

DIGITAL INCLUSION AND HUMAN RESOURCE GOVERNANCE: A BUREAUCRATIC TRANSFORMATION MODEL FOR NORTH SUMATRA

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Abstract

This study developed and validated a Bureaucratic Transformation Model (BTM) for the digital era, examining how digital inclusion and government human resource governance (HRG) practices collectively reshape public sector performance and institutional culture in North Sumatra, Indonesia. Indonesian bureaucratic reform has increasingly centred on digital transformation as a mechanism for enhancing public service quality, government accountability, and workforce productivity. However, the structural and cultural conditions through which digital inclusion translates into organisational transformation in Indonesian regional government agencies remain theoretically underdeveloped and empirically underexplored. Employing a mixed-methods developmental research design, this study combined quantitative path analysis ($n = 186$ civil servants across eight Regional Government Work Units / Organisasi Perangkat Daerah in Medan) with qualitative case studies of three agency-level digital transformation initiatives. The BTM comprises four interacting dimensions: Digital Infrastructure Readiness, HRG Capability, Digital Inclusion Culture, and Transformative Performance Output. Structural equation modelling (SEM-PLS) results confirmed that digital inclusion culture significantly mediated the relationship between HRG capability and transformative performance output ($\beta = 0.63$, $p < .001$, $R^2 = 0.59$). HRG capability directly predicted digital inclusion culture ($\beta = 0.71$, $p < .001$) and transformative performance ($\beta = 0.54$, $p < .001$). Qualitative case analyses identified innovative work behaviour and contextual performance as the primary behavioural mechanisms linking digital inclusion to institutional transformation, consistent with Supriadi's prior theorisation of contextual performance in private university settings. Three BTM implementation pathways leadership-driven, peer-diffusion, and platform-mediated were inductively identified from the case data. These findings contributed a theoretically grounded, empirically validated model for digital-era bureaucratic transformation with direct implications for national civil service reform policy, regional government HRD strategy, and academic scholarship on public sector transformation in Indonesia.

Keywords: bureaucratic transformation model, digital inclusion, human resource governance, civil service, North Sumatra, innovative work behaviour

1. Introduction

Indonesia's national bureaucratic reform agenda, articulated through the Grand Design of Bureaucratic Reform 2010–2025 and accelerated by the Perpres No. 95/2018 on e-Government Systems, positions digital transformation as the primary lever for improving public service delivery, government accountability, and civil service workforce productivity. In North Sumatra a province with 33 regencies and cities, a civil service workforce exceeding 180,000 personnel, and pronounced intra-regional digital infrastructure disparities the operationalisation of these national commitments encounters complex organisational, cultural, and capability constraints. Supriadi (2025) documented that organisational climate, innovative work behaviour, and contextual performance were structurally interrelated in North Sumatra's private universities, a theoretical framework that this study extends to regional government agencies where bureaucratic culture poses distinctive barriers to digital transformation.

Human resource governance (HRG) in public sector contexts encompasses the systems, policies, and practices through which government agencies manage civil servant competency development, performance accountability, career progression, and organisational culture. Supriadi et al. (2021) established that contextual performance including cooperation, initiative, and organisational commitment was significantly predicted by organisational climate antecedents in private educational institutions, findings that are directly theoretically relevant to the present study's investigation of how HRG practices shape the behavioural dispositions prerequisite for digital transformation. Supriadi and Mukminin (2024) further documented that counterproductive cultural behaviours including task masking and performative productivity systematically undermined institutional performance in Indonesian higher education, identifying the cultural transformation imperative that the present study addresses in the government context.

Digital inclusion in public sector workforces extends beyond infrastructure access to encompass civil servants' meaningful participation in digital work processes, their capacity to leverage digital tools for performance improvement, and the organisational cultural conditions that normalise and reward digital engagement. Susilawati et al. (2021) demonstrated that technology innovation significantly mediated student loyalty and institutional participation in Indonesian higher education, establishing a theoretical precedent for the present study's positioning of digital inclusion as a cultural mediator between HRG investment and transformative performance. Safrida et al. (2025) provided direct empirical grounding by demonstrating that the P3SPD digital platform produced significant improvements in women employees' digital management competency in North Sumatra evidence of a contextually validated, platform-mediated digital inclusion pathway directly relevant to the present government HRG context.

This study addressed three research objectives: (1) to develop and validate a Bureaucratic Transformation Model (BTM) integrating digital inclusion culture as a mediating construct between HRG capability and transformative performance; (2) to test the structural relationships within the BTM using SEM-PLS with North Sumatra civil servants; and (3) to identify, through qualitative case analysis, the implementation pathways through which digital inclusion-enabled bureaucratic transformation unfolds in regional government agencies.

2. Literature Review

Bureaucratic transformation theory draws on Weber's foundational conceptualisation of rational-legal authority and its successive critiques, which have collectively repositioned bureaucracy from a static rule-governed system to a dynamic, adaptive institutional form capable of purposeful change. In the Indonesian context, Supriadi (2024) conceptualised the tension between bureaucratic stability and transformative dynamism through the lens of remote work burnout and digital nomadism, identifying the psychological and organisational conditions under which digital work mode transitions produce either adaptive innovation or maladaptive avoidance a framework that directly informs the BTM's inclusion of 'digital inclusion culture' as a mediating construct. Supriadi (2025) further elaborated the structural linkages between management strategy, innovative work behaviour, and contextual performance in North Sumatra's institutional landscape, providing the theoretical scaffold for the BTM's performance dimension.

Human resource governance (HRG) as a public management construct differs from conventional HRM in its emphasis on constitutional accountability, merit-based civil service principles, and the public interest obligations of government employment systems. Supriadi et al. (2023) established that competency significantly predicted teacher performance in Medan's Madrasah Tsanawiyah settings when moderated by principal leadership a finding that translates to the civil servant context as evidence that HRG capability effects on performance are contingent on leadership quality. Safrida et al. (2023) corroborated this pattern by demonstrating that strategic leadership, work motivation, and democratic management style collectively predicted institutional performance across North Sumatran educational organisations, a multivariate performance model that the BTM incorporates at the organisational unit level.

Digital inclusion in government workforces has been theorised as a three-layered phenomenon: first-order inclusion (infrastructure access), second-order inclusion (skills and usage), and third-order inclusion (meaningful outcomes and agency). The EU DigComp 2.2 framework (Vuorikari et al., 2022) operationalises these layers across five competency domains applicable to public sector digital transformation assessment. Khaira et al. (2023) demonstrated that technology-enhanced instructional design produced significant competency gains through empowerment pathways in Indonesian learning contexts, establishing a precedent for the present study's treatment of digital inclusion as both a skill and an agency phenomenon. Susilawati and Khaira (2021) further documented that structured digital learning environments produced loyalty and participation effects in Indonesian higher education that parallel the civil servant commitment and performance effects targeted by the BTM.

Innovative work behaviour (IWB) and contextual performance are the two behavioural constructs through which the BTM theorises the transformation from digital inclusion to organisational performance change. Supriadi (2024) proposed a conceptual framework for task masking among Generation Z employees, identifying the conditions under which performative productivity the appearance of work without its substance undermines IWB in contemporary workplaces. Supriadi (2025) subsequently demonstrated that organisational climate significantly predicted contextual performance through IWB in North Sumatra's private university sector, a structural relationship that the BTM extends to the regional government context with digital inclusion culture as an additional antecedent pathway. Yusrita et al. (2022) corroborated the role of institutional environment in enabling innovative

performance among university students, findings that strengthen the theoretical case for treating organisational culture transformation as a prerequisite for individual IWB in government digital transformation.

Supply chain and circular economy perspectives have increasingly informed public sector transformation scholarship by providing frameworks for understanding how value flows through institutional systems. Supriadi et al. (2025) demonstrated that circular supply chain management in technology industries produced systemic performance benefits through inter-organisational information sharing and collaborative governance — a logic that the BTM applies to the intra-government information and knowledge sharing that digital transformation enables. Riana et al. (2025) similarly documented systemic value creation through digital platform integration in UMKM contexts, suggesting that the BTM's 'platform-mediated' transformation pathway has established precedents in Indonesian organisational contexts adjacent to government.

3. Research Method

This study employed a concurrent mixed-methods developmental research design, integrating quantitative model testing with qualitative case-based model elaboration. Developmental research design was selected for its capacity to simultaneously build and validate theoretical models in applied organisational contexts, consistent with the study's objective of producing a practically deployable BTM for North Sumatra's regional government agencies.

The quantitative phase administered a validated survey instrument to 186 civil servants (Aparatur Sipil Negara / ASN) across eight Organisasi Perangkat Daerah (OPD) in Medan, purposively selected to represent diverse functional domains including education, health, public works, and social services. The survey instrument comprised four validated scales measuring the BTM dimensions: (1) Digital Infrastructure Readiness Scale (DIRS, 12 items, $\alpha = 0.84$); (2) HRG Capability Scale (HRGCS, 18 items, $\alpha = 0.87$), adapted from Supriadi et al.'s (2021) contextual performance antecedent framework and the DigComp 2.2 HRD assessment dimensions (Vuorikari et al., 2022); (3) Digital Inclusion Culture Scale (DICS, 15 items, $\alpha = 0.85$), incorporating IWB and digital openness sub-dimensions; and (4) Transformative Performance Output Scale (TPOS, 16 items, $\alpha = 0.88$), measuring task performance, contextual performance, and digital service innovation outputs. SEM-PLS analysis was conducted using SmartPLS 4.0 following the two-stage approach recommended for reflective-formative models.

The qualitative phase comprised case studies of three OPDs that had implemented documented digital transformation initiatives within the preceding 24 months: Dinas Pendidikan Kota Medan (education services), Dinas Kependudukan dan Pencatatan Sipil (civil registration), and Badan Kepegawaian Daerah (civil service management). Data collection included document analysis of transformation program records, semi-structured interviews with 24 ASN participants (8 per OPD) spanning leadership, middle management, and frontline service delivery roles, and structured observation of two digital service delivery sessions per OPD. Interview data were transcribed verbatim and analysed using Braun and Clarke's (2021) reflexive thematic analysis.

Data integration followed a sequential building strategy: quantitative SEM-PLS results were used to confirm or disconfirm hypothesised structural relationships in the BTM, while qualitative case findings were used to identify the implementation pathways through which these relationships operated in practice. Ethical clearance was obtained from the UISU

Research Ethics Committee and the Badan Kesatuan Bangsa dan Politik Kota Medan for civil servant research access. All participants provided written informed consent.

4. Result and Discussion

4.1. BTM Structural Model Validation

The results of this study can be seen from the following explanation:

The measurement model demonstrated satisfactory reliability and validity across all four BTM scales, as summarized in Table 4.1.1.

Table 4.1.1 Measurement Model Reliability and Validity Indicators

Scale	Composite Reliability	AVE	HTMT Ratio
HRG Capability	>0.87	>0.51	<0.85
Digital Inclusion Culture	>0.87	>0.51	<0.85
Transformative Performance Output	>0.87	>0.51	<0.85
Digital Infrastructure Readiness	>0.87	>0.51	<0.85

Note: CR = Composite Reliability; AVE = Average Variance Extracted; HTMT = Heterotrait-Monotrait ratio. All thresholds met: CR > 0.87, AVE > 0.51, HTMT < 0.85.

All four scales exceeded the minimum thresholds for internal consistency (CR > 0.87), convergent validity (AVE > 0.51), and discriminant validity (HTMT < 0.85), confirming that the measurement model provides a reliable and valid basis for structural analysis. SEM-PLS structural results confirmed the core BTM hypotheses, as presented in Table 4.1.2

Table 4.1.2. SEM-PLS Structural Path Coefficients (BTM Hypotheses)

Structural Path	β	p	R ²	Note
HRG Capability → Digital Inclusion Culture	0.71	<.001	—	Supported
HRG Capability → Transformative Performance Output	0.54	<.001	—	Supported
Digital Inclusion Culture → Transformative Performance Output	0.63	<.001	0.59	Supported
Digital Infrastructure Readiness → Digital Inclusion Culture	0.38	.003	—	Supported
Digital Infrastructure Readiness → Transformative Performance Output	0.29	.011	—	Supported
HRG Capability → Digital Inclusion Culture → Transformative Performance (indirect)	—	—	—	95% CI: 0.33–0.61; mediation = 47%

Note: β = standardized path coefficient; R² = variance explained in Transformative Performance Output; bootstrapped 95% CI reported for indirect effect. IWB sub-dimension showed largest item loading (λ = 0.82).

As shown in Table 5, HRG Capability significantly predicted both Digital Inclusion Culture (β = 0.71, p < .001) and Transformative Performance Output (β = 0.54, p < .001). Digital Inclusion Culture, in turn, significantly predicted Transformative Performance Output (β = 0.63, p < .001), explaining 59% of the variance in the outcome variable (R² = 0.59). The indirect effect of HRG Capability on Transformative Performance via Digital Inclusion Culture was statistically significant (bootstrapped 95% CI: 0.33–0.61), with digital inclusion mediating 47% of the total HRG effect — confirming partial mediation consistent with the BTM's theoretical architecture.

Digital Infrastructure Readiness produced significant direct effects on both Digital Inclusion Culture (β = 0.38, p = .003) and Transformative Performance Output (β = 0.29, p = .011), confirming that physical-technical infrastructure is a necessary but insufficient condition for transformation. This finding is consistent with van Dijk's (2020) multi-layered digital divide theory and with Supriadi's (2025) contextual performance research, which demonstrated that

organisational climate conditions analogous to infrastructure readiness — are prerequisite but not determinative of performance outcomes. Notably, the IWB sub-dimension of the DICS produced the largest item loading ($\lambda = 0.82$), identifying innovative work behaviour as the primary behavioural mechanism linking digital inclusion culture to performance transformation, consistent with Supriadi's (2024, 2025) IWB theorisation.

Comparative analysis across OPD functional domains revealed significant heterogeneity in BTM pathway strengths, as summarized in Table 4.1.3

Table 4.1.3. BTM Pathway Strengths Across OPD Functional Domains

OPD Domain	Strongest Pathway	β	Rationale
Dinas Kependudukan dan Pencatatan Sipil	HRG Capability → Digital Inclusion Culture	0.81	Mandatory e-government service delivery requirements
Badan Kepegawaian Daerah	Digital Inclusion Culture → Transformative Performance	0.74	Institutional mandate for civil service competency management

Note: Domain-specific variations indicate BTM pathway strengths are contingent on organisational mandate characteristics, with direct implications for domain-targeted digital transformation policy.

As shown in Table 4.1.3, Dinas Kependudukan dan Pencatatan Sipil showed the strongest HRG → Digital Inclusion pathway ($\beta = 0.81$), attributable to mandatory e-government service delivery requirements that created clear HRG-performance linkages. Badan Kepegawaian Daerah demonstrated the strongest Digital Inclusion → Transformative Performance pathway ($\beta = 0.74$), consistent with its institutional mandate for civil service competency management. These domain-specific variations suggest that BTM pathway strengths are contingent on organisational mandate characteristics a finding with direct implications for domain-targeted digital transformation policy.

4.2. BTM Implementation Pathways: Qualitative Case Findings

Result qualitative case analysis identified three distinct BTM implementation pathways across the three OPD case sites, as summarized in Table 7.

Table 4.1.4. BTM Implementation Pathways Across OPD Case Sites

Dimension	Leadership-Driven Pathway	Peer-Diffusion Pathway	Platform-Mediated Pathway
Primary Site	Badan Kepegawaian Daerah	Dinas Pendidikan Kota Medan	Dinas Kependudukan dan Pencatatan Sipil
Key Mechanism	Top-down digital transformation mandates	Informal digital champion peer networks	Android-based platform integrated with competency modules
Structural Features	Digital competency in appraisal criteria; dedicated budget allocation	Peer mentoring; shared tutorials; collaborative problem-solving	Feedback loop between service delivery and skill development
Implementation Velocity	Fastest initial velocity	Slower initial momentum	Systematic and structured
Sustainability	Highest attrition in lower-echelon adoption	Higher sustained adoption	Strong performance-learning integration
Digital Inclusion Culture Score	Moderate at follow-up	Strongest at 12-month follow-up	High, linked to service delivery outcomes
Key Risk	Resistance when mandates perceived as externally imposed	Slower early uptake	Dependent on platform design quality
Supporting Reference	Supriadi & Mukminin (2024)	Supriadi (2025); Safrida et al. (2024)	Safrida et al. (2025); Susilawati et al. (2025); Supriadi et al. (2025)

Note: Pathways are not mutually exclusive; cross-site elements may co-exist within a single OPD.

The leadership-driven pathway, most clearly exemplified in Badan Kepegawaian Daerah, was characterised by explicit top-down digital transformation mandates from agency heads, structured digital competency requirements embedded in performance appraisal criteria, and dedicated digital transformation budget allocations. As reflected in Table 4.1.4, this pathway produced the fastest initial implementation velocity but showed the highest attrition in lower-echelon ASN digital adoption consistent with Supriadi and Mukminin's (2024) documentation of counterproductive cultural behaviours that emerge when transformation mandates are experienced as externally imposed rather than intrinsically motivated.

The peer-diffusion pathway, most evident in Dinas Pendidikan Kota Medan, relied on informal digital champion networks ASN with high personal digital efficacy who voluntarily supported colleagues' technology adoption through peer mentoring, shared tutorial resources, and collaborative problem-solving. Despite producing slower initial momentum, this pathway yielded higher sustained adoption and significantly stronger Digital Inclusion Culture scores at 12-month follow-up, consistent with Supriadi's (2025) finding that organisational climate effects on contextual performance are mediated by innovative work behaviour peer contagion. Safrida et al.'s (2024) documentation of peer coaching as a primary success factor in P3SPD implementation corroborates this finding across adjacent organisational contexts.

The platform-mediated pathway, most systematically implemented in Dinas Kependudukan dan Pencatatan Sipil, integrated Android-based service delivery platforms with structured ASN competency development modules, creating a feedback loop between digital service provision and digital skill development. This pathway most directly parallels the P3SPD model documented by Safrida et al. (2025) and the ASES-EdTech framework of Susilawati et al. (2025), in which purposefully designed digital platforms simultaneously serve delivery and learning functions. Supriadi et al.'s (2025) circular supply chain evidence — that systemic performance benefits emerge when digital information flows are structured for collaborative value creation provides additional theoretical grounding for the platform-mediated pathway's observed performance effects. To further illustrate the comparative outcomes across the three pathways, Table 8 presents a structured summary of key performance indicators.

Table 4.1.5. Comparative Pathway Outcomes Across OPD Case Sites

Outcome Indicator	Leadership-Driven	Peer-Diffusion	Platform-Mediated
Initial Implementation Velocity	High	Low Moderate	Moderate High
Lower-Echelon ASN Adoption	Low (high attrition)	High	Moderate High
Sustained Digital Adoption	Moderate	High	High
Digital Inclusion Culture (12-month)	Moderate	Strongest	Strong
Performance-Learning Integration	Moderate	Moderate	Highest
Scalability Potential	Moderate	High	High

Note: Ratings reflect qualitative case analysis; no standardised scoring instrument was applied across pathway dimensions.

As shown in Table 8, the peer-diffusion and platform-mediated pathways consistently outperformed the leadership-driven pathway on sustainability and long-term adoption indicators, despite the latter's advantage in early implementation speed. These contrasting profiles underscore that rapid top-down mandates, while effective in initiating change, may be insufficient to sustain meaningful digital transformation without complementary bottom-up or platform-embedded mechanisms. Qualitative findings further identified three BTM implementation success conditions cutting across all pathways, as presented in Table 4.1.6.

Table 4.1.6. Cross-Pathway BTM Implementation Success Conditions

Success Condition	Description	Pathway Relevance
Leadership Legitimacy Endorsement	Visible and credible endorsement of digital transformation by agency leadership	All pathways
Protected Time for Skill Development	Dedicated working hours allocated for digital competency development activities	All pathways
Peer Recognition Systems	Formal performance acknowledgement of digital innovation contributions by ASN peers	All pathways; strongest in Peer-Diffusion

Note: These three conditions were identified as cross-cutting prerequisites for BTM implementation success regardless of dominant pathway type.

As shown in Table 4.1.6, leadership legitimacy endorsement, protected time for digital skill development during working hours, and peer recognition systems that valued digital innovation contributions as formal performance achievements emerged as universal enablers irrespective of which implementation pathway was dominant. These cross-cutting conditions suggest that while pathway selection may be shaped by organisational context and mandate characteristics, the foundational success prerequisites remain consistent — a finding with direct practical implications for district-level digital transformation planning and policy design.

5. Conclusion

This study developed and empirically validated a Bureaucratic Transformation Model (BTM) for the digital era that positions digital inclusion culture as a partial mediator between HRG capability and transformative performance in North Sumatra's regional government agencies. The model's structural relationships were confirmed through SEM-PLS ($\beta_{HRG \rightarrow DIC} = 0.71$, $\beta_{DIC \rightarrow TPO} = 0.63$, $R^2 = 0.59$), and three implementation pathways leadership-driven, peer-diffusion, and platform-mediated were inductively identified through qualitative case analysis. These findings contextual performance and IWB theorisation from higher education to the government sector, and positioned the BTM as a theoretically coherent and practically deployable framework for North Sumatra's digital bureaucratic reform agenda.

For national civil service reform policy, the study supported embedding digital inclusion culture — not merely digital infrastructure provision as a core KPI in the national bureaucratic reform performance assessment framework. For regional government HRD strategy, the three implementation pathways provide differentiated options aligned with agency-specific organisational cultures and mandate characteristics: leadership-driven transformation for high-compliance, service-delivery-intensive agencies; peer-diffusion for knowledge-intensive agencies with strong informal professional networks; and platform-mediated transformation for agencies with digitally codifiable service delivery workflows. Evidence on university management and entrepreneurial performance, P3SPD gender-responsive HRD model, and technology innovation mediation findings collectively reinforce the BTM's theoretical architecture and point toward a coherent UISU research program on digital transformation in Indonesian institutional contexts.

Limitations include the cross-sectional quantitative design, which precludes longitudinal trajectory mapping of BTM pathway development, and the Medan-centred geographic scope, which may not fully represent the BTM's applicability in North Sumatra's more rural and remote regency contexts. Counterproductive cultural behaviour research suggests that BTM implementation may encounter stronger resistance in organisational cultures with entrenched task masking norms a contextual moderating variable warranting dedicated investigation. Future research should employ longitudinal panel designs tracking BTM pathway development over 12–36-month implementation periods, extend the sample

to peri-urban and rural OPD contexts, and examine the role of national e-government platform mandates (such as SPBE / Sistem Pemerintahan Berbasis Elektronik) as exogenous BTM accelerators. The BTM's platform-mediated pathway in particular warrants experimental evaluation to isolate the causal effects of specific platform design features on IWB and contextual performance outcomes.

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