empirically. Future studies can strengthen this model by grounding digital leadership in validated leadership-role frameworks and by testing boundary conditions such as digital readiness, organizational culture, environmental dynamism, industry and firm size.

The findings reposition digital leadership as an organizational capability that produces value when it is converted into transformation activity. This distinction is important because leadership rhetoric or technological enthusiasm alone does not guarantee performance. The mediator explains why two organizations with similarly ambitious leaders may achieve different outcomes: the organization that institutionalizes digital processes, capabilities and data-driven routines is more likely to translate leadership into measurable performance.

For practice, the synthesis points to a balanced capability agenda: leaders may need strategic digital direction, technology/data literacy, change and collaboration capability, and human-centric judgment. These implications should be read as literature-informed guidance rather than as effect estimates from the present study. Organizations evaluating transformation should connect technology deployment indicators with process, employee and strategic outcomes.

Limitations And Future Research

The principal limitation is the bounded and non-systematic nature of the evidence base. The original references were preselected and lacked a documented search trail; the present revision improves transparency and bibliographic verification and adds foundational anchor sources, but it does not claim exhaustive coverage of Scopus, Web of Science or other databases. The corpus is also heterogeneous in method, sector and geography. Consequently, terms such as 'recurring' and 'prominent' refer only to patterns within this bounded synthesis and should not be interpreted as prevalence estimates for the wider literature. No raw respondent data were analyzed,

so reliability coefficients, factor loadings, path coefficients, R-squared values, p-values and mediation confidence intervals cannot be reported as findings.

Future research should conduct a preregistered or protocol-driven systematic review using explicit database strings, date ranges, duplicate removal, inclusion/exclusion screening and a formal quality-assessment tool. Empirical testing should then use validated measures, an a priori power analysis and an appropriate SEM approach. Longitudinal designs would be particularly valuable because transformation unfolds over time, while multi-group analysis could assess whether proposed relationships vary by country, industry, organizational size, digital maturity or managerial level.

Table 6. Propositions and recommended tests for a future empirical study

Proposition	Proposed Relationship	Recommended Test	Decision Rule for Future Empirical Study
P1	DL → DT (positive)	SEM direct path: $\beta_{DL \rightarrow DT}$	Evaluate after measurement validation; support would require a positive path and a confidence interval excluding zero.
P2	DL → OP (positive)	SEM direct path: $\beta_{DL \rightarrow OP}$	Evaluate after measurement validation; support would require a positive path and a confidence interval excluding zero.
P3	DT → OP (positive)	SEM direct path: $\beta_{DT \rightarrow OP}$	Evaluate after measurement validation; support would require a positive path and a confidence interval excluding zero.
P4	DL → DT → OP (mediation)	Bootstrapped indirect effect	Evaluate the bootstrapped indirect effect; mediation evidence requires an indirect-effect confidence interval excluding zero.

CONCLUSION

This bounded integrative synthesis develops a future-testable framework linking digital leadership, digital transformation and organizational performance in the Industry 5.0 context. The reviewed literature suggests recurring leadership capability domains and provides a theoretically coherent explanation for how transformation may translate leadership inputs into organizational outcomes. The article does not claim statistically significant direct or mediated effects. Its contribution is instead a transparent conceptual model, a clearly delimited evidence base, literature-derived propositions and an empirical protocol that can be tested with adequately powered respondent-level data.

A longitudinal design would be particularly valuable because digital transformation unfolds over time. Multi-group analysis could also test whether the mediation pathway differs by organization size, industry, country, digital maturity or managerial level.

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