



RESEARCH ARTICLE

Strengthening Land Administration Governance Through Electronic Land Certificates for Bureaucratic Reform at The Medan City Land Office

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ABSTRACT

The implementation of land administration reforms through electronic land certificates presents a critical challenge in bridging the gap between normative legal frameworks and factual bureaucratic practice in Indonesia. This thesis examines the strengthening of land administration governance through electronic land certification at the Medan Land Office, with particular emphasis on its implications for bureaucratic reform. Employing socio-legal research methodology through qualitative inquiry, the study identifies a significant phenomenon termed "service duality," wherein public-facing service infrastructure appears modernised whilst backend data processing remains labour-intensive and manual-dependent. The research utilises a triadic analytical framework encompassing Radbruch's legal certainty theory, Soekanto's law effectiveness theory, and modernisation theory to analyse the disjuncture between law in books and law in action. Findings reveal that the implementation of the Minister of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) Regulation No. 3 of 2023 on Electronic Documents encounters substantial technical, organisational, and sociological impediments, including incomplete data validation, inter-agency coordination deficiencies, and persistent public skepticism regarding digital documentation. The thesis demonstrates that successful land administration digitalisation necessitates not merely technological substitution of physical certificates, but rather systemic transformation encompassing data integrity assurance, inter-sectoral institutional integration, and cultural-cognitive acceptance. The study proposes four strategic interventions: procedural digitalisation reform, establishment of a unified data reconciliation unit, cybersecurity fortification with blockchain adoption, and humanistic socialisation combined with fiscal incentives. These recommendations are calibrated to achieve substantive bureaucratic reform that delivers not only administrative efficiency but also equitable access to justice and enhanced investment certainty across Medan.

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Introduction

Digital transformation in land administration has engendered profound implications through the deployment of electronic systems integrating information technology, computational infrastructure, communication networks, and connectivity architectures (Habibi et al., 2025). This technological integration aims to effectuate substantive alterations in the operational modalities of land administration whilst simultaneously addressing multifarious challenges inherent to manual systems characterised by temporal inefficiency, susceptibility to errors, and bureaucratic complexity (Susmana, 2025). Within the Indonesian context, the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) has positioned itself as the vanguard institution in the digital transformation of public services within the land sector. This commitment manifests through an array of strategic policies designed to modernise comprehensive aspects of land administration, encompassing land rights registration through to the issuance of foundational land documentation (Masri & Hirwansyah, 2023).

The most salient initiative launched constitutes the policy framework governing the issuance of Electronic Land Certificates (Sertipikat Tanah Elektronik), regulated under Ministerial Regulation of Agrarian Affairs and Spatial Planning/Head of National Land Agency Number 1 of 2021 concerning Electronic Certificates, subsequently refined through Ministerial Regulation ATR/KaBPN Number 3 of 2023 concerning the Issuance of Electronic Documents in Land Registration Activities (Habibi et al., 2025). The implementation of electronic certificates endeavours to augment administrative efficiency in land administration whilst ensuring security and integrity of digital transactions through authentication mechanisms and confidentiality protocols employing electronic signatures, data encryption, and multilayered security systems supported by the State Cyber and Encryption Agency (BSSN) (Masri & Hirwansyah, 2023).

However, within the context of local implementation at Medan City Land Office, the execution of electronic certificate issuance policy continues to encounter substantive challenges pertaining to digital infrastructure readiness, public awareness, and inter-agency coordination (Restiti et al., 2025). The Medan City Land Office, as the technical implementing unit responsible for land administration at the municipal level, continues to demonstrate circumstances wherein land registration administrative processes have not yet fully implemented comprehensive digitalisation systems. Application documents and in-process documents at Medan City Land Office remain predominantly in analogue or printed format, despite Ministerial Regulation ATR/BPN Number 3 of 2023 mandating that land registration and land document issuance be conducted electronically (Syamsur, 2023).

This phenomenon indicates a discrepancy between normative regulations at the national level and factual implementation at local levels, a pattern similarly identified across various land offices throughout Indonesia (Syamsur, 2023). The implementation of electronic certificate policy since its promulgation in 2021 has not been fully executed across all Indonesian territories and remains in preparatory stages in numerous locations, attributable to several inhibitory factors including Human Resource readiness concerning information technology mastery capabilities and data validation encompassing both physical and juridical data that remain incomplete (Syamsur, 2023).

This problematic situation is exacerbated by the suboptimal implementation of electronically integrated one-stop administrative service systems, commonly recognised by the nomenclature Online Single Submission (OSS) or, within the land service context, may refer to integrated one-stop service mechanisms (Rafianti et al., 2024). Service systems of this nature, which have demonstrated efficacy in enhancing service quality across various other public sectors, remain unimplemented comprehensively at Medan City Land Office. Consequently, communities requiring land registration services continue to confront convoluted procedures, protracted waiting periods wherein land registration application processing duration still necessitates an average of 21 days utilising manual systems, and uncertainty within administrative processes (Susmana, 2025; Restiti et al., 2025).

The asymmetry in land certificate registration administrative service quality contributes significantly towards increased service duration and consequentially impacts the investment climate in Medan City (Syamsur, 2023). Investment, as one of the principal pillars of regional economic growth, depends heavily upon legal certainty over land ownership rights and facilitation of ownership

transactional processes (Masri & Hirwansyah, 2023). When land administration systems continue to operate manually with analogue documentation, risks of administrative errors, data duplication, and even potentiality for duplicate certificates escalate exponentially (Habibi et al., 2025).

Recent research demonstrates that when land administration systems successfully implement electronic certificates, efficiency increases significantly with processing time reducing from an average of 21 days to 10 working days and substantial decreases in land disputes (Susmana, 2025). Electronic certificates provide advantages comprising digital storage of physical and juridical data, thereby facilitating easier monitoring, verification, and enhanced transparency in land management (Masri & Hirwansyah, 2023). However, alternative research identifies that electronic certificate policy implementation remains confronted by significant technical challenges including data protection, uneven infrastructure, and necessitated regulatory updates to guarantee data security more comprehensively (Habibi et al., 2025).

This research is predicated upon the premise that comprehensive implementation of electronic land certificates at Medan City Land Office, accompanied by construction of integrated service systems oriented towards public satisfaction, constitutes a strategic pathway to strengthen legal certainty over land ownership, enhance land administration effectiveness, and ultimately create a more conducive investment climate for Medan City's economic growth. The research questions guiding this investigation encompass:

1. How is legal governance strengthening of land administration through electronic land certificates manifested at Medan City Land Office?
2. What is the effectiveness of electronic land certificate implementation towards bureaucratic reform at Medan City Land Office?
3. What concrete strategies should Medan City government undertake towards strengthening land administration governance in enhancing bureaucratic reform at Medan City Land Office?

Method

This research employs socio-legal research methodology, constituting a qualitative juridical approach investigating the dynamic relationship between normative legal provisions and their operational implementation within social contexts. The socio-legal paradigm, as articulated by Cotterrell (2024), transcends conventional doctrinal legal analysis by examining law not merely as autonomous normative text but as social phenomenon embedded within and shaped by societal structures, institutional practices, and cultural values. This methodological orientation proves particularly germane for analysing electronic land certificate implementation, wherein regulatory mandates encounter complex realities of bureaucratic inertia, technological infrastructure limitations, inter-agency coordination challenges, and diverse public responses ranging from enthusiastic adoption to sceptical resistance.

Research Design and Approach

The research adopts an interpretivist epistemological stance, recognising that understanding the effectiveness of electronic land certificate policy necessitates deep engagement with the subjective meanings, experiences, and interpretations of multiple stakeholder groups (Creswell & Poth, 2018). The study employs purposive sampling to select key informants representing diverse organisational positions and perspectives, including:

1. Officials from Medan City Land Office encompassing managerial and operational levels.
2. Officials from Regional Revenue Agency (Bapenda) Medan City responsible for land and building taxation.
3. Officials from One-Stop Integrated Investment and Services Agency (DPMPTSP) facilitating business licensing.
4. Property investors and developers as service users.
5. District heads (camat) possessing knowledge of socio-geographical data.
6. Community members as land registration service applicants.

Data Collection Techniques

Data collection employs triangulated methods to enhance validity and comprehensiveness:

1. Semi-structured interviews conducted with key informants to elicit detailed narratives regarding implementation experiences, challenges encountered, and perceptions of policy effectiveness.
2. Direct observation of service delivery processes, physical infrastructure, and human-system interactions at Medan City Land Office to identify discrepancies between official procedures and actual practices.
3. Document analysis encompassing examination of regulatory frameworks (laws, ministerial regulations, local regulations), official reports, administrative records, and archival materials to establish juridical-normative foundations and trace policy evolution

Data Sources

The research utilises both primary and secondary data sources. Primary data constitute information obtained directly from fieldwork through interviews, observations, and participatory engagement with research subjects. Primary data reflect factual portrayals of law implementation, compliance patterns, and interpretative processes within social practices. Within the socio-legal research framework, primary data manifest dynamic interactions between written legal norms (law in books) and societal values and behaviours in their field application (law in action). Secondary data encompass written sources relevant to research problems including legislation, court decisions, official institutional reports, antecedent research findings, and academic literature supporting legal analysis (Marzuki, 2017; Miles et al., 2020).

Data Analysis Technique

Data analysis employs qualitative descriptive analysis through a socio-legal research approach, exploring dynamic relationships between land law norms (Ministerial Regulation ATR/BPN No. 3/2023, No. 1/2021, No. 20/2021) and implementation realities at Medan City Land Office. The analytical process proceeds through three stages:

1. Data reduction involving classification, interpretation, and critical construal of primary data (interview results with Medan City Land Office stakeholders, Bapenda, DPMPSTP, business actors) and secondary data (legal documents, regulations, academic literature) to identify implementation patterns, structural impediments, and community responses towards land administration digitalisation policy.
2. Comparison of law in books and law in action examining discrepancies between written legal norms and field implementation practices to identify gaps between progressive regulatory frameworks and implementation realities that remain manual and unintegrated.

Inductive synthesis connecting empirical findings (experiences of BPN officials, investors, community members) with theoretical foundations (Radbruch's legal certainty theory, Soekanto's law effectiveness theory, legal modernisation theory) to generate holistic and contextual conclusions regarding the effectiveness of land administration governance strengthening through electronic certificates towards bureaucratic reform and investment enhancement in Medan City.

Results and Discussion

Service Infrastructure Transformation: Between Physical Modernisation and “Bureaucratic Hybridisation” Reality

Fieldwork observations at Medan City Land Office reveal a phenomenon characterised as “service duality”, wherein frontline service infrastructure exhibits ostensible modernisation through digital display systems, electronic queuing mechanisms, and contemporary physical facilities, yet backend operational processes remain substantially dependent upon manual data entry, physical document verification, and paper-based workflow management. This duality creates a superficial impression of comprehensive digitalisation to external observers and service users, whilst internal work processes perpetuate labour-intensive practices vulnerable to human error, temporal inefficiencies, and data integrity compromises.

Interview data from operational-level officials indicate that despite the existence of digital systems for electronic certificate issuance, the underlying data feeding these systems predominantly

originates from manual transcription of physical documents (warkah). This “digital mimicry” phenomenon, wherein digital outputs merely replicate manually processed inputs rather than constituting genuinely born-digital data, substantially undermines the purported efficiency gains and error reduction benefits theoretically attributable to electronic systems. The persistence of hybrid systems necessitates dual maintenance of both physical archives and digital repositories, generating redundant costs and spatial requirements whilst failing to realise the streamlining objectives articulated within Ministerial Regulation ATR/BPN No. 3 of 2023.

Data Integration Challenges: Tax Potential and Digital-Spatial Disparities

A critical impediment to seamless electronic certificate implementation concerns the inadequate integration between land administration data systems (managed by ATR/BPN) and local taxation systems (managed by Bapenda). Interview responses from Bapenda officials reveal that Land and Building Tax Object Numbers (NOP) utilised for Property Tax (PBB) and Land and Building Rights Acquisition Duty (BPHTB) frequently exhibit discordance with Land Parcel Identification Numbers (NIB) employed within the land registration system. This data asynchrony engenders practical complications wherein tax verification processes, constituting mandatory prerequisites for certificate issuance, experience protracted delays averaging 3-5 working days, substantially contributing towards overall service duration extension.

Furthermore, spatial data validation encounters technical complexities related to coordinate system incompatibilities and georeferencing inconsistencies between datasets produced by different surveying epochs employing variant geodetic reference frames. Officials from the Surveying and Mapping Section reported encountering frequent “coordinate offset” problems wherein legacy physical certificates contain spatial data recorded using older coordinate systems (e.g., Indonesian Datum 1974) whilst contemporary electronic systems employ WGS84 or Indonesian Geospatial Reference System 2013. Coordinate transformation processes, whilst technically feasible, introduce minor positional discrepancies that, although geodetically insignificant, generate confusion and dispute potential amongst neighbouring landowners operating under perceptions of absolute boundary fixity.

Societal Responses: Psychological Dualism and Digital Literacy Deficiencies

Community interviews and observations of public service interactions reveal a pronounced “psychological dualism” characterising societal attitudes towards electronic certificates. Whilst acknowledging abstract advantages of digital systems (efficiency, accessibility, reduced corruption potential), substantial proportions of respondents expressed persistent preference for tangible physical certificates as psychologically reassuring artefacts embodying ownership rights. This “paper fetishism” phenomenon, wherein physical materiality confers subjective legitimacy transcending abstract digital representations, constitutes a formidable cultural impediment towards wholesale electronic certificate adoption, particularly amongst elderly demographics and communities characterised by limited digital literacy.

District heads (camat) interviewed emphasised that prevailing public scepticism partly emanates from inadequate socialisation efforts failing to comprehensively communicate security mechanisms, legal equivalence, and practical advantages of electronic certificates to community stakeholders. The absence of culturally sensitive, linguistically accessible, and pedagogically effective public education campaigns has engendered information vacuums wherein rumours, misconceptions, and exaggerated security concerns proliferate unchecked, substantially impeding voluntary adoption rates.

Substantive Legal Analysis: Normative Aspirations versus Implementation Realities

Ministerial Regulation ATR/BPN No. 3 of 2023 articulates an unambiguous normative mandate for comprehensive electronic documentation across all stages of land registration processes, explicitly stipulating that application documents, processing documents, and output documents shall be produced, transmitted, and stored in electronic formats authenticated through certified electronic signatures. However, empirical observations reveal persistent reliance upon physical documentation throughout substantial portions of the registration workflow, with electronic systems functioning primarily as supplementary digital repositories rather than primary operational platforms.

This disjuncture between normative prescription (law in books) and operational practice (law in action) manifests the phenomenon Friedman (2019) conceptualised as the “legal system gap” wherein formal legal rules encounter friction, resistance, or transformation when traversing from normative abstraction into concrete social practices mediated by institutional structures, resource constraints, and cultural contexts. Within Medan’s context, this gap partly reflects insufficient transitional provisions within the regulatory framework, which mandated comprehensive digitalisation without adequately addressing legacy data migration challenges, infrastructural prerequisites, or capacity-building timelines necessary for effective implementation.

Structural Legal Analysis: Institutional Doubt and Sectoral Egoism

Structural analysis employing Friedman’s legal system framework reveals significant “institutional doubt” within BPN organisational culture regarding the reliability, security, and permanence of digital archives. Despite regulatory mandates, physical document archives (*warkah*) continue to be meticulously preserved as “master documents” following digitisation, indicating organisational reluctance to entrust land rights documentation exclusively to electronic systems. This institutional conservatism, whilst understandable given catastrophic consequences potentially attendant upon data loss or corruption, paradoxically undermines system efficiency and perpetuates resource-intensive dual documentation regimes.

Additionally, inter-agency coordination deficiencies attributable to “sectoral egoism” wherein institutional actors prioritise departmental prerogatives over collaborative integration, substantially impede the realisation of seamless data ecosystems envisioned within electronic land administration frameworks. Interviews with officials from multiple agencies revealed mutual attribution of responsibility for coordination failures, with each institution citing incompatible systems, divergent procedural requirements, or resource limitations as justifications for integration inadequacies. This fragmented landscape necessitates manual intermediation by service users and front-line officials to bridge informational discontinuities, fundamentally contradicting the integrated service philosophy ostensibly underpinning electronic governance initiatives.

Cultural Legal Analysis: Paper Fetishism and Literacy Disparities

Cultural analysis reveals profound “paper fetishism” within both bureaucratic and public spheres, wherein tangible physical documents retain symbolic and psychological significance transcending their functional informational content. For community members, particularly those from older generations or rural backgrounds, physical certificates represent culturally intelligible, sensorially verifiable, and spatially securable artefacts consonant with traditional conceptions of ownership documentation. Electronic certificates, conversely, constitute abstract digital constructs requiring technological mediation for access and verification, characteristics generating anxieties regarding accessibility, permanence, and authenticity amongst populations characterised by limited digital literacy or technological scepticism.

This cultural resistance is compounded by insufficient public education initiatives capable of effectively communicating the security architectures, legal equivalencies, and practical advantages of electronic systems in linguistically and culturally appropriate modalities. The resulting public comprehension deficit fosters environments wherein misinformation, exaggerated security concerns, and institutional distrust proliferate, substantially impeding voluntary adoption and generating persistent demand for parallel physical documentation even amongst service users ostensibly receiving electronic certificates.

Technical Impediments: Spatial Infrastructure and Cybersecurity Deficiencies

Social impediments encompass digital literacy deficits and institutional trust deficiencies within communities. Substantial demographic segments, particularly elderly populations, lower-income groups, and individuals from rural backgrounds, possess limited digital competencies, constraining their capacities to navigate electronic service platforms, comprehend digital documentation formats, or verify electronic certificate authenticity. This digital divide risks creating a two-tier land administration system wherein digitally literate populations access efficient electronic services whilst digitally marginalised groups remain dependent upon slower, costlier traditional channels, thereby exacerbating existing socioeconomic inequalities in access to justice and property rights security.

Moreover, generalised institutional distrust towards governmental digital systems, fuelled by high-profile data breach incidents, historical experiences of bureaucratic malfeasance, and inadequate transparency regarding data governance practices, engenders public scepticism regarding electronic certificate security, integrity, and permanence. This trust deficit substantially impedes voluntary adoption, with communities preferring familiar physical certificates perceived as less vulnerable to digital manipulation, system failures, or unauthorised access.

Organisational Impediments: Human Resource Capacity and Bureaucratic Resistance

Organisational impediments centre upon human resource capacity deficiencies and bureaucratic resistance dynamics. Many land office personnel, particularly those from senior cohorts, possess limited digital competencies and exhibit reluctance towards technological adoption attributable to comfort with established manual workflows, anxieties regarding skill obsolescence, or perceptions that digitalisation threatens discretionary authorities historically exercised within manual systems. Insufficient capacity-building investments exacerbate these challenges, with training programmes frequently characterised by inadequate duration, superficial technical coverage, and failure to address underlying attitudinal barriers towards technological change.

Additionally, organisational cultures emphasising risk aversion and procedural rigidity generate institutional inertias resistant to the procedural innovations and workflow reconfigurations necessitated by genuine digital transformation. This conservatism manifests through persistent adherence to manual verification practices even when digital alternatives exist, maintenance of redundant physical documentation systems, and hesitancy to delegate authorities to automated systems.

Social Impediments: Digital Literacy Deficits and Trust Crises

Fieldwork observations at Medan City Land Office reveal a phenomenon characterised as “service duality”, wherein frontline service infrastructure exhibits ostensible modernisation through digital display systems, electronic queuing mechanisms, and contemporary physical facilities, yet backend operational processes remain substantially dependent upon manual data entry, physical document verification, and paper-based workflow management. This duality creates a superficial impression of comprehensive digitalisation to external observers and service users, whilst internal work processes perpetuate labour-intensive practices vulnerable to human error, temporal inefficiencies, and data integrity compromises.

Interview data from operational-level officials indicate that despite the existence of digital systems for electronic certificate issuance, the underlying data feeding these systems predominantly originates from manual transcription of physical documents (warkah). This “digital mimicry” phenomenon, wherein digital outputs merely replicate manually processed inputs rather than constituting genuinely born-digital data, substantially undermines the purported efficiency gains and error reduction benefits theoretically attributable to electronic systems. The persistence of hybrid systems necessitates dual maintenance of both physical archives and digital repositories, generating redundant costs and spatial requirements whilst failing to realise the streamlining objectives articulated within Ministerial Regulation ATR/BPN No. 3 of 2023.

Comprehensive Procedural Digitalisation: Implementing “Born-Digital” Principles

To overcome inefficiencies attributable to bureaucratic hybridisation and dual workload burdens, ATR/BPN and specifically Medan City Land Office must undertake procedural revolution by implementing “Born-Digital” principles whereby land administration data is generated digitally from source rather than through post-hoc digitisation of physical documents. Implementation mechanisms include:

1. Mandating field surveyors to input measurement results real-time using encrypted tablets with GNSS satellite connectivity directly at surveying locations, eliminating manual survey drawings subsequently scanned or manually transcribed at offices.
2. Requiring notaries/Land Deed Officials (PPAT) to create electronic deeds (e-deeds) directly within integrated land systems using structured data formats (XML/JSON) readable by BPN systems, rather than creating paper deeds subsequently uploaded as scanned documents.

3. Providing applicants with self-upload access featuring AI-based automatic validation for preliminary completeness verification prior to physical office visits or further processing. Expected impacts encompass elimination of manual data re-entry chains constituting error and inefficiency sources, with physical document validation conducted solely once initially for legacy data historical reference, thereafter permanently closing physical archives for already-digital data.

Establishment of “Integrated Data Reconciliation Unit” for Cross-Sectoral Coordination

Addressing institutional doubt, sectoral egoism, and data integration deficiencies necessitates establishment of a permanent “Integrated Data Reconciliation Unit” comprising representatives from ATR/BPN Medan City, Bapenda, DPMPTSP, Dukcapil, and potentially banking sector representatives. This unit’s mandate encompasses:

1. Standardising data formats, metadata schemas, and interoperability protocols across participating agencies.
2. Developing and maintaining real-time data synchronisation mechanisms ensuring nib-nop concordance and eliminating verification delays.
3. Establishing unified dispute resolution mechanisms for data discrepancy adjudication.
4. Coordinating periodic data audits to identify and rectify systemic inconsistencies. Expected outcomes include transformation of fragmented data silos into cohesive informational ecosystems enabling seamless cross-agency data flows, substantially reducing service durations and enhancing data reliability.

Cybersecurity Fortification and Blockchain Technology Adoption

To address institutional doubt, overcome paper fetishism, and restore public trust regarding data security, BPN must elevate data security standards beyond current conventional practices. Short-term measures include implementing stringent Digital Audit Trails wherein every instance of data access, modification, or printing by any personnel is automatically logged (User ID, Timestamp, IP Address, access purpose) with logs subject to regular oversight preventing account misuse. Long-term strategies encompass adopting Blockchain technology for chain-of-title recording, ensuring land history data remains immutable and transparent across network nodes, thereby constituting a definitive response to judicial scepticism and public fears regarding duplicate certificates. Blockchain’s decentralised and transparent characteristics guarantee data integrity through cryptographic algorithms impossible to counterfeit, rendering electronic certificates “super-documents” with security exceeding physical certificates. Legal impacts include electronic certificates possessing evidentiary strength substantially surpassing paper documentation, as data integrity is algorithmically guaranteed rather than relying upon physical security measures vulnerable to conventional forgery techniques.

Humanistic Socialisation and Fiscal Incentive Strategies

Overcoming cultural resistance and digital literacy deficits necessitates comprehensive, culturally sensitive socialisation campaigns designed and delivered in collaboration with community leaders (traditional leaders, religious figures, neighbourhood heads). Socialisation content must transcend technical explanations to address emotional, psychological, and cultural dimensions of ownership documentation, demonstrating electronic certificate security, accessibility, and legal equivalence through concrete examples, testimonials, and hands-on demonstrations accessible to non-technical audiences.

Complementing educational initiatives, fiscal incentive structures can catalyse voluntary adoption, including:

1. Substantive fee discounts (20-30%) for applicants opting for electronic certificates.
2. Expedited processing guarantees (e.g., 5-day maximum) exclusively for electronic applications.
3. Simplified documentary requirements for electronic submissions leveraging automated inter-system data retrieval. These incentives reconfigure cost-benefit calculations favouring electronic adoption whilst maintaining voluntary choice respecting community preferences and digital readiness diversities.

Conclusions and Recommendations

research proffers the following conclusions:

Digital Transition Vulnerabilities: Electronic land certificate implementation at Medan City Land Office remains entrapped within a “half-hearted transition” phase. Whilst regulatory compliance with Ministerial Regulation ATR/BPN No. 3/2023 is ostensibly maintained, operational workflows remain substantially dependent upon manual data transcription from physical to digital formats. This condition engenders novel legal risks including human error potentialities compromising certificate data authenticity, whilst failing to deliver promised significant service acceleration.

Disconnected Data Ecosystems: The paramount impediment to electronic certificate service acceleration concerns not internal BPN factors but rather incompatibility and sluggishness within inter-governmental data ecosystems. Protracted population data verification (Dukcapil) consuming multiple days and taxation system validation rigidity (BPHTB) constitute principal bottlenecks negating rapid service targets. Absent direct, expeditious inter-system connectivity, electronic certificates merely accelerate printing processes whilst validation procedures remain temporally protracted.

Institutional and Public Trust Deficits: Persistent institutional doubt within BPN organisational culture regarding digital archive reliability, coupled with pronounced public scepticism regarding electronic certificate security and permanence, constitute formidable adoption impediments. These trust deficits partly reflect insufficient cybersecurity investment, inadequate transparency regarding data governance practices, and ineffective public education initiatives.

Legal-Cultural Disjunctures: Substantial discrepancies persist between progressive normative legal frameworks mandating comprehensive digitalisation and conservative cultural orientations valorising physical documentation. This disjuncture manifests through “paper fetishism” wherein tangible certificates retain symbolic significance transcending functional informational equivalence with electronic alternatives, generating persistent demand for physical documentation even amongst electronic certificate recipients.

Recommendations

To address identified impediments and realise electronic land certificate transformative potential, the following strategic recommendations are proffered:

For Medan City Land Office and ATR/BPN:

1. Implement comprehensive “born-digital” procedural reforms eliminating manual data re-entry workflows through mandatory digital data capture at source (field surveys, notarial deeds, applicant submissions).
2. Invest substantially in enterprise-grade cybersecurity infrastructures including intrusion detection systems, regular penetration testing, and comprehensive personnel security awareness training.
3. Establish permanent Digital Audit Trail systems with transparent public reporting (anonymised) to demonstrate data governance accountability and enhance institutional trustworthiness.
4. Develop long-term blockchain implementation roadmap for immutable chain-of-title recording, positioning electronic certificates as “super-documents” with evidentiary strength exceeding physical alternatives.

For Medan City Government and Inter-Agency Coordination:

1. Establish a permanent “Integrated Data Reconciliation Unit” comprising multi-agency representatives with authority to standardise data formats, implement real-time synchronisation protocols, and adjudicate data discrepancy disputes.
2. Mandate API-based inter-system integration enabling instantaneous cross-agency data verification, eliminating manual intermediation and multi-day validation delays.
3. Develop unified fiscal incentive frameworks (coordinated across Bapenda, DPMPSTP, BPN) rewarding electronic certificate adoption through fee discounts, expedited processing, and simplified documentary requirements.

For Community Socialisation and Public Trust Building:

1. Design and implement culturally sensitive, linguistically accessible public education campaigns delivered collaboratively with community leaders (traditional, religious, neighbourhood) addressing emotional, psychological, and cultural dimensions of ownership documentation.
2. Establish community technology centres providing hands-on training and assisted access to electronic land administration systems, bridging digital literacy gaps particularly for elderly and economically marginalised populations.
3. Implement transparent public reporting mechanisms (e.g., annual digital governance reports, publicly accessible system uptime and security incident statistics) to demonstrate accountability and enhance institutional trustworthiness.

For National Policy Development:

1. Develop comprehensive transitional regulations addressing legacy data migration timelines, infrastructural prerequisites, and capacity-building requirements, providing realistic implementation pathways rather than immediate comprehensive digitalisation mandates.
2. Establish national cybersecurity standards specifically calibrated for land administration systems, with mandatory compliance auditing and public certification to enhance system credibility.
3. Create enabling regulatory frameworks for blockchain-based land registries, addressing legal questions regarding decentralised architectures, cryptographic authentication mechanisms, and evidentiary status within judicial proceedings..

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