Governance Driven Digital Transformation in the Public Sector: Exploring Organizational, Technological, and Environmental Determinants

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ABSTRACT
This study examines the determinants of governance-driven digital transformation in the public sector by integrating the Technology Organization Environment (TOE) and Collaborative Governance Regime (CGR) frameworks. The objective is to analyze how organizational readiness, technological capability, and environmental conditions interact to shape sustainable digital transformation within regional public administration. A qualitative case study approach was employed, focusing on South Sulawesi Province, Indonesia. Primary data were collected through semi-structured interviews with six key informants from strategic institutions responsible for digital governance implementation. Secondary data were drawn from SPBE Evaluation Reports (2023–2024), the Indonesia Digital Society Index (IMDI), regional development plans, and relevant provincial regulations. Data analysis followed a three-stage coding procedure open, axial, and selective coding supported by NVivo 12 Plus. The results reveal that leadership commitment and institutional anchoring are the strongest organizational enablers, while interoperability, data governance mechanisms, and information system integration constitute the core technological drivers. Environmental factors including fiscal capacity, infrastructure readiness, and citizen digital inclusion significantly influence the scalability and sustainability of digital initiatives. The convergence of these three dimensions led to the formulation of the Model of Digital Transformation Ecology (MET-DS), which conceptualizes digital transformation as an ecological process shaped by dynamic, non-linear interactions between governance capacity and technological adaptation. Unlike existing linear adoption models, MET-DS introduces the concept of institutional learning loops and positions governance as an active ecological mediator rather than a static contextual variable. This study contributes theoretically by extending the TOE–CGR integration into a unified analytical model and practically by offering policy recommendations on interoperability, human capital development, and cross-sector collaboration for regional governments pursuing digital reform.

Keywords: *Digital Transformation; E-Government; Collaborative Governance; Interoperability; TOE Framework; Organizational Capacity*
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INTRODUCTION

The accelerating wave of digital transformation has fundamentally reshaped how governments deliver public services and interact with citizens [1][3]. Public institutions worldwide are increasingly adopting digital technologies to enhance efficiency [4], accountability [5], and transparency [6], while promoting citizen participation in governance processes [7][8]. The integration of information and communication technology (ICT) into public administration [9][10] has evolved from traditional e-government initiatives primarily focused on service digitalization toward digital governance, which emphasizes collaboration, interoperability, and data-driven decision-making [11][12].

In developing countries, however, digital transformation in the public sector remains complex and uneven. Structural rigidity, hierarchical bureaucratic cultures [13], and limited human capital capacity often hinder the institutionalization of digital reforms [14]. Furthermore, technological adoption tends to be fragmented across agencies, lacking coherent integration frameworks [15]. These challenges underscore the need for governance mechanisms that align digital innovation with institutional capabilities, leadership commitment, and environmental readiness [16]. Without such alignment, digital transformation risks becoming a short-term administrative initiative rather than a sustainable reform [17].

The theoretical discourse surrounding digital transformation has been largely framed by two dominant perspectives. The Technology Organization Environment (TOE) framework [18] explains the determinants of innovation adoption by examining technological readiness, organizational capacity, and external pressures. The Collaborative Governance Regime (CGR) framework [19] emphasizes inter-organizational coordination, shared

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motivation, and collective action as drivers of governance outcomes. While each framework offers valuable insights individually, their integration enables a more holistic understanding of how internal and external factors interact in shaping digital transformation success in public administration [20].

Despite extensive studies on digital transformation, empirical evidence from developing-country bureaucracies remains limited, particularly regarding how governance mechanisms mediate the interaction among organizational, technological, and environmental dimensions [21][22]. Existing research often focuses on evaluating technical readiness or policy outcomes in isolation, overlooking the dynamic interplay between leadership, institutional design, and cross-sector collaboration [23]. Moreover, the TOE framework, while widely applied, tends to treat its three dimensions as relatively static and independent categories, without adequately explaining how governance processes mediate their interactions [24]. Conversely, the CGR framework offers rich insights into collaborative dynamics but lacks the technological dimension necessary for analyzing digital transformation [19]. In Indonesia, where digital transformation is shaped by hierarchical institutional structures, regional disparities, and uneven digital literacy, understanding this mediation process is crucial for achieving sustainable digital reform.

This study addresses this research gap by posing the following research questions:

RQ1: How do organizational, technological, and environmental factors interact to shape governance-driven digital transformation in regional public administration?

RQ2: What governance mechanisms mediate the integration of these determinants to support sustainable digital reform?

RQ3: How can the interaction between these dimensions be conceptualized into an integrative analytical model that captures the dynamic and non-linear nature of digital transformation?

To answer these questions, this study integrates the TOE and CGR frameworks and introduces the Model of Digital Transformation Ecology (MET-DS). The MET-DS moves beyond the linear, factor-based logic of the TOE framework by incorporating the process-oriented governance dynamics of the CGR framework. Its key novelty lies in three contributions: (a) it positions governance not as a static contextual variable but as an active ecological mediator that shapes how technological and organizational factors translate into transformation outcomes; (b) it introduces the concept of "institutional learning loops" whereby governance systems continuously adapt to technological developments and environmental changes; and (c) it reconceptualizes digital transformation as a co-evolutionary ecological process rather than a sequential adoption pathway, capturing the feedback dynamics, mutual dependencies, and non-linear interactions among the three dimensions that linear models fail to represent.

II. LITERATURE REVIEW

Digital Governance and Public Sector Transformation

Digital transformation in public administration is part of a broader reform agenda that shifts government operations from bureaucratic processes to networked, data-driven governance systems [1][11]. Fountain's (2001) technology enactment framework emphasizes that technology adoption in government is mediated by institutional arrangements, organizational forms, and cognitive frames meaning that the same technology can produce different outcomes depending on the governance context in which it is embedded [25]. Dunleavy et al. (2006) further argue that digital-era governance represents a fundamental departure from new public management, characterized by reintegration of services, needs-based holism, and digitization processes [26]. These perspectives establish that digital transformation in the public sector is inherently a governance challenge, not merely a technological one.

In Indonesia, the government has accelerated the implementation of the Sistem Pemerintahan Berbasis Elektronik (SPBE), as mandated by Presidential Regulation No. 95 of 2018 and reinforced by the Satu Data Indonesia policy aimed at achieving data interoperability across government agencies [27][28]. At the provincial level, this transformation represents a governance-driven approach where institutional leadership, bureaucratic capacity, and cross-sector collaboration are crucial determinants of success [29]. The SPBE evaluation results and the Indeks Masyarakat Digital Indonesia (IMDI) indicate uneven progress across regions, reflecting the complexity of aligning organizational readiness, digital infrastructure, and policy coherence [30][31].

Technology Organization Environment (TOE) Framework

The TOE framework, originally proposed by Tornatzky and Fleischer (1990), provides a theoretical foundation for understanding the determinants of technological innovation adoption within organizations [18]. The framework identifies three contextual dimensions: (1) the technological context, encompassing existing technologies, infrastructure availability, and innovation characteristics; (2) the organizational context, including organizational size, management structure, leadership commitment, and human resource capacity; and (3) the environmental context, referring to regulatory frameworks, competitive pressures, and external stakeholder demands.

In the context of public sector digital transformation, the TOE framework has been widely applied to examine e-government adoption and digital governance maturity [4][32]. Zhu et al. (2006) demonstrated that the three TOE dimensions have differential effects depending on institutional context, with organizational readiness being particularly critical in developing-country settings [33]. However, as noted by Mergel et al. (2019), the TOE framework treats its dimensions as relatively independent predictors without fully explicating the governance processes that mediate their interactions [24]. This limitation is particularly significant in the public sector,

where cross-agency coordination, political leadership, and regulatory alignment play outsized roles in shaping technology adoption outcomes.

Collaborative Governance Regime (CGR) Framework

The CGR framework, developed by Emerson and Nabatchi (2015), offers a process-oriented perspective on multi-actor governance [19]. It identifies three key dynamics within collaborative governance: principled engagement (the quality of deliberation and negotiation among stakeholders), shared motivation (mutual trust, legitimacy, and commitment), and capacity for joint action (institutional arrangements, leadership, resources, and knowledge). The framework situates these dynamics within a broader system context that includes political, legal, socioeconomic, and environmental conditions.

In the context of digital transformation, the CGR framework helps explain how governance mechanisms such as coordination bodies, shared data platforms, and collaborative policy design mediate the translation of technological capabilities into governance outcomes [20]. Ansell and Gash (2008) similarly emphasize that collaborative governance depends on facilitative leadership, institutional design, and the quality of face-to-face dialogue among stakeholders [34]. These insights are critical for understanding why technically similar digital systems produce vastly different governance outcomes across jurisdictions the difference often lies in the quality of collaborative processes rather than the technology itself.

Integrating TOE and CGR: Toward an Ecological Perspective

While the TOE framework effectively identifies the structural determinants of digital adoption, it tends to treat organizational, technological, and environmental factors as separate, relatively static categories. The CGR framework compensates for this limitation by introducing dynamic, process-oriented governance dimensions, but it lacks the explicit technological focus necessary for analyzing digital transformation. Integrating these two frameworks addresses their respective limitations by positioning governance as the mediating mechanism through which technological readiness, organizational capacity, and environmental conditions converge to produce sustainable digital reform [20].

This integration is particularly relevant for developing-country contexts, where digital transformation success depends not only on technology adoption but also on institutional coordination, leadership consistency, and adaptive capacity across multiple governance levels. Heeks (2006) argues that the majority of e-government projects in developing countries fail partially or completely due to "design reality gaps" mismatches between the assumptions embedded in system design and the actual organizational, informational, and political realities on the ground [35]. Gil-García and Pardo (2005) similarly identify institutional, organizational, and inter-organizational factors as key challenges in e-government initiatives, calling for integrative analytical frameworks [36]. Despite these calls, empirical applications of integrated TOE–CGR frameworks remain scarce, particularly in subnational government contexts.

The ecological metaphor adopted in this study moves beyond the additive logic of existing integrative models. Rather than simply combining TOE and CGR variables, the ecological perspective emphasizes mutual dependencies, feedback loops, and co-evolutionary dynamics among governance, technology, and environmental factors. This conceptualization draws on Nardi and O'Day's (1999) notion of "information ecologies" [37], in which technology, people, values, and practices form interdependent systems that evolve together. Applied to digital governance, this ecological lens captures how changes in one dimension trigger adaptive responses in others, creating feedback loops that shape the trajectory of transformation over time.

Digital Technology and Organizational Readiness in Indonesia's SPBE Context

Digital transformation initiatives under SPBE have focused on establishing integrated information systems such as SIPD (Sistem Informasi Pemerintahan Daerah), SRIKANDI (Sistem Informasi Kearsipan Dinamis Terintegrasi), e-Musrenbang, and SAPOTA (Sarana Pengelolaan Tata Naskah Elektronik). Each system supports administrative efficiency, transparency, and inter-agency coordination [38]. However, interoperability challenges persist due to fragmented data structures, inconsistent data governance standards, and uneven ICT capacity across agencies [39]. These conditions indicate that technology adoption alone is insufficient without alignment of organizational processes, management systems, and digital culture.

Organizational readiness encompassing institutional leadership, structural flexibility, and human resource capability forms the core of the organizational dimension within the TOE framework. Janssen and van der Voort (2016) argue that adaptive governance in the digital age requires organizations to develop not only technical capabilities but also institutional agility to respond to rapidly changing technological landscapes [40]. Leadership commitment is particularly important in driving behavioral and cultural change, ensuring that technological tools are integrated into routine administrative practices [41]. Meanwhile, human resource readiness remains a critical challenge in developing-country bureaucracies, with persistent gaps in digital literacy, data analytics skills, and adaptive learning capacity [42][43].

METHODS

Research Design

This study employed a qualitative case study approach [44] focused on South Sulawesi Province, Indonesia, a regional government with moderate SPBE maturity and active digital reform initiatives. The case was selected purposively based on three criteria: (1) it represents a mid-level digital transformation context where organizational, technological, and environmental challenges are simultaneously observable; (2) the province has

implemented multiple SPBE-related digital systems, providing sufficient empirical material for analysis; and (3) institutional access to key informants was feasible through established research networks.

B. Data Collection

Primary data were collected through semi-structured interviews with six key informants representing strategic SPBE institutions. The informants were selected using purposive sampling based on their direct involvement in SPBE planning, implementation, or evaluation at the provincial level. Table I presents the informant profiles.

Table I: Profile Of Key Informants

Code	Institution	Role/Position	Duration
INF-1	Bappeda (Regional Development Planning Agency)	Senior Planning Official	75 min
INF-2	BKD (Regional Personnel Agency)	Head of Digital Services Division	80 min
INF-3	BPSDM (Human Resources Development Agency)	Training Program Coordinator	65 min
INF-4	Diskominfo (Office of Communication and Informatics)	IT Infrastructure Manager	90 min
INF-5	Diskominfo (Office of Communication and Informatics)	Data Governance Officer	70 min
INF-6	Bappeda (Regional Development Planning Agency)	SPBE Coordination Officer	60 min

Although six informants may appear limited, the sample size was determined by the principle of data saturation [45]. During the analytical process, no substantively new themes or categories emerged after the fourth interview; the fifth and sixth interviews served as confirmatory sources that reinforced existing patterns without introducing new conceptual categories. This is consistent with Guest et al.'s (2006) empirical finding that thematic saturation in qualitative research typically occurs within the first six to twelve interviews when the informant pool is relatively homogeneous in terms of expertise and institutional context [45]. Furthermore, each informant occupied a strategically distinct institutional position within the SPBE governance ecosystem (planning, personnel, human resource development, and information technology), ensuring diversity of perspective despite the compact sample size.

Each interview explored themes related to leadership commitment, institutional anchoring, digital infrastructure readiness, inter-agency coordination, and barriers to digital integration. Interview protocols were developed based on the TOE and CGR conceptual frameworks to ensure theoretical alignment. All interviews were audio-recorded with consent, transcribed verbatim in Indonesian, and translated into English by the research team for analytical purposes.

Secondary data included SPBE evaluation reports (2023–2024), IMDI datasets, regional development plans (RPJMD and Renstra OPD), and relevant provincial regulations, including Peraturan Gubernur tentang SPBE.

Data Analysis

Data analysis was conducted using NVivo 12 Plus through a three-stage coding procedure following Strauss and Corbin's (1998) grounded theory coding approach [46]:

Open coding: Initial concepts related to digital governance, organizational readiness, and environmental conditions were identified from interview transcripts and documentary sources. This phase generated 47 initial codes across the three TOE dimensions.

Axial coding: Relationships between categories such as leadership and institutional coordination, interoperability and data governance, fiscal capacity and infrastructure readiness were systematically mapped. Categories were organized into 12 sub-themes grouped under the three primary dimensions.

Selective coding: Overarching themes were constructed by identifying the core category governance as ecological mediator that integrates all identified dimensions. This phase led to the formulation of the MET-DS model.

D. Trustworthiness

To ensure research rigor, the study applied Lincoln and Guba's (1985) criteria [47]. Credibility was established through data triangulation (comparing interview data with SPBE evaluation reports, IMDI datasets, and regulatory documents), member checking (returning preliminary findings to three informants for verification), and peer debriefing among two domain experts in public administration and digital governance. Dependability was addressed through detailed documentation of the research protocol, interview guides, coding decisions, and analytical memos. Confirmability was supported by maintaining a complete audit trail in NVivo, including code definitions, coding frequency reports, and theme development notes. Ethical clearance was obtained through institutional approval from Hasanuddin University, and all informants provided written informed consent before participation.

Research Framework

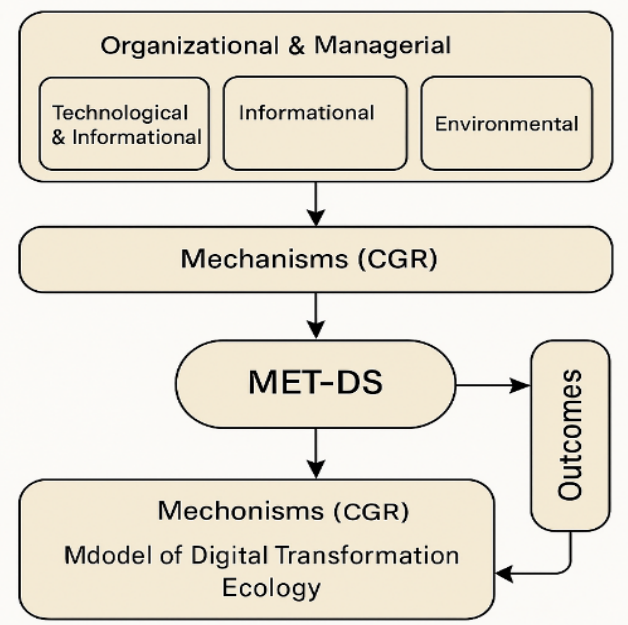

Fig. 1 Research Framework of Governance-Driven Digital Transformation

The research framework illustrates the integrative relationship between the three primary determinants of digital transformation organizational, technological, and environmental dimensions mediated by governance mechanisms. The framework synthesizes the TOE and CGR frameworks to explain how internal readiness, technological capability, and external pressures interact within a governance-driven ecosystem. Governance mechanisms serve as the central mediating construct linking these dimensions through coordination, collaboration, and institutional learning loops continuous feedback processes through which governance systems adapt to technological developments and environmental changes.

RESULTS AND DISCUSSION

This section presents the findings across three interrelated dimensions influencing governance-driven digital transformation, followed by their synthesis into the proposed MET-DS model.

Organizational and Managerial Factors

Leadership commitment and institutional anchoring emerged as the most influential determinants in the transformation process. Interview data indicated that top management particularly at the provincial level served as both policy driver and catalyst for interdepartmental coordination. Strong leadership ensured that SPBE initiatives were incorporated into strategic planning documents (Renstra and RPJMD), demonstrating institutional alignment between political will and administrative execution.

However, the bureaucratic structure remained highly hierarchical, which often delayed decision-making and inhibited innovation diffusion. INF-2 from BKD stated:

"The success of SPBE is highly dependent on the direct instruction of the governor and consistency among agencies. Without sustained leadership commitment, digital initiatives tend to stall at the planning stage."

This dependence on top-down directives reflects what Fountain (2001) describes as the embeddedness of technology adoption within existing institutional arrangements [25]. INF-4 from Diskominfo elaborated on the coordination challenge:

"Each agency develops its own system based on internal needs. There is no single coordinating body with sufficient authority to enforce integration standards across all units."

From the perspective of the CGR framework, these findings indicate that while principled engagement exists through formal policy mandates, the shared motivation component mutual trust and collective ownership of digital reform remains underdeveloped across agencies [19]. Human capital readiness was consistently identified as uneven. INF-3 from BPSDM noted:

"We provide general ICT training, but what agencies actually need is specialized training in data governance, system integration, and analytics which we currently lack the capacity to deliver consistently."

This finding aligns with Heeks's (2006) observation that human capacity gaps constitute a primary source of design reality mismatches in developing-country e-government projects [35].

Technological and Informational Integration

Technological infrastructure and interoperability among digital platforms were found to be key enablers of efficiency and data-based decision-making. The integration of systems such as SIPD, e-Musrenbang, SRIKANDI, and SAPOTA improved workflow automation and data accessibility. However, the absence of a unified data governance mechanism limited the potential of these platforms to function as an integrated ecosystem.

Table II summarizes the core technological mechanisms identified through thematic analysis.

Table II. Technological And Informational Mechanisms Supporting Digital Transformation

Mechanism	Description and Function
1. Data Governance Mechanism	Establishes standardized data management procedures across government agencies, covering data classification, metadata management, and information security protocols.
2. Interoperability Framework	Builds architectural compatibility between digital systems through API integration, shared databases, and enterprise service bus (ESB) models to enable seamless real-time data exchange.
3. Knowledge Management System	Develops an institutional knowledge repository containing operational manuals, best practices, and policy reports to facilitate organizational learning.
4. Business Process Reengineering	Redesigns bureaucratic workflows to align with digital operations by eliminating redundant steps and automating document approvals.
5. ICT Security & Risk Management	Implements cybersecurity standards including data backup, firewall configuration, and regular system audits to ensure data protection and public trust.
6. Performance Dashboard & Analytics	Integrates SPBE performance indicators and financial data into a centralized dashboard for real-time monitoring and evidence-based policy formulation.
7. Continuous System Evaluation	Establishes feedback loops through periodic evaluation of system performance and user satisfaction for continuous improvement.

Based on thematic analysis, Figure 2 depicts the interaction of key technological and informational mechanisms shaping regional digital transformation

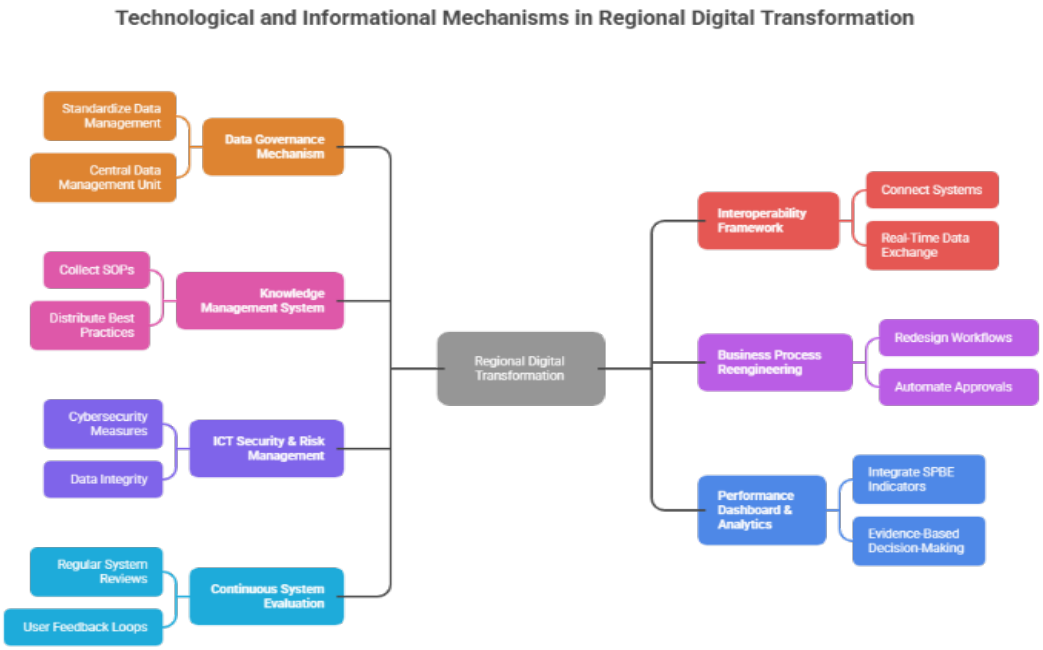

Fig. 2 Technological and Informational Mechan isms in Regional Digital Transformation

The thematic analysis indicates that interoperability challenges remain the most critical technological barrier. INF-5 from Diskominfo explained:

"We have multiple systems running, but these systems cannot communicate with each other. Each system was procured at different times, by different agencies, using different technical standards."

This fragmentation reflects what Janssen et al. (2012) characterize as the "interoperability paradox" in government [15]. According to the TOE framework, these limitations represent gaps in the technological context. The finding corroborates Xu and Dai's (2024) observation that interoperability gaps remain the primary barrier to achieving digital governance maturity in developing regions [12]. Nevertheless, the use of performance dashboards has enhanced monitoring transparency. INF-6 from Bappeda observed:

"The dashboard allows us to track SPBE progress in real time. Previously, evaluation was done manually and often delayed by months. Now leadership can directly see each agency's achievements."

Environmental and Policy Context

The external environment comprising infrastructure readiness, fiscal capacity, and citizen digital inclusion plays a decisive role in shaping transformation outcomes. The IMDI data (2023) indicate that several districts in the province remain below the national average in digital participation, particularly in rural areas [43]. INF-1 from Bappeda stated:

"Digital transformation requires sustained investment not one time procurement. But budget allocations for ICT are often considered secondary to physical infrastructure projects. Every year we have to re-advocate for ICT budgets at the musrenbang."

This finding resonates with Heeks's (2006) argument that fiscal sustainability is a critical environmental determinant of e-government success in developing countries [35]. Furthermore, the limited participation of private and community actors highlights the partial realization of collaborative governance. INF-4 elaborated:

"Collaboration with the private sector and academia is still project-based; there is no institutionalized collaboration mechanism. Yet they possess the technical capacity that is urgently needed."

This absence of systematic multi-stakeholder engagement represents what Emerson and Nabatchi (2015) identify as a gap in "capacity for joint action" [19]. Strengthening partnerships through formalized collaboration platforms would create a more enabling ecosystem for sustainable digital governance [20][34].

Synthesis: Model of Digital Transformation Ecology (MET-DS)

The integration of findings across all three dimensions led to the formulation of the Model of Digital Transformation Ecology (MET-DS), presented in Figure 3.

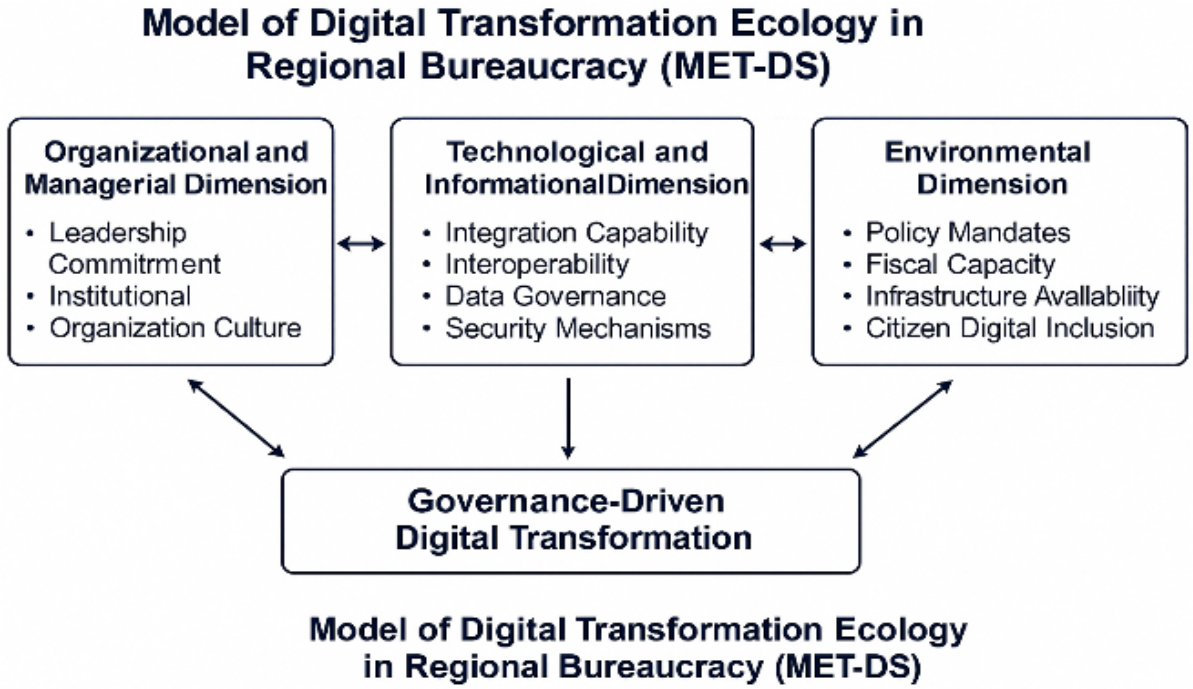

Fig. 3 Model of Digital Transformation Ecology (MET-DS)

The MET-DS model is structured around three core dimensions and a central mediating construct:

Organizational and Managerial Dimension: Leadership commitment, institutional regulation, human capital readiness, and organizational culture shape the capacity of institutions to adopt and manage technological innovations. The empirical findings demonstrate that this dimension functions as the primary catalyst.

Technological and Informational Dimension: Integration capability, interoperability, data governance, and security mechanisms constitute the operational backbone of digital governance. The findings reveal that

these mechanisms are necessary but insufficient on their own.

Environmental Dimension: Policy mandates, fiscal capacity, infrastructure availability, and citizen digital inclusion create the supportive ecosystem for transformation.

Governance as Ecological Mediator: The central construct positions governance as the dynamic mediating process through which the three dimensions interact, operating through: (a) institutional learning loops iterative policy adjustment and adaptive redesign; (b) cross-dimensional feedback changes in one dimension triggering adaptive responses in others; and (c) collaborative bridging facilitating connections between siloed institutional domains.

Distinguishing MET-DS from Existing Frameworks. The MET-DS model makes three distinct contributions beyond the individual TOE and CGR frameworks. First, whereas the TOE framework treats organizational, technological, and environmental factors as parallel, independent predictors of adoption, the MET-DS model conceptualizes them as interdependent, co-evolving dimensions connected through governance feedback loops. Second, whereas the CGR framework focuses on collaboration without explicit attention to technology, the MET-DS model integrates the technological dimension as a constitutive element of governance capacity. Third, the MET-DS model introduces institutional learning loops as a distinct analytical category, drawing attention to the temporal dynamics of transformation. Table III presents a comparative analysis.

Table III: Comparative Analysis of TOE, CGR, And MET- DS Frameworks

Dimension	TOE Framework	CGR Framework	MET-DS Model
Core focus	Determinants of technology adoption	Collaborative governance processes	Governance-mediated digital transformation ecology
Treatment of technology	Central variable	Absent/implicit	Co-evolutionary dimension
Treatment of governance	Implicit in organizational context	Central process	Ecological mediator with learning loops
Inter-dimensional dynamics	Parallel, independent	Process-oriented but technology-blind	Recursive, feedback-driven co-evolution
Temporal orientation	Cross-sectional	Process-focused	Longitudinal/evolutionary
Applicability	Identifies adoption factors	Explains collaborative dynamics	Integrates adoption, collaboration, and adaptation

CONCLUSION

This study demonstrates that the success of digital transformation in public administration depends on the synergy among organizational, technological, and environmental dimensions, mediated by governance mechanisms. Leadership commitment, institutional anchoring, and human capital readiness serve as primary catalysts, while technological integration through interoperability, data governance, and security mechanisms provides the operational backbone. Environmental factors including fiscal capacity, infrastructure readiness, and citizen inclusion determine the sustainability of reform.

The Model of Digital Transformation Ecology (MET-DS) extends the application of the TOE and CGR frameworks into a unified integrative model that positions governance as an ecological mediator. Unlike existing linear adoption models, MET-DS captures the recursive, co-evolutionary dynamics of digital transformation through institutional learning loops and cross-dimensional feedback mechanisms.

PRACTICAL IMPLICATIONS

The findings offer several practical recommendations: (a) establishing integrated digital governance councils with cross-agency authority; (b) developing differentiated digital competency programs tailored to administrative and technical staff; (c) prioritizing interoperability standards and middleware development at the provincial level; (d) institutionalizing fiscal commitment to digital transformation through dedicated budget lines; and (e) fostering multi-stakeholder partnerships through formalized collaboration mechanisms with academia, civil society, and the private sector.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, it is based on a single regional case, which constrains generalizability. While the case was purposively selected for its analytical richness, the specific governance dynamics of South Sulawesi Province may not be directly transferable to other regions. Second, the informant pool consists of only supply-side actors government officials involved in SPBE implementation and does not capture demand-side perspectives from citizens, private-sector partners, or civil society organizations. Third, the MET-DS model is conceptually derived from thematic synthesis rather than empirically validated through quantitative measurement.

Future research should pursue several directions. Comparative case studies across provinces with varying SPBE maturity levels would test the applicability of the MET-DS model in different contexts. Longitudinal designs would capture the temporal dynamics of institutional learning loops. Quantitative studies could operationalize the model's dimensions through structural equation modeling. Finally, incorporating demand-side perspectives particularly citizen satisfaction, digital inclusion outcomes, and private-sector collaboration experiences would provide a more balanced assessment of governance-driven digital transformation.

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