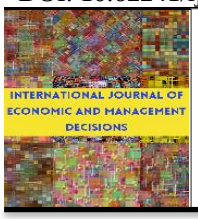
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Digital transformation and strategic value creation through organizational capability institutional governance and ecosystem participation

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ABSTRACT

Digital transformation produces uneven organizational outcomes because technological investment interacts with capabilities, governance arrangements, and ecosystem relationships. This study develops an integrated framework explaining these relationships through dynamic capability theory, the resource-based view, institutional theory, organizational ambidexterity, and digital ecosystem perspectives. The research design combines bibliometric analysis, a longitudinal enterprise panel, executive surveys, structural equation modeling, and interviews. The supplied study reports 2,347 publications, 612 publicly listed enterprises across 28 countries, 7,344 firm-year observations within a stated 2012–2025 window, 1,412 valid executive questionnaires, and 36 interviews. Reported estimates associate digital transformation capability with strategic performance, organizational innovation, operational responsiveness, and competitiveness. Organizational adaptability provides a proposed transmission mechanism, while governance quality and ecosystem participation help explain differences in transformation outcomes. Survey responses also indicate a gap between recognizing transformation as strategically important and integrating it into organizational culture. The findings support an interpretation of digital transformation as coordinated organizational renewal rather than technology acquisition alone. However, the available manuscript does not provide the underlying datasets, estimation outputs, complete measurement instruments, or sufficient information to resolve inconsistencies in panel coverage and construct labeling. Accordingly, the numerical findings are presented as reported evidence rather than independently verified causal estimates. The framework contributes a clearer account of resource complementarity, institutional embeddedness, and interorganizational value creation. Its managerial implications emphasize capability development, accountable governance, and deliberate ecosystem participation, while its research implications concern transparent measurement, stronger identification, and reproducible comparative analysis.

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1. INTRODUCTION

Digital transformation changes how organizations coordinate activities, interpret information, and create value. Artificial intelligence, cloud services, connected devices, analytics, and digital platforms expand the range of decisions that firms can support with data and the range of relationships they can organize through shared infrastructures. Their strategic significance extends beyond faster processing. A digital service may change the customer relationship, move responsibility between departments, require new expertise, and expose the organization to a different set of partners. Understanding these consequences requires attention to the organization implementing the technology and to the institutional environment in which implementation occurs. This broader perspective provides the starting point for the present study.

The distinction between digitization, digitalization, and transformation is useful for establishing scope. Digitization concerns converting information into digital form. Digitalization concerns using digital technologies to improve or reorganize activities. Transformation involves more extensive changes in organizational arrangements, strategic priorities, business models, or relationships with stakeholders. These processes can occur together, but they do not necessarily produce equivalent outcomes. An enterprise can acquire advanced software while preserving decision routines that prevent useful experimentation. Another can use comparatively familiar technologies to reorganize its services and responsibilities more effectively. The organizational consequences of adoption therefore require explanation rather than being assumed from the presence of technology [1], [2].

This distinction matters because digital expenditure provides an incomplete indicator of strategic progress. Expenditure records resources committed, whereas transformation concerns what an organization becomes capable of doing. Financial performance may also respond slowly to changes in capability. Training, systems integration, and experimentation can create immediate costs before producing observable benefits. Conversely, temporary productivity gains may conceal dependence on a supplier, declining employee discretion, or weak control over organizational data. An adequate account of transformation should distinguish investment, implementation, capability formation, and value realization. Treating these as separate analytical stages makes it possible to examine why firms with similar technological resources report different outcomes.

Strategic management research offers several explanations for this variation. The resource-based view directs attention to the combinations of resources that distinguish organizations and support advantage. Dynamic capability theory examines the ability to reconfigure those combinations when conditions change. Organizational ambidexterity explains the difficulty of preserving reliable operations while experimenting with unfamiliar opportunities. Institutional theory identifies how rules, legitimacy, and governance conditions influence organizational action. Digital ecosystem research adds relationships that extend beyond the boundaries of the firm. These perspectives address related problems, but they operate at different levels and emphasize different mechanisms. Their integration requires more than assembling a list of relevant concepts [4], [5], [6], [8].

The central argument developed here is that digital transformation contributes to strategic value when technological resources are converted into usable organizational capabilities under governance arrangements that support reliable cooperation. Learning and adaptability influence whether technologies become embedded in everyday practices. Governance shapes how responsibilities, risks, and access rights are defined. Ecosystem participation affects access to complementary resources and the distribution of value between partners. These relationships are mutually reinforcing, but they may also generate tensions. Greater connectivity can increase learning opportunities while increasing dependence on a platform. Faster automated decisions can improve responsiveness while making responsibility harder to establish. Such tensions are part of transformation itself.

Institutional governance deserves particular attention because transformation changes the information and decisions for which organizations must account. Automated recommendations may influence lending, recruitment, pricing, or operational priorities. Data may cross organizational boundaries, and service continuity may depend on external infrastructures. In these settings, governance is relevant to operational feasibility as well as organizational legitimacy. Clear responsibilities and credible controls can support collaboration, while uncertainty over data use or accountability can discourage participation. Nevertheless, national institutional quality and internal governance capability should not be treated as interchangeable. The former describes the environment surrounding firms; the latter describes arrangements firms can develop and manage within that environment.

Ecosystem participation introduces another source of variation. Organizations can obtain software, expertise, market access, and shared operational information through partners rather than producing these resources internally. Participation can therefore broaden the possibilities available to a firm. Yet network access does not establish the ability to absorb knowledge, coordinate activities, or negotiate favorable conditions. A firm may join several platforms without integrating the resulting information into decisions. Alternatively, extensive participation may create switching costs that narrow future choices. The framework consequently treats ecosystem participation as a relational capability whose strategic contribution depends on organizational learning and the governance of interdependence [14], [15], [40].

The study addresses how these organizational, institutional, and relational mechanisms jointly explain transformation outcomes. Its guiding questions concern how technological capability becomes organizational adaptability, how governance conditions support or constrain that process, and how ecosystem participation contributes to strategic value. The analysis also considers whether the same interpretation applies across industries

with different operating requirements. These questions deliberately distinguish mechanisms from outcomes. Innovation, resilience, and competitiveness are not assumed to be equivalent manifestations of a single benefit. They represent related but distinguishable organizational consequences that require clear measures and appropriate observation periods.

The supplied research combines several sources of evidence. Bibliometric analysis is used to organize the intellectual structure of the field. Enterprise panel data provide an intended longitudinal perspective, while executive questionnaires address capabilities and governance arrangements that are difficult to observe in financial databases. Interviews offer contextual explanations of implementation and coordination. Structural equation modeling examines the relationships between measured constructs. The value of this combination depends on how the components are linked, rather than on their number. Each source must address a defined question and retain a traceable relationship to the claims it is used to support.

The contribution of the paper is therefore an integrated explanation of transformation rather than a claim that every component is theoretically new. It clarifies the complementarity between digital resources and organizational capabilities, distinguishes internal governance from institutional context, and treats ecosystem participation as both an opportunity and a source of dependence. It also reassesses the strength of the available evidence. The original draft presents numerous statistically significant findings but provides incomplete documentation for reconstructing the analyses. This revision retains those reported values while separating empirical description from theoretical interpretation. That distinction permits substantive discussion without overstating what the supplied materials establish.

The framework also gives the study a defined boundary. Its focus is enterprise transformation and strategic outcomes, rather than an assessment of every societal consequence of digitalization. Employee experiences, customer interests, and public responsibilities remain relevant where they affect implementation, legitimacy, and value distribution. Maintaining this boundary allows the paper to connect multiple disciplines without presenting organizational performance as a complete measure of social progress.

2. LITERATURE REVIEW

Digital transformation scholarship examines changes that connect technology, organizational activity, and strategic direction. Vial's review provides a foundation for understanding the phenomenon as a process in which digital technologies prompt responses that alter value creation [1]. The multidisciplinary perspective associated with Verhoef and colleagues similarly brings organizational and strategic questions into the analysis [2]. These approaches support a definition that extends beyond installing digital systems. However, a broad definition also creates a measurement challenge. If transformation includes every desirable organizational characteristic, its association with performance becomes difficult to interpret. Clear boundaries between technological deployment, capability development, and realized outcomes are therefore essential to theoretical progress.

Digital business strategy further complicates a simple division between technology and strategy. Digital resources can influence products, customer access, coordination costs, and competitive boundaries, which means that technology decisions may shape the scope and direction of the business itself [3]. A service platform, for example, can change which customers a firm reaches and which activities it performs internally. The relevant analytical question is how the organization coordinates these changes. Strategic alignment should consequently refer to an observable relationship between digital initiatives and organizational priorities. It should not simply describe an executive's general belief that digital transformation is important, because that belief may coexist with fragmented implementation.

The resource-based view explains why similar investments need not produce similar outcomes. Barney's account of sustained advantage directs attention to resources whose value depends on their characteristics and organizational embedding [5]. Many digital technologies can be purchased by competitors, making acquisition alone an insufficient explanation for persistent differences. Their contribution depends on complementary knowledge, routines, data quality, coordination, and the ability to use them in a particular setting. Information systems research extends this reasoning by considering how technological capability interacts with organizational resources [12], [36]. The resulting implication is conditional: a resource can support value creation when the organization possesses the complementary arrangements needed to use it effectively.

Complementarity also implies that deficiencies cannot always be corrected through additional expenditure in the same category. More computing capacity will not resolve disagreement about data ownership. More analytic models may not improve decisions if managers lack incentives to use their outputs. Similarly, training alone may have limited effect when systems prevent employees from accessing relevant information. Theoretical accounts of digital capability should therefore specify the relationships between components. Capability is not adequately represented by an inventory of technologies or a count of projects. It concerns the

coordinated ability to accomplish an organizational task. This distinction provides a basis for separating infrastructure maturity from the adaptive routines examined as potential mediators.

Dynamic capability theory addresses the renewal of such resource combinations. Teece, Pisano, and Shuen conceptualize dynamic capabilities around integrating, building, and reconfiguring competencies as environments change [4]. Applied to digital transformation, this perspective explains why established arrangements may need repeated adjustment. A firm may initially implement analytics to improve forecasting, then discover that the resulting information changes purchasing responsibilities or customer service procedures. Subsequent adjustment can require new coordination rather than another technology. Warner and Wäger's work on digital transformation places continuing strategic renewal at the center of this process [9]. The important theoretical distinction is between performing an existing activity efficiently and changing how activities are organized.

Organizational learning connects digital information with the possibility of renewal. New data do not interpret themselves. Employees and managers must assess reliability, relate findings to operational knowledge, and decide whether established practices should change. Learning also depends on the ability to examine unsuccessful experiments without concealing them. An organization that rewards only immediate improvements may discourage the exploration needed to discover useful applications. Digital transformation can expand access to information while leaving these constraints intact. The proposed framework therefore treats learning as a capability through which technological possibilities become usable organizational knowledge. Its expected contribution concerns the quality of adaptation, rather than a general preference for more data.

Leadership shapes the conditions under which learning and coordination occur. A digital vision can help establish priorities, but the more consequential task is allocating authority and resolving conflicts between functions. Information technology teams may prioritize standardization, operating units may request local flexibility, and compliance functions may seek tighter controls. Leadership capability involves coordinating these requirements while keeping the purpose of transformation visible. Change management literature provides a related account of mobilizing participation and sustaining organizational adjustment [22]. In the present framework, leadership is relevant because it influences the routines and incentives through which transformation is implemented. It should not become an all-purpose explanation for any favorable result.

Organizational ambidexterity explains a related coordination problem. Exploration involves experimentation with uncertain opportunities, while exploitation concerns improving established activities. Research on ambidexterity examines how organizations manage their coexistence [7], [8]. Digital transformation can intensify this tension because a firm must maintain dependable services while testing unfamiliar systems. Allocating all resources to experimentation can undermine continuity, whereas concentrating exclusively on existing operations can preserve arrangements that no longer meet emerging demands. The implication is not that every firm requires the same balance. Appropriate arrangements depend on the costs of failure, the pace of change, and the extent to which exploratory work can be connected to operational learning.

Institutional theory introduces influences that cannot be reduced to internal resources. Organizations act within regulatory, normative, and professional environments that shape acceptable behavior and access to cooperation [6]. North's institutional perspective also emphasizes the rules that structure economic interaction [38]. For digital transformation, institutional conditions affect data exchange, contractual confidence, reporting responsibilities, and the legitimacy of automated decisions. Predictable rules can reduce uncertainty even when compliance imposes costs. Conversely, inconsistent requirements may complicate coordination across jurisdictions. Institutional quality should therefore be analyzed through particular mechanisms rather than treated as a general indicator that explains every cross-country difference in performance.

Internal governance translates obligations and organizational priorities into decision rights, controls, and accountability arrangements. These arrangements include responsibility for data access, security incidents, model approval, vendor relationships, and performance review. Their influence may be direct when they improve coordination, or conditional when they change how effectively technological resources are used. These are different propositions. A positive association between governance and transformation success demonstrates neither a statistical interaction nor a moderating effect by itself. Establishing moderation requires evidence that the relationship between transformation and an outcome changes across governance conditions. This distinction becomes important when interpreting the results reported in the supplied manuscript.

Cybersecurity provides a specific connection between governance and ecosystem participation. Shared infrastructures can increase exposure to failures that originate outside the organization. Security capability may reduce the perceived risks of participation by establishing access controls, recovery arrangements, and procedures for responding to incidents. It can also support trust between partners. Nevertheless, an association between security maturity and participation may reflect reverse selection: larger or more digitally connected organizations may invest more heavily in security. The framework consequently treats cybersecurity as a plausible enabling condition while retaining the need for temporal evidence. A technologically connected organization is not automatically resilient, particularly when several services depend on the same external provider.

Digital ecosystems extend analysis beyond resource ownership. Platform research describes arrangements in which multiple actors coordinate through shared technological and commercial infrastructures [14], [15]. Participants can benefit from access to complementary innovations, customers, and information. Digital innovation research also emphasizes the changing boundaries of products and contributions in such settings [16], [40]. However, participation does not guarantee that value is distributed evenly. Platform owners may control access conditions, visibility, and interface changes. A firm's strategic position therefore depends on the resources it contributes, the alternatives available to it, and its ability to coordinate with other actors. These considerations connect ecosystem analysis with organizational capability and governance.

Open innovation provides a related explanation of learning across boundaries. Chesbrough's account emphasizes the use of knowledge originating outside the firm and the movement of ideas through alternative commercialization arrangements [17]. Digital infrastructures can make such exchange easier, but they also increase the importance of evaluating information quality and protecting relevant rights. Partner information must be interpreted in relation to internal processes before it improves decisions. The framework thus connects ecosystem participation to learning and adaptability rather than assuming a direct, uniform performance effect. This interpretation allows collaboration to be beneficial while acknowledging that the same relationship can create coordination costs and dependence.

Artificial intelligence adds a distinctive set of organizational questions. Systems that produce predictions or recommendations can alter the distribution of expertise and discretion within a firm. Their value depends on the suitability of the task, the quality of the underlying data, and the arrangements for evaluating outputs. Work on organizations in the age of AI draws attention to the strategic implications of combining algorithms and networks [13]. At the same time, scholarship on opacity and surveillance raises questions about who can understand, challenge, or contest decisions [19], [20]. These concerns are relevant to transformation because trust and accountability influence whether people use systems and whether partners accept their outputs.

Strategic value creation must also be defined more carefully than a general statement of improvement. Cost efficiency, innovation, resilience, and competitiveness describe different outcomes. An organization can improve one while weakening another. Standardization may lower costs while reducing local responsiveness; greater automation may improve throughput while increasing the consequences of a system failure. Long-term value therefore requires evidence over a suitable period and attention to tradeoffs. Strategy research helps situate these outcomes in relation to competitive position and the activities through which value is created [21], [37]. In this study, strategic value is treated as an organizing concept whose component measures require separate interpretation.

These perspectives yield an integrated expectation that digital resources contribute to strategic outcomes through organizational capabilities and relationships shaped by governance. Transformation capability is expected to be positively associated with innovation and strategic performance. Learning and adaptability provide potential transmission mechanisms because they connect information and technology to revised practices. Governance is expected to support trust and participation, although conditional effects require explicit interaction tests. Ecosystem participation should broaden access to complementary resources while introducing dependence that can constrain value capture. These propositions define the framework's explanatory structure. Their empirical support must be judged by the measures and estimates actually reported, rather than by treating theoretical consistency as equivalent to confirmation.

The relationship between organizational autonomy and shared standards adds a further dimension to theoretical integration. Common interfaces can make collaboration possible by reducing the effort required to exchange information. They may also restrict local choices and concentrate influence among actors that define the standards. This means that the same institutional arrangement can support coordination while constraining experimentation. An integrated explanation should identify who establishes the rules, which participants can revise them, and how disagreement is resolved. Such questions connect institutional legitimacy with resource dependence without assuming that cooperation removes differences in power. They also make governance observable through decisions and responsibilities rather than treating it as an abstract favorable environment.

Time is another important theoretical dimension. Capability development can precede measurable returns, and an organization may experience disruption while replacing established routines. Conversely, benefits observed soon after implementation may diminish when competitors adopt similar systems. A theory of strategic value must therefore specify whether it concerns immediate efficiency, intermediate capability formation, or persistent competitive differences. These horizons may require different measures and explanations. The framework developed here emphasizes their connection, but it does not presume that improvement at one horizon guarantees improvement at another. This temporal distinction helps prevent short-term implementation success from being interpreted as durable organizational advantage.

3. METHODS

The study uses a mixed-methods design combining a bibliometric component, enterprise panel analysis, executive questionnaires, and qualitative interviews. The components address different levels of the research problem. Bibliometric analysis concerns how the field organizes knowledge. Panel analysis concerns changes and differences in enterprise outcomes. Questionnaire data address capabilities and governance arrangements, while interviews provide accounts of implementation and interorganizational coordination. This combination is compatible with mixed-methods research when the relationship between components is explicit [25]. In the supplied materials, their sequencing is described, but the complete integration protocol is unavailable. The present account therefore distinguishes procedures reported in the draft from analytical details that still require documentation.

The bibliometric component covers literature dated from 2010 to 2025 and identifies Scopus and Web of Science as the databases searched. Search concepts include digital transformation, organizational capability, governance, ecosystems, strategic value creation, artificial intelligence capability, innovation, and adaptability. The draft reports 4,286 initial records and 2,347 retained articles following exclusions. It also states that the retained corpus consists of English-language journal articles from Q1 and Q2 journals. This restriction defines the corpus rather than establishing that all relevant research has been captured. The resulting map should be interpreted as a view of a selected publication segment, with possible language, disciplinary, and publication-status biases.

The manuscript identifies VOSviewer and Bibliometrix as the tools used for co-citation, keyword co-occurrence, thematic clustering, and conceptual mapping [24]. However, it does not provide full search strings, search dates, database export files, deduplication rules, or journal-quartile reference years. Nor does it report counting methods, keyword thresholds, normalization choices, thesaurus files, or clustering parameters. These omissions prevent an independent reconstruction of the reported map. Accordingly, the bibliometric component is used to contextualize the framework, while claims about the precise structure or completeness of the research field remain provisional. No additional publications, clusters, or citation counts have been generated for this revision.

The enterprise component reportedly includes 612 publicly listed firms across 28 countries and six identified industry groups. The source describes the observation window as 2012–2025 and reports 7,344 firm-year observations. These figures do not establish a balanced panel over that interval. The inclusive calendar window contains fourteen years, whereas the reported observations correspond to twelve observations per firm on average. The source does not identify which years or firms are missing, whether variables use different observation windows, or whether the discrepancy is a reporting error. This revision retains the supplied observation count and period while treating the balance and coverage of the panel as unresolved.

Financial and operational information is attributed to Bloomberg, Thomson Reuters Eikon, Compustat, annual reports, sustainability disclosures, and governance databases. The reported eligibility criteria require continuous financial reporting, evidence of transformation activity, and sufficient governance and innovation disclosures. These criteria may increase data completeness but can also select comparatively visible and digitally active firms. They therefore limit generalization to firms with weaker reporting capacity or little observable transformation. The source does not provide a country roster, enterprise identifiers, database fields, or a record of matching across sources. These materials are necessary to determine sample composition, identify duplicates, and reproduce the construction of firm-year variables.

Digital transformation capability is described through artificial intelligence integration, infrastructure maturity, cloud integration, ecosystem connectivity, digital innovation, and strategic alignment. The draft indicates that objective measures and executive perceptions both contribute to its operationalization. Objective examples include digital investment, patents, implementation activity, and platform participation. Survey measures use five-point scales. These information types should remain distinguishable unless a documented aggregation procedure combines them. The available text does not specify weighting, normalization, missing-item rules, or whether the descriptive scores refer to respondents, firms, or pooled observations. The results therefore retain the reported scale values without assuming that they are identical to the longitudinal indicators.

Organizational capability encompasses learning, leadership, adaptation, innovation flexibility, and ambidexterity. These dimensions require separation from the predictor because the source also includes adaptability and innovation within some descriptions of transformation. Using the same content to define a predictor, mediator, and outcome could create an association partly through measurement overlap. The conceptual framework treats technological deployment and integration as transformation inputs, organizational routines as potential mechanisms, and realized performance as outcomes. This distinction is an analytical clarification rather than a claim that the original instruments already implement it. The item wording and measurement model are needed to evaluate whether the empirical variables meet these boundaries.

Governance is described through transparency, cybersecurity readiness, ethics policies, regulatory compliance, and trust. The framework distinguishes organizational governance from country-level institutional quality, although the source sometimes combines them. Country-level measures describe contextual conditions shared by firms, while internal measures describe differences between organizations. Appropriate analysis must account for this nesting and avoid inferring a national effect from individual perceptions. Similarly, strategic value creation includes both financial and nonfinancial consequences. The available manuscript does not specify the

calculation of its performance index or explain how it differs from organizational competitiveness. These unresolved definitions constrain interpretation of coefficients and comparison across models.

The executive questionnaire reportedly underwent expert review and a pilot involving 42 participants. Main administration occurred electronically between March and September 2025 and targeted senior executives, transformation managers, innovation directors, information technology leaders, and strategy professionals. The draft reports 2,840 invitations, 1,526 returns, and 1,412 valid questionnaires following screening. Valid returns represent approximately 49.7 percent of invitations, consistent with the reported response rate. However, a complete sampling frame, screening rules, regional allocation, and participant-to-firm mapping are not supplied. Because multiple executives may represent a single organization, the 1,412 responses cannot automatically be treated as an equal number of independent enterprises.

The source describes early-versus-late response comparisons and reports no significant differences, but does not supply group definitions or test outputs. It also reports that the first factor accounted for less than 38 percent of variance in a single-factor assessment. This observation cannot exclude common-method bias. Measurement separation, multiple informants, temporal separation, and explicit method-factor analysis would provide additional information. Where several executives describe the same firm, aggregation requires evidence that their assessments meaningfully represent an organizational construct. Without respondent identifiers linked to firms, neither aggregation quality nor the independence of responses can be checked from the supplied manuscript.

Panel estimation reportedly uses fixed-effects and random-effects models, a Hausman comparison, lagged specifications, and generalized method of moments. A coherent primary specification would relate a clearly defined performance outcome to transformation capability, organizational capability, governance, and ecosystem participation, with documented controls and suitable firm and time effects. Strategic value creation should not simultaneously appear as the outcome and an unexplained overlapping predictor. The original equation contains this ambiguity and repeated notation. The present revision therefore describes the intended relationships in prose instead of reproducing an equation that would imply a settled specification unsupported by the available documentation [26].

Controls identified in the source include size, age, industry, research intensity, market volatility, institutional quality, and national infrastructure. Their appropriate use depends on the estimator. Time-invariant characteristics cannot receive separately identified coefficients in a conventional firm fixed-effects specification, and firm age can be collinear with firm and year effects. Controls may also lie on the pathway through which transformation affects performance. Decisions about inclusion therefore require an explicit causal rationale. The draft does not identify which controls appear in each model, how standard errors are clustered, or whether time and country effects are included. The reported coefficient table should be read with these specifications unresolved.

The structural equation component is described as using AMOS 28 and SmartPLS. These packages support different estimation approaches, and their outputs should not be combined without explanation. The fit measures supplied in the draft are presented as reported model diagnostics, while the estimator, measurement specification, and treatment of ordinal indicators require confirmation. Reliability and convergent validity ranges are also reported, but the loading matrix, construct-specific estimates, residuals, and discriminant validity evidence are unavailable. Establishing mediation would require the indirect path and its uncertainty interval. Establishing moderation would require a specified interaction or an appropriate comparison across groups. Neither can be established solely from a positive direct path [27].

The qualitative component reportedly consists of semi-structured interviews with 36 senior transformation leaders, analyzed thematically with NVivo. Topics include adaptation, leadership, governance, ecosystem relationships, and implementation experience. The source does not provide interview dates, recruitment procedures, the guide, a codebook, transcripts, or illustrative quotations. Its qualitative findings are therefore presented as summarized themes. The original claim that approximately 71 percent of interviewees expressed particular concerns is not treated as a verified prevalence estimate because the underlying count and coding denominator are absent. Interview themes inform interpretation without supplying an independent statistical test of the proposed relationships.

Participation is described as voluntary and confidential, with organizational and personal identifiers removed during analysis. These statements provide an account of the draft's reported procedures, but do not establish an approval number, data retention policy, or documented consent process. Before submission, the authors should supply the applicable ethics and data availability statements and identify which proprietary data can be accessed under license. No approval, dataset, interview quotation, estimation result, or robustness statistic has been invented in preparing this version. This boundary is particularly important because editorial expansion can clarify reasoning but cannot replace empirical documentation or resolve discrepancies without access to the underlying study materials.

Integration between evidence sources requires a documented matching and interpretation procedure. Bibliometric themes can justify selecting constructs, but cannot validate the enterprise relationships. Survey

estimates can illuminate perceived capabilities, but do not independently verify financial outcomes. Interview accounts can explain why a process occurred, but their contribution depends on how participants and cases were selected. A defensible mixed-methods synthesis would indicate which findings converge, which address different questions, and which remain inconsistent. The supplied manuscript does not provide such a matrix or case linkage. The present interpretation therefore uses each component within its stated scope and avoids treating repeated references to a mechanism across methods as independent confirmation of causality.

Missing data also require explicit treatment because they can influence both sample coverage and substantive estimates. Excluding firms with incomplete disclosures may change the characteristics of the retained sample, while imputing observations requires assumptions about why information is absent. The source mentions cleaning and screening but does not report the number removed at each stage or the procedures used for individual variables. Before replication, an observation-level availability record should distinguish missing outcomes, unavailable predictors, and deliberate exclusions. This information would clarify the discrepancy in panel coverage and establish whether model comparisons use identical samples. It would also help assess whether the reported relationships are concentrated among enterprises with unusually complete reporting.

4. RESULTS

The results are consolidated into five tables. Table 1 summarizes study coverage and participant information, Table 2 combines digital capability and governance measures, Table 3 presents the supplied panel coefficients, Table 4 reports structural paths and model diagnostics, and Table 5 compares industries. Numerical entries reproduce the supplied manuscript except where percentages are calculated directly from reported counts and explicitly identified. Inferential labels such as supported are avoided because the materials do not include complete specifications or underlying outputs. The tables therefore provide a transparent record of the reported evidence and its reporting limits. They should not be interpreted as results of a new analysis conducted during rewriting.

Table 1 Study coverage and sample composition

Component	Reported value	Coverage or qualification
Bibliometric search	4,286 initial; 2,347 retained	Scopus and Web of Science; 2010–2025
Enterprise sample	612 firms; 28 countries	Publicly listed enterprises; country roster unavailable
Panel coverage	7,344 firm-years; 2012–2025	Fourteen calendar years; panel balance unresolved
Technology	154 firms; 25.2%	Share calculated from sector count
Manufacturing	132 firms; 21.6%	Share calculated from sector count
Financial services	96 firms; 15.7%	Share calculated from sector count
Healthcare	87 firms; 14.2%	Share calculated from sector count
Retail	74 firms; 12.1%	Share calculated from sector count
Telecommunications	69 firms; 11.3%	Share calculated from sector count
Innovation-oriented firms	286; 46.7%	Overlapping characteristic, not another sector
Executive survey	2,840 invited; 1,526 returns	1,412 valid; 49.7% of invitations
Pilot and interviews	42 pilot respondents; 36 interviews	Firm linkage and interview recruitment unspecified
Revenue and maturity	USD 8.2 billion; maturity 4.18	Reported averages; maturity scale 1–5

The industry counts sum to 612 enterprises, which is consistent with the stated sample size. The rounded percentages sum slightly above 100 percent because of rounding. Innovation-oriented firms are treated as an overlapping characteristic, not as a seventh industry, since the source identifies them through research intensity rather than a mutually exclusive sector. The absence of the country list prevents assessment of geographic concentration. Table 1 also makes the panel discrepancy visible: the stated window and observation total may describe an unbalanced panel, but the supplied materials do not establish that explanation. Resolving this issue would affect the interpretation of longitudinal coverage and the effective samples used in individual models.

Table 2 Reported digital capability and governance measures

Construct	Mean	SD
Digital transformation capability	4.24	0.66
AI integration capability	4.17	0.71
Cloud infrastructure maturity	4.21	0.69
Digital innovation capability	4.29	0.64
Strategic digital alignment	4.13	0.73
Ecosystem connectivity	4.16	0.68
Organizational learning capability	4.20	0.67
Cybersecurity governance capability	4.09	0.75
Innovation ecosystem participation	4.14	0.70
Digital leadership orientation	4.18	0.69
Strategic adaptability	4.22	0.65

Organizational resilience capability	4.11	0.72
Institutional governance capability	4.15	0.70
Governance transparency	4.18	0.67
Regulatory compliance capability	4.09	0.73
Digital trust capability	4.21	0.66
Cybersecurity readiness	4.14	0.71
Ethical AI governance	3.97	0.82
Organizational ambidexterity	4.11	0.70
Adaptive leadership capability	4.26	0.64
Knowledge integration capability	4.18	0.68
Strategic flexibility	4.23	0.66
Ecosystem collaboration capability	4.17	0.69

The capability scores describe generally favorable executive assessments on the reported five-point scales. Digital innovation has the highest listed digital score at 4.29, while cybersecurity governance has the lowest within that group at 4.09. Adaptive leadership is reported at 4.26, whereas ethical AI governance is lower at 3.97. These differences are descriptive. The manuscript does not provide paired comparisons, confidence intervals, or a measurement-invariance assessment that would justify claims about statistically meaningful differences between constructs. The source's generic significance column for means has therefore been removed because it does not identify a null hypothesis, reference population, or test procedure.

The results also show why overall maturity should not be treated as a single unambiguous quantity. The source gives a digital maturity mean of 4.18 in the sample description and a transformation capability mean of 4.24 in its capability table. These may be distinct constructs, but their relationship is not explained. The revision retains their separate labels and does not average them. The governance scores similarly combine distinct concepts, including internal practices and trust. High reported means support a description of positive perceptions among respondents; they do not establish that governance requirements are met in practice or that the sample represents less digitally mature firms.

Table 3 Reported panel regression relationships

Relationship	Coefficient	t value	p value
Transformation capability → strategic performance	0.47	12.84	<0.001
Organizational capability → transformation effectiveness	0.42	11.37	<0.001
Institutional governance → transformation success	0.39	10.44	<0.001
Ecosystem participation → innovation capability	0.34	9.18	<0.001
AI integration → organizational innovation	0.41	10.92	<0.001
Organizational adaptability → strategic flexibility	0.38	9.87	<0.001
Cybersecurity governance → ecosystem participation	0.28	7.61	<0.01
Digital leadership → transformation capability	0.37	9.54	<0.001
Cloud infrastructure → operational responsiveness	0.35	8.97	<0.001
Organizational learning → strategic innovation	0.40	10.15	<0.001

The supplied panel results report positive coefficients across the listed relationships. Transformation capability is associated with strategic performance at 0.47, while organizational capability is associated with transformation effectiveness at 0.42. Governance and transformation success are linked by a reported coefficient of 0.39. These values are compatible with the framework's expectations, but their magnitude cannot be compared confidently because the source does not establish whether coefficients are standardized or whether dependent variables share a scale. The table also summarizes several outcomes under one diagnostic block without identifying which model generated each diagnostic. The adjusted R squared value of 0.77 consequently cannot be assigned to every relationship.

Some original narrative statements assign different outcomes to the same coefficients. For example, the ecosystem coefficient of 0.34 is associated with innovation in the panel table but with strategic value in parts of the narrative. The revised table retains the panel table's relationship labels and treats the discrepancy as unresolved. A reported indirect adaptability effect of 0.31 is also noted in the draft, but its component paths and interval are missing. It remains suggestive evidence of a proposed mechanism rather than a reconstructed mediation test. Likewise, the claim that governance moderates transformation is not established by its positive direct association with success.

Table 4 Reported structural paths and measurement diagnostics

Structural path	β	t value	p value
Transformation → organizational innovation	0.46	13.62	<0.001
Transformation → strategic value creation	0.44	12.98	<0.001
Organizational capability → strategic adaptability	0.43	12.11	<0.001
Institutional governance → ecosystem participation	0.38	10.43	<0.001
Organizational learning → transformation success	0.41	11.32	<0.001
AI capability → operational agility	0.37	9.84	<0.001
Ecosystem participation → competitiveness	0.34	8.97	<0.001
Digital leadership → organizational resilience	0.36	9.26	<0.001
Cybersecurity governance → digital trust	0.32	8.17	<0.01

Strategic adaptability → long-term competitiveness	0.45	12.74	<0.001

The structural model reports a positive transformation-to-innovation path of 0.46 and a transformation-to-value path of 0.44. Adaptability is associated with long-term competitiveness at 0.45. The supplied fit statistics indicate close correspondence between the specified model and the data according to the reported measures. They do not establish that the model is uniquely correct or that alternative structures would fit less well. The aggregate reliability and average variance extracted ranges likewise do not substitute for construct-specific measurement results. Their interpretation remains conditional on the estimator, item assignments, sample structure, and measurement model being documented sufficiently for inspection.

Survey summaries report that 88.4 percent of respondents consider transformation critical to competitiveness and ecosystem participation, while 82.7 percent report changes in decisions and organizational arrangements. Only 53.9 percent report integration into culture and strategic governance. These percentages suggest a difference between perceived importance and reported organizational integration. However, the source does not provide item wording, response categories, or a cross-tabulation showing whether the same respondents selected each position. The figures cannot establish a precise implementation failure rate. They identify an issue for closer investigation rather than defining which organizations have completed a transformation process.

Table 5 Reported sector comparisons of transformation outcomes

Industry	Digital capability	Innovation	Flexibility	Ecosystem participation	Resilience
Technology	4.52	4.49	4.43	4.51	4.46
Financial services	4.39	4.31	4.28	4.34	4.27
Healthcare	4.24	4.19	4.17	4.15	4.18
Telecommunications	4.28	4.21	4.20	4.29	4.23
Retail	4.09	4.04	4.01	4.08	4.02
Manufacturing	3.98	3.91	3.94	3.88	3.96
Reported ANOVA F	9.16	8.88	7.94	8.27	8.12

Technology firms have the highest reported sector means across the five dimensions, while manufacturing firms have the lowest. Financial services also display comparatively high scores. The supplied analysis of variance statistics indicate sector differences, but the absence of degrees of freedom, group-level dispersion, post hoc comparisons, and covariate adjustment limits interpretation. Sector rankings may reflect differences in firm size, digital intensity, market conditions, or respondent composition. They should not be read as proof that industry membership determines success. The interview summaries offer a complementary interpretation: leaders describe cultural adjustment, employee participation, learning, and governance alignment as recurring implementation concerns across industries, while also identifying dependence and accountability risks.

5. DISCUSSION

The reported findings are consistent with an explanation of digital transformation that centers on the organization of resources rather than their acquisition alone. Positive associations between transformation capability, innovation, and strategic performance suggest that technological integration is relevant to organizational outcomes. The accompanying capability and governance relationships indicate that this relevance cannot be understood in isolation. However, the evidence supports an integrated interpretation more clearly than it establishes an integrated causal theory. The study's contribution lies in specifying the connections that need explanation and identifying where the reported results align with them. A stronger claim would require reproducible estimates, clearer construct boundaries, and direct comparison with alternative models.

For the resource-based view, the substantive implication concerns complementarity. Technologies that are widely accessible may still produce uneven benefits when combined with organization-specific routines, knowledge, and coordination. The reported capability relationships fit this interpretation. Yet they do not show that the resulting advantage is rare, difficult to imitate, or durable. Those characteristics require evidence beyond a positive coefficient. The paper therefore extends the application of resource reasoning by clarifying what should be measured: how digital resources are used, which complementary arrangements matter, and whether competitors can reproduce the combination. This approach is more precise than classifying every digital investment as a strategic resource.

Dynamic capability theory offers a process explanation of the same relationships. Adaptation can connect technological possibilities with revised practices through repeated experimentation, feedback, and reconfiguration. The reported adaptability effect is compatible with this mechanism. Nevertheless, identifying a process requires temporal ordering. A capable firm may invest more in technology because it is already adaptable, and successful performance may provide resources for both learning and adoption. A cross-sectional executive assessment cannot resolve these possibilities. Future analysis should establish when capabilities change relative to investments and outcomes, and should distinguish the capacity to adapt from the favorable performance that adaptation is intended to explain.

The distinction between transformation capability and organizational adaptability is especially consequential. If transformation is measured partly by flexibility, learning, innovation, and strategic alignment, a positive relationship with similar outcome measures may reflect conceptual duplication. That problem does not invalidate the framework, but it changes the empirical task. Technological integration should be measured separately from the routines proposed to mediate its consequences. Innovation should then be assessed through a sufficiently distinct outcome. A transparent item-level analysis could show whether respondents distinguish these concepts. Without it, the strongest interpretation is that related favorable assessments covary, rather than that a particular mechanism has been isolated statistically.

Organizational ambidexterity helps explain why capability development may remain difficult even when leadership recognizes its importance. Firms must preserve reliable operations while testing changes whose benefits are uncertain. The difference between the survey's strategic-importance and cultural-integration percentages is compatible with this tension. An executive can regard transformation as essential while lacking authority, resources, or incentives to reorganize established activities. Treating that gap as simple resistance would overlook competing demands on the organization. A useful managerial response is to connect exploratory work with operational feedback, define conditions for scaling or stopping experiments, and protect continuity while permitting learning from unsuccessful trials.

Governance contributes through coordination as well as constraint. Responsibility for data, technology procurement, security, and automated decisions can be distributed across functions with different priorities. Unclear authority can delay implementation or allow incompatible practices to develop. Governance arrangements may improve transformation by making these responsibilities explicit and by providing procedures for resolving disagreement. The reported positive governance coefficient is consistent with this reasoning. It does not establish that more formal controls always improve outcomes. Excessive centralization can impede local adaptation, while decentralized discretion can weaken consistency. The relevant question is whether governance fits the risks and coordination requirements of a particular activity.

Institutional context introduces a different mechanism. Predictable rules and credible enforcement can support trust between organizations, whereas fragmented requirements can increase uncertainty and transaction costs. These effects may influence the benefits available from internal capability. Yet the draft does not provide the interaction estimates or multilevel structure needed to demonstrate that national quality changes the transformation–performance relationship. The distinction should remain explicit. Evidence of strong internal governance is not evidence of a strong national environment, and a favorable country context does not establish effective internal controls. The integrated framework is most useful when it makes these levels distinguishable and specifies how they may interact.

Cybersecurity illustrates the strategic role of credible coordination. An organization may be reluctant to share data or depend on external systems when it cannot assess access, recovery, and incident responsibilities. Security arrangements can make participation feasible by reducing uncertainty and clarifying how problems will be handled. The reported association between cybersecurity governance and participation supports investigating this mechanism. It should not be interpreted as evidence that security has eliminated ecosystem risk. Connected systems can transmit disruption through shared providers or common dependencies. Resilience therefore requires attention to recovery and substitution as well as prevention, including whether the organization can continue essential activities when a platform becomes unavailable.

The ecosystem results also qualify an exclusively internal account of competitive advantage. Access to complementary expertise, information, and services can broaden what a firm can accomplish. Participation may therefore support innovation without requiring ownership of every relevant resource. However, the strategic question includes value capture. A firm can help create substantial ecosystem value while receiving a limited share or becoming more dependent on its partners. The reported outcome measures do not separate these possibilities. Future work should distinguish the benefits generated through collaboration from bargaining position, switching costs, and control over critical data. These distinctions would explain why apparently similar participation produces different enterprise outcomes.

Dependence is particularly relevant when platform rules can change unilaterally. Interface changes, access restrictions, or altered commercial conditions may affect services built around a platform. Organizations should consequently assess ecosystem participation as a continuing strategic relationship. An effective arrangement requires understanding which capabilities are retained internally, which data remain accessible, and how activities could be transferred if cooperation deteriorates. These are implications of the framework rather than findings quantified by the supplied tables. They connect organizational adaptability with ecosystem governance: adaptability concerns the capacity to change relationships as well as the ability to change internal routines.

The AI-related results suggest that intelligent systems should be evaluated in relation to the decisions they support. A positive association with agility does not establish that every automated task improves organizational performance. Useful deployment depends on task suitability, reliable inputs, and arrangements for responding to errors. Accountability also requires identifying who can challenge an output and who bears

responsibility for acting on it. The comparatively lower ethical-governance score makes this issue relevant to the reported sample, but does not demonstrate actual harm. The practical implication is to assess decision quality and oversight alongside implementation progress, rather than measuring success solely by the number of models deployed.

The sector comparisons support a contextual interpretation. Technology firms may have more experience with digital products and infrastructures, while manufacturing organizations must often coordinate change with physical assets and continuity requirements. These considerations could help explain the descriptive rankings, but they were not tested directly in the supplied analysis. Sector averages also conceal differences within industries. A digitally adaptive manufacturer may differ more from another manufacturer than from a technology firm. Future comparisons should account for resource intensity, legacy systems, firm size, and market conditions. Such analysis would help distinguish genuine sector effects from the distribution of organizational capabilities across sectors.

Managers can use the integrated framework to organize transformation decisions around the conversion of investment into capability. A project should identify the organizational task it is intended to improve, the knowledge and authority required to use the technology, and the evidence that would indicate value realization. This does not imply that every benefit can be quantified immediately. It requires distinguishing an implementation milestone from a change in organizational capability and from an eventual performance outcome. Leadership can then identify whether a disappointing result reflects technology limitations, incomplete integration, unsuitable incentives, or unrealistic expectations. That diagnosis is more useful than treating additional expenditure as the default response.

Policy implications follow from the dependence of organizational transformation on shared conditions. Infrastructure access matters, but it may produce limited benefits when skills, interoperability, or confidence in digital transactions remain weak. Public initiatives can therefore consider how firms access expertise, understand responsibilities, and participate in reliable networks. The present study does not compare specific policy instruments or estimate their effects. Its contribution is to identify complementary conditions that policy evaluation should examine. Any claim that a particular regulatory model improves transformation would require evidence appropriate to that comparison, including the costs of compliance and the needs of firms with limited administrative capacity.

Several methodological limitations restrict the strength of the conclusions. The panel's stated calendar coverage does not reconcile with a balanced sample, and firm-year records are unavailable for inspection. The respondent-to-firm relationship is unspecified, creating uncertainty over aggregation and independence. Measures overlap conceptually, and multiple outcomes appear under inconsistent labels. Common-method assessments are insufficient to dismiss shared-response bias, while the listed robustness procedures lack the outputs needed to assess their validity. In particular, a reference to generalized method of moments does not establish a credible solution to endogeneity without instruments and diagnostic tests. These limitations should be resolved before treating the numerical results as validated evidence.

The next research priority is an auditable design that links clearly separated constructs across time and levels. Researchers should document the sampling frame, country composition, variable construction, questionnaire items, and matching between executives and firms. Analyses should distinguish internal governance from national conditions and separate direct, indirect, and conditional relationships. Qualitative material should include a transparent coding process and enough anonymized evidence to show how interpretations were developed. Replication across smaller firms would address the source's emphasis on listed enterprises. These improvements would allow the proposed framework to be assessed as an explanatory model rather than relying on the apparent consistency of favorable coefficients.

A further implication concerns how transformation success is evaluated inside organizations. Metrics can shape behavior as well as describe progress. Counting completed deployments may encourage rapid implementation even when employees cannot use the systems effectively. Emphasizing only cost savings may discourage experimentation whose benefits are delayed. Evaluation should therefore connect project outputs with observable changes in decisions, service reliability, or collaborative activity, while recognizing the costs and risks incurred. The framework does not establish a universal set of indicators. It suggests that indicators should match the mechanism being evaluated and should distinguish the organization receiving a benefit from other actors who may bear its costs. This approach would make managerial assessment more consistent with the paper's account of strategic value.

6. CONCLUSION

Digital transformation is best understood as a process in which organizations combine technological resources with capabilities, governance arrangements, and ecosystem relationships to change how they create and capture value. The reported findings associate transformation capability with innovation, strategic performance, and adaptability, while also indicating the relevance of leadership, learning, trust, and interorganizational participation. Together, these relationships support a framework that connects internal resource coordination with

institutional conditions and external collaboration. They also show why implementation and value realization should remain analytically distinct. Acquiring technology establishes possibilities; realizing strategic benefits requires organizations to develop routines, assign responsibilities, and revise relationships in ways that make those possibilities usable.

The study contributes by clarifying the mechanisms through which resources may become capabilities and by distinguishing governance and ecosystem relationships from undifferentiated measures of digital maturity. Its practical implications emphasize aligning projects with organizational tasks, developing learning capacity, and evaluating the distribution of responsibility and dependence. These implications remain conditional on context and should not be interpreted as a universal sequence of transformation stages. Different industries, firms, and institutional settings may require different combinations of standardization, experimentation, and collaboration. A useful integrated framework explains these differences instead of assuming that every organization should follow the same technological path.

The available evidence also imposes clear limits. Reported coefficients and fit statistics cannot replace access to model definitions, measurement instruments, sampling records, and estimation outputs. The unresolved panel coverage and inconsistent relationship labels restrict causal interpretation and reproducibility. Future research should address these issues through transparent longitudinal designs, explicit multilevel measurement, stronger identification, and qualitative evidence that documents the processes under study. Sustainable strategic value remains the central question, but it should be evaluated through distinct outcomes and appropriate time horizons. Progress depends on showing how technological change becomes organizational capability, under which governance conditions it works, and which actors ultimately benefit from the resulting value.

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