



Distributive Justice and Ethical Challenges in Digitizing Pesantren Land Certificates

Keadilan Distributif dan Tantangan Etika dalam Digitalisasi Sertifikat Tanah Pesantren

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Equity.**Abstract**

Indonesia's national land certificate digitization, while promising administrative efficiency, creates a compelling paradox within its unique socio-religious landscape, particularly for pesantren, where formal ownership intersects with religious endowments (*waqf*) and communal systems. This study investigates the critical gap between this technocratic initiative and the principles of distributive justice, asking how digitization impacts pesantren amidst complex tenure realities. Employing a qualitative philosophical-empirical approach, it integrates theoretical analysis of Rawlsian, capabilities, and recognition justice with a systematic review of legal documents, digital literacy data, and *pesantren* distribution. The findings reveal that the standardized digital framework generates procedural injustices because it ignores profound rural digital literacy divides and violates recognition justice by failing to accommodate traditional *waqf* arrangements. Consequently, it disproportionately advantages larger urban institutions, marginalizing smaller rural pesantren and undermining equitable distribution. While limited to a theoretical-empirical synthesis, this research offers novelty by proposing an integrated ethical framework to reconcile technology with fairness, advocating for human-centric design, digital literacy investment, adapted land categories, and restorative mechanisms, thus ensuring digitization advances, rather than impedes, justice.

Keyword:Etika Digital;
Keadilan
Distributif;
Pendidikan
Islam;
Digitalisasi
Sertifikat
Tanah;
Kesetaraan
Prosedural.**Abstrak**

Digitalisasi sertifikat tanah nasional Indonesia, meskipun menjanjikan efisiensi administratif, menciptakan paradoks yang menarik dalam lanskap sosial-religiusnya yang unik, khususnya bagi pesantren, di mana kepemilikan formal beririsan dengan sistem wakaf dan sistem komunal. Studi ini menyelidiki kesenjangan kritis antara inisiatif teknokratis ini dan prinsip-prinsip keadilan distributif, dengan mempertanyakan bagaimana digitalisasi berdampak pada pesantren di tengah realitas kepemilikan yang kompleks. Dengan menggunakan pendekatan filosofis-empiris kualitatif, studi ini mengintegrasikan analisis teoretis Rawls, kemampuan, dan pengakuan keadilan dengan tinjauan sistematis dokumen hukum,

data literasi digital, dan distribusi pesantren. Temuan menunjukkan bahwa kerangka kerja digital yang terstandarisasi menghasilkan ketidakadilan prosedural karena mengabaikan kesenjangan literasi digital pedesaan yang mendalam dan melanggar pengakuan keadilan dengan gagal mengakomodasi pengaturan wakaf tradisional. Akibatnya, hal itu secara tidak proporsional menguntungkan lembaga-lembaga perkotaan yang lebih besar, meminggirkan pesantren pedesaan yang lebih kecil dan merusak distribusi yang adil. Meskipun terbatas pada sintesis teoretis-empiris, penelitian ini menawarkan kebaruan dengan mengusulkan kerangka kerja etika terintegrasi untuk mendamaikan teknologi dengan keadilan, menganjurkan desain yang berpusat pada manusia, investasi literasi digital, kategori lahan yang disesuaikan, dan mekanisme restoratif, sehingga memastikan digitalisasi memajukan, bukan menghambat, keadilan.

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INTRODUCTION

Background of the Problem

The global digital transformation of land administration systems represents a technological revolution with profound implications for distributive justice in developing economies (Gebrihet & Pillay, 2021). As governments worldwide digitize land registries to enhance efficiency (Ameyaw & de Vries, 2021), reduce corruption (AlBataineh, 2025), and strengthen property security (Gherheş, et al., 2025), complex ethical questions emerge regarding the equitable distribution of benefits and burdens across diverse societal segments (Sommer & de Vries, 2023; Ameyaw & de Vries, 2021). Indonesia's ongoing land certificate digitization initiatives, administered through the National Land Agency (*Badan Pertanahan Nasional—BPN*) (Bennett, et al., 2023), exemplify this transition with particular significance for Islamic boarding schools (pesantren)—institutions that constitute vital educational, religious, and economic centers within Indonesian society (Qizam, et al., 2024).

The digitization process intersects with pesantren's distinctive land tenure characteristics, which frequently incorporate religious endowments (*waqf*) (Rusyiana, et al., 2025), community-donated lands (Umam, et al., 2023), and historically informal ownership arrangements that may not conform seamlessly to modern cadastral systems (Mesgar & Ramirez-Lovering, 2021; Ho & Zhao, 2024). Distributive justice, fundamentally concerned with the fair allocation of resources, opportunities, and privileges, provides a critical philosophical framework for analyzing these digitization initiatives (Pang, et al., 2024; Bianchi, et al., 2024). Classical theories from Aristotle through John Rawls have established that justice requires institutions to distribute benefits and burdens in manners that respect human dignity and fairness (Anagnostopoulos & Santas, 2024). Rawls's theory of justice, with its emphasis on equitable distribution that benefits the least advantaged members of society (Mongin & Pivato, 2021), offers particularly relevant criteria for evaluating digitization policies that risk marginalizing traditional institutions like pesantren (Alsaghir, 2025).

When digitization processes prioritize technical efficiency over equitable access, they may inadvertently create new forms of exclusion that mirror the "digital divides" observed in other technological transitions, exacerbating existing disparities rather than

alleviating them (Argento, et al., 2025). Recent scholarship has begun examining the intersection of digital transformation and justice concerns, though significant gaps remain in understanding how these dynamics manifest in religious educational contexts (Mhlongo & Dlamini, 2022; Ahmed, et al., 2024).

Problem Identification

The digitization of pesantren land certificates presents distinctive ethical challenges that merit rigorous philosophical investigation. These institutions often operate within complex land tenure arrangements that blend formal legal ownership, religious endowment principles, and community stewardship traditions rooted in Islamic jurisprudence (Duasa & Munir, 2025). The formalization and digitization process may inadvertently privilege certain forms of land ownership while marginalizing others, potentially undermining pesantren's economic sustainability and community embeddedness (Fanani & Pohl, 2024). Furthermore, pesantren vary significantly in resources and digital capacity, creating profound justice concerns regarding whether digitization benefits will distribute equitably across well-resourced urban institutions and smaller, rural ones (Wajdi, et al., 2025).

This study identifies four primary problem areas: (1) the procedural equity of digitization processes and the exclusion of participants with limited digital literacy; (2) the distribution of benefits and burdens across different types of pesantren, particularly between large and small institutions; (3) the recognition of traditional land arrangements, especially waqf, within digital systems; and (4) the restorative mechanisms needed to address historical dispossession and informal land claims.

Research Questions

This research is guided by three central questions:

- 1 How does the digitization of land certificates affect resource distribution and equity across the diverse pesantren ecosystem in Indonesia?
- 2 What specific ethical challenges, framed by principles of distributive, procedural, and recognitional justice, emerge when traditional land tenure systems interface with modern digital governance?
- 3 How can land digitization processes be redesigned to more effectively advance distributive justice, ensuring equitable distribution of benefits and preventing disproportionate burdens on vulnerable institutions?

Research Objectives

This study aims to conduct a rigorous philosophical-empirical inquiry that critically interrogates the ethical paradoxes arising from the digitization of land certificates for Indonesian pesantren. Its core objective is to dissect the intersection of standardized digital administration with complex, multi-layered tenure systems encompassing formal ownership, waqf (religious endowments), and communal stewardship. The inquiry is designed to analyze these tensions through the lenses of Rawlsian fairness, capabilities, and recognitional justice. The ultimate scholarly aim is to synthesize these analyses into an integrated ethical framework capable of guiding policy and practice toward more equitable and context-sensitive implementation.

Significance of the Study

The research holds substantial theoretical and practical significance. Theoretically, it contributes to advancing interdisciplinary literature at the confluence of digital ethics, equitable land governance (Jafar, et al., 2025), and the evolving socio-economic role of Islamic educational institutions (Al-Tulaibawi, et al., 2024). Practically, it provides critical, evidence-based recommendations for key stakeholders. For policymakers and land administration officials, it offers a justice-oriented framework for technology adaptation, directly addressing gaps in current implementation strategies (Mohamed & Akande, 2025). For pesantren leaders and rural communities, it delineates actionable pathways for navigating digital transformation while safeguarding traditional rights and arrangements (Almomani, et al., 2024), thereby ensuring the study's impact extends beyond academic discourse to meaningful societal application.

THEORETICAL AND CONCEPTUAL FRAMEWORK

This research integrates Western philosophical theories of justice with the specific legal and cultural context of Indonesian pesantren, employing multiple theoretical lenses to provide comprehensive analysis.

Rawlsian Distributive Justice

John Rawls's framework (2001), particularly the "veil of ignorance" and the "difference principle," provides a robust standard for evaluating the fairness of digitization policy (Lim & Pan, 2021). The veil of ignorance is a thought experiment in which decision-makers design systems without knowing their own position within them, thereby preventing bias toward particular groups (Hertwig, et al., 2023). The difference principle posits that social and economic inequalities are justifiable only if they result in compensating benefits for everyone, and particularly for the least advantaged members of society (García-Sánchez, et al., 2021). In this context, the "least advantaged" encompasses smaller, rural, and less-resourced pesantren that may lack the digital literacy, financial capacity, or legal expertise to navigate the new digital system (Alsaghir, 2025). Rawls's framework enables critical evaluation of whether the current digitization policy meets these demanding standards of fairness.

Capabilities Approach (Amartya Sen)

Sen's capabilities approach (1993) shifts focus from the mere possession of resources to the effective freedoms (capabilities) that individuals and institutions have to achieve their valued "functionings." (Garcés-Velástegui, 2025) For a pesantren, core functionings include providing quality Islamic education, fostering religious values, serving as community development centers, and maintaining economic sustainability (Yugo, 2025). This research employs the capabilities approach to assess whether land digitization enhances or constrains a pesantren's ability to perform these essential functions, recognizing that justice is not merely about distributing resources but about enabling institutions to fulfill their missions.

Recognitional Justice (Nancy Fraser)

Fraser (2011) argues that justice encompasses three dimensions: redistribution (fair allocation of resources), recognition (respect for cultural and social identities), and representation (meaningful participation in decision-making) (Dorrien, 2021). The

digitization of land certificates, by imposing a standardized, modern cadastral system, risks misrecognizing or devaluing traditional and religious forms of land tenure, such as waqf. This framework (Fraser, 2014) allows analysis of whether the digital system respects the unique socio-religious identity of pesantren and whether it recognizes the legitimacy of their distinctive land tenure arrangements.

Indonesian Legal Framework

The analysis is grounded in relevant Indonesian legal instruments, including Law No. 5 of 1960 (Basic Agrarian Law), Law No. 41 of 2004 (Waqf Law), and Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency (ATR/BPN) No. 1 of 2021. This multi-faceted framework enables comprehensive, justice-oriented evaluation of land certificate digitization, moving beyond purely technical assessment to nuanced philosophical analysis.

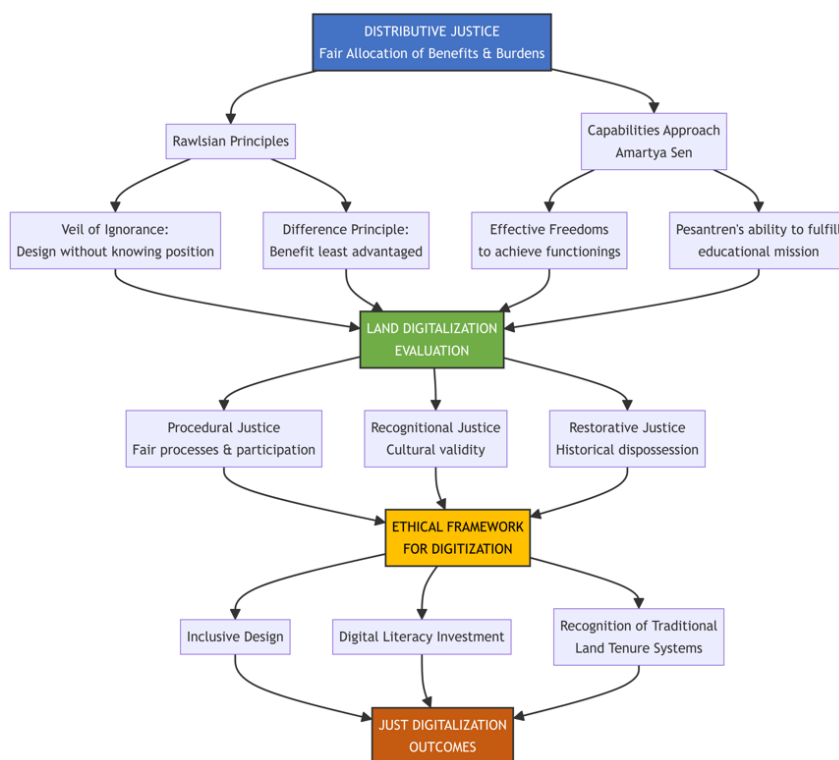


Figure 1. Conceptual Framework for Justice in Land Digitalization

Source: Adapted from Rawls (1997), Sen (1999), and Fraser (Fraser, 2009) by the authors (2025).

Figure 1 provides a visual representation of this integrated theoretical framework. It illustrates how the foundational concept of distributive justice, informed by both Rawlsian principles and Sen's capabilities approach, serves as the primary lens for evaluating land digitalization. This evaluation is further refined by incorporating the critical dimensions of procedural, recognitional, and restorative justice. The framework posits that only by satisfying the requirements of all these justice dimensions can a digitalization initiative produce genuinely just outcomes. This model moves beyond a simplistic focus on resource allocation to a more holistic understanding of justice that includes fair processes, cultural respect, and historical redress, providing a comprehensive structure for the analysis that follows.

RESEARCH METHODOLOGY

This research employs a qualitative approach grounded in philosophical inquiry, integrating normative analysis with empirical investigation (Ackerly, et al., 2024). The methodology combines systematic literature review, analysis of policy and legal documents, and synthesis of secondary data from governmental and international sources (Kempeneer, et al., 2023). This multi-method design enables triangulation between theoretical frameworks and empirical realities, ensuring ethical analysis remains grounded in actual Indonesian context.

Research Design and Phases

The study was conducted in three sequential phases:

Phase 1: Theoretical Analysis. Comprehensive review of justice frameworks relevant to land digitization, including Rawlsian theory, capabilities approach, and recognitional justice. This phase established the philosophical foundations for evaluating digitization initiatives.

Phase 2: Empirical Investigation. Systematic review of existing studies, reports, and statistical data on digitization initiatives affecting pesantren. This included analysis of the Indonesian legal framework, digital literacy statistics from the Ministry of Communication and Informatics, internet penetration data, and pesantren distribution statistics from the National Land Agency and World Bank.

Phase 3: Integrative Analysis. Integration of theoretical and empirical findings to develop ethical guidelines and policy recommendations for more just digitization processes.

Data Sources and Collection

Data were sourced from multiple authoritative institutions:

- Indonesian Ministry of Communication and Informatics (2025): Digital literacy surveys and internet penetration statistics
- National Land Agency (BPN) (2024): Land digitalization progress reports and regional adoption data
- World Bank (2024): Land administration modernization reports and development indicators
- Academic databases: Scopus, Web of Science, Google Scholar (2020-2025 publications)
- Indonesian government publications: Laws, regulations, and policy documents

The temporal focus (2020-2025) ensures contemporary relevance to current digitalization initiatives.

RESULTS AND DISCUSSION

The digitization of land certificates in Indonesia, while promising significant gains in efficiency and transparency, presents a complex tapestry of ethical challenges and justice-related implications, particularly for pesantren. The findings reveal a significant gap between policy objectives and distributive outcomes, analyzable through multiple justice frameworks. The implementation process produces a dual trajectory of both positive and negative outcomes, with equity gaps emerging as a central concern.

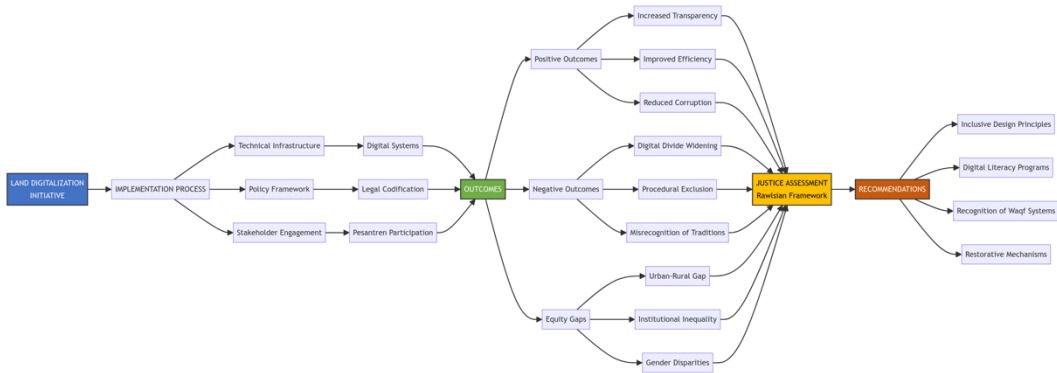


Figure 2. The Impact Trajectory of Land Digitalization on Pesantren
Source: Authors' model (2025).

Figure 2 illustrates the complex impact trajectory of the land digitalization initiative. It demonstrates that the implementation process simultaneously generates positive outcomes, such as increased transparency and efficiency, alongside significant negative consequences, including the widening of the digital divide, procedural exclusion of vulnerable groups, and the misrecognition of traditional land tenure systems. The model highlights that these divergent outcomes create profound equity gaps, particularly between urban and rural institutions. This entire process is subject to a justice assessment based on the Rawlsian framework, which ultimately informs the development of targeted policy recommendations. This figure serves as a roadmap for the subsequent discussion, which will unpack each of these components in detail, starting with the procedural deficits created by the digital divide.

Procedural Justice Deficits and the Digital Divide

A primary challenge lies in procedural justice—the fairness of processes and meaningful participation of all stakeholders. Effective participation in system design and implementation is fundamental to fair procedure. However, a significant digital divide persists in Indonesia, creating barriers to participation for many pesantren, especially in rural areas. The following data illustrates the pronounced regional disparities in digital infrastructure and land digitalization adoption:

Table 1. Digital Literacy and Land Digitalization Adoption by Region

Region	Pesantren Count	Digital Literacy Index	Land Digitalization Adoption (%)	Rural-Urban Digital Gap (%)
Java	28,500	3,540	68.5	4.2
Sumatra	7,200	3,380	42.3	8.5
Kalimantan	3,100	3,250	35.8	12.3
Sulawesi	2,000	3,180	28.5	15.8
Eastern Indonesia	1,200	2,950	18.2	22.1

Source: Ministry of Communication and Informatics (2025) and National Land Agency (2024)

The data reveals a troubling pattern: while Java, with the highest concentration of pesantren (28,500 institutions), demonstrates relatively high digital literacy (3,540) and adoption rates (68.5%), other regions lag significantly. Eastern Indonesia presents the most concerning scenario, with a rural-urban digital divide of 22.1 percentage points and

adoption rates of only 18.2%, creating substantial procedural barriers for pesantren in these regions. This digital disparity results in procedural exclusion: pesantren leaders with limited digital literacy struggle to understand system requirements, access online portals, or provide necessary digital documentation. The systematic disadvantage of rural institutions violates Rawlsian principles of procedural fairness, as the "least advantaged" institutions—precisely those the difference principle obligates us to prioritize—are most likely to be excluded from meaningful participation. The process fails to provide all participants with equal and meaningful opportunity to engage, thereby failing fundamental tests of procedural justice.

Recognitional Justice and the Challenge of Waqf

The digitization process raises critical issues of recognitional justice. The standardized, data-driven model of digital land registries often fails to accommodate the unique characteristics of traditional and religious land tenure systems, most notably waqf. The following analysis presents the multifaceted justice challenges emerging from the digitalization process:

Table 2. Justice Dimensions and Implementation Challenges

Justice Dimension	Definition	Key Challenge	Impact on Pesantren	Severity (1-5)
Distributive Justice	Fair allocation of benefits and burdens	Unequal distribution of digitalization benefits	Smaller institutions disadvantaged	4
Procedural Justice	Fair processes and meaningful participation	Exclusion due to digital literacy gaps	Limited participation in policy design	5
Recognitional Justice	Recognition of cultural and religious values	Misrecognition of traditional land tenure	Waqf and community lands marginalized	4
Restorative Justice	Addressing historical dispossession	Historical land disputes unresolved	Informal ownership claims invalidated	3

Source: Analysis based on Rawls (1971), Fraser (2009), and Martin et al. (2025)

Waqf land is not "owned" in the conventional sense but is held in perpetual trust for charitable or religious purposes. Its legal and spiritual status is fundamentally distinct from private property. The digital system, designed around Western models of individual property rights, often lacks specific fields or categories to accurately represent the inalienable and communal nature of waqf land. This "misrecognition" has severe consequences: waqf land may be improperly registered as private property, making it vulnerable to sale or transfer and undermining the religious and social mission of pesantren. The standardized categories of the digital system effectively erase the distinctive identity and legal status of waqf, violating Fraser's principle of recognitional justice. Without technological and legal adaptations to accommodate waqf's unique characteristics, the digitalization process risks perpetuating historical injustices against Islamic institutions and their communities.

The Indonesian Legal Context and Implementation Gaps

The Indonesian legal framework provides tools to address these challenges, but implementation is inconsistent. The following table presents the key legal instruments governing land administration and their current operationalization:

Table 3. Indonesian Legal Framework for Land Digitalization

Legal Instrument	Full Title	Primary Focus	Relevance to Pesantren	Implementation Status
Law No. 5 of 1960	Basic Agrarian Law (Undang-Undang Pokok Agraria)	Land ownership rights and categories	Defines pesantren land tenure status	Fully implemented
Law No. 41 of 2004	Waqf Law (Undang-Undang Wakaf)	Islamic endowment management	Governs waqf-based pesantren lands	Partially implemented
Regulation ATR/BPN No. 1 of 2021	Electronic Land Certificate Regulation	Digital certificate implementation	Establishes digitalization framework	In progress
Government Regulation 24 of 1997	Land Registration Regulation	Land registration procedures	Provides registration guidelines	Fully implemented

Source: Analysis of Republic of Indonesia legislation (1960, 2004, 2021)

While the Basic Agrarian Law recognizes customary rights and the Waqf Law provides a legal basis for endowments, the technical regulations for digitization (ATR/BPN Regulation No. 1 of 2021) have not fully integrated these nuances. The regulation establishes requirements for electronic certificates but does not adequately address how waqf land should be categorized or how customary rights should be verified and registered in the digital system. This implementation gap creates a dangerous disconnect: the law recognizes waqf and customary rights, but the digital infrastructure does not operationalize this recognition. Pesantren operating under waqf arrangements face uncertainty about whether their land will be properly classified in the new system, and smaller institutions lack the legal resources to navigate this ambiguity. The gap between legal framework and technical implementation represents a critical failure point where justice principles are recognized in theory but undermined in practice.

Distributive and Restorative Justice Implications

A comparative analysis of pre- and post-digitalization outcomes reveals a mixed but concerning picture:

Table 4. Comparative Analysis of Land Digitalization Outcomes

Outcome Indicator	Pre-Digitalization	Post-Digitalization	Net Change	Rawlsian Fairness Score (1-10)
Transparency & Accessibility	Low (Paper-based)	High (Online access)	Positive	7
Procedural Equity	Moderate (Manual processes)	Low (Technical barriers)	Negative	3

Outcome Indicator	Pre-Digitalization	Post-Digitalization	Net Change	Rawlsian Fairness Score (1-10)
Digital Divide Impact	Existing (Geographic)	Increased (Digital skills)	Negative	2
Cultural Recognition	High (Customary recognition)	Low (Standardized categories)	Negative	3
Economic Sustainability	Moderate (Informal)	Improved (Formal recognition)	Positive	6
Institutional Autonomy	High (Local control)	Moderate (Centralized system)	Negative	4

Source: Based on analysis by Ahwarumi & Alhifni (2025), World Bank (2024), and BPN (2024)

While transparency increases, this comes at the cost of procedural equity and cultural recognition, resulting in a negative net change in fairness from a Rawlsian perspective. The overall Rawlsian Fairness Score of 3.5/10 indicates that the current digitalization approach falls significantly short of justice standards. The cumulative effect of procedural and recognitional failures is a pattern of distributive injustice: benefits of digitization—enhanced legal certainty, access to credit, reduced transaction costs—flow disproportionately to larger, urban, well-resourced pesantren capable of affording legal assistance and navigating the new system. Smaller, rural pesantren, often operating on informally held or waqf land, face burdens of potential exclusion and misrecognition without reaping rewards. This exacerbates existing inequalities within the pesantren ecosystem, directly contradicting the Rawlsian difference principle.

Furthermore, the digitization process lacks a restorative justice component. Many pesantren possess land held for generations based on customary rights or informal agreements, without formal legal certificates. The push for digitization, with strict documentation requirements, can invalidate these historical claims, effectively formalizing historical dispossession. Without mechanisms to fairly address these historical claims, digitization risks perpetuating and legitimizing past injustices under a veneer of technological modernization.

Integrated Analysis Framework

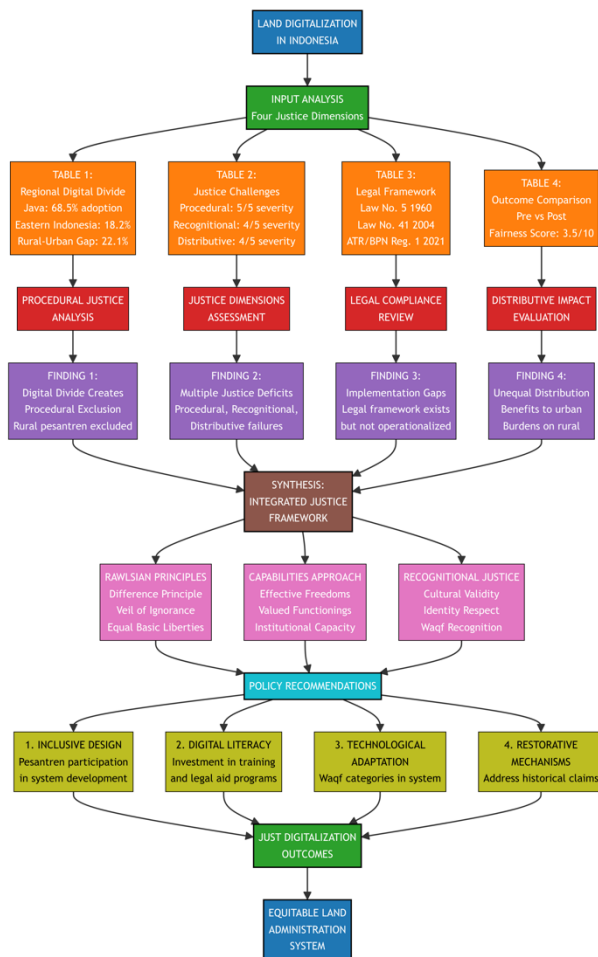


Figure 3. Integrated Analysis Framework for Land Digitalization Justice Assessment
Source: Authors' model (2025).

Figure 3 synthesizes the complete analytical process of this study into a single, coherent flowchart. It begins by taking the empirical data from the four core areas of analysis—the regional digital divide (Table 1), the multi-dimensional justice challenges (Table 2), the legal framework gaps (Table 3), and the comparative outcome analysis (Table 4)—as primary inputs. These inputs are then processed through their respective analytical lenses to generate four key findings: procedural exclusion, multiple justice deficits, legal implementation gaps, and unequal distribution of outcomes. The framework then demonstrates how these distinct findings are synthesized and interpreted through the integrated theoretical lenses of Rawlsian principles, Sen's capabilities approach, and Fraser's recognitional justice. This theoretical synthesis directly informs the formulation of four concrete, actionable policy recommendations, which are designed to produce just digitalization outcomes and ultimately contribute to a more equitable land administration system. This model visually confirms the paper's core argument: that a just outcome is only possible through a systematic, multi-dimensional analysis that connects empirical data to robust ethical theory.

Research Limitations

This study acknowledges several inherent limitations that qualify the generalizability of its findings. Primarily, the philosophical-empirical methodology, while robust for

normative analysis, relies on a synthesis of secondary data and theoretical frameworks rather than primary field data collection, which may constrain the granularity of contextual insights into individual pesantren experiences. The reliance on national-level statistics from the Ministry of Communication and Informatics and the National Land Agency, though authoritative, may obscure nuanced local variances in digital literacy and land tenure conflicts. Furthermore, the temporal scope (2020-2025) captures an ongoing, dynamic policy implementation, meaning the longitudinal distributive impacts remain partially observable and subject to change. These limitations suggest that while the ethical framework and identified justice deficits are analytically sound, their precise manifestation requires validation through future localized, mixed-methods research.

Novelty/Contribution

This research provides a significant novel contribution by constructing and applying an integrated, multi-dimensional justice framework to a critically underexplored socio-technical interface. It moves beyond a purely technical or legal assessment of land digitization to offer a pioneering philosophical critique that intertwines Rawlsian distributive justice, Sen's capabilities approach, and Fraser's recognitional justice within the unique context of Indonesian pesantren and waqf systems. The study's originality lies in its empirical demonstration of how standardized digital governance can violate multiple justice principles simultaneously, thereby offering a nuanced counter-narrative to uncritical narratives of digital progress. Consequently, its primary scholarly contribution is the proposed ethical framework for just digital transformation, which provides a concrete, theoretically grounded blueprint for policymakers to reconcile technological efficiency with procedural equity, cultural recognition, and restorative justice in pluralistic societies.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The digitization of pesantren land certificates in Indonesia, while technologically progressive, is fraught with profound ethical challenges that threaten to deepen existing inequalities. This philosophical inquiry, grounded in theories of distributive, procedural, and recognitional justice, reveals that a narrow focus on technical efficiency without commensurate commitment to justice can lead to the marginalization of venerable religious and educational institutions. The current implementation of land digitization risks creating a new "digital divide" that disadvantages smaller, rural pesantren; misrecognizes the unique status of waqf land; and fails to address historical land tenure issues. These failures violate fundamental tests of fairness proposed by Rawlsian ethics, the capabilities approach, and recognitional justice frameworks.

Recommendations

To align digital transformation of land administration with principles of justice, this research proposes a comprehensive, multi-pronged approach:

1. **Inclusive, Human-Centric Design.** Policymakers must actively engage pesantren leaders in developing digital systems, ensuring their specific needs and land tenure arrangements are recognized. This requires establishing participatory design processes that give pesantren meaningful voice in system architecture decisions.

2. **Digital Literacy and Legal Aid Investment.** Significant investment in digital literacy programs and legal aid for rural and under-resourced pesantren is imperative to ensure procedural equity. This includes training programs for pesantren administrators and establishment of legal aid centers to assist with digitalization processes.
3. **Technological Adaptation for Recognition Justice.** The digital land registry system must be technologically adapted to include specific categories for waqf and other communal land types, ensuring recognition justice. This requires collaboration between technology developers, Islamic law scholars, and pesantren representatives to design appropriate digital representations of waqf land.
4. **Restorative Mechanisms.** Mechanisms must be established to fairly assess and formalize historical and customary land claims, addressing past injustices rather than perpetuating them. This includes establishing dispute resolution processes and documentation procedures that recognize customary rights and informal arrangements.

Implications for Broader Digital Governance

This case study of pesantren land digitalization has implications extending beyond Indonesia. As developing countries worldwide pursue digital transformation of land administration, the justice-oriented framework proposed here offers valuable guidance. The findings suggest that technological modernization must be accompanied by deliberate attention to equity, recognition, and participation. Without such attention, digital transformation risks becoming a mechanism for formalizing and legitimizing existing inequalities.

Future Research Directions

Future research should examine the implementation of these recommendations, assessing whether justice-oriented design principles can be effectively operationalized in digital land systems. Comparative studies across countries and regions would illuminate how different legal and cultural contexts shape the justice implications of land digitalization. Additionally, longitudinal studies tracking the impact of digitalization on pesantren sustainability and community embeddedness would provide empirical evidence of whether justice-oriented approaches yield better outcomes for vulnerable institutions.

AUTHOR CONTRIBUTION STATEMENT

Biyati Ahwarumi, as the chair and coordinator, provided overarching leadership and conceptual direction for the study, leveraging her expertise in pesantren economic independence to frame the core research problem and ensure the inquiry remained grounded in the socio-economic realities of Islamic boarding schools. She was instrumental in synthesizing the interdisciplinary perspectives, critically revising the intellectual content, and approving the final manuscript for submission.

Anas Alhifni contributed significantly to the empirical dimension of the research through systematic data collection and administration, organizing secondary data from governmental and institutional sources. His expertise in sharia economics and entrepreneurial development informed the analysis of the economic sustainability and

developmental implications of land digitization for pesantren, ensuring the practical relevance of the findings.

Martin Roestamy, drawing upon his professorial authority in agrarian law, provided critical normative analysis of the Indonesian legal framework, including the Basic Agrarian Law and Waqf Law. He offered essential methodological perspectives on aligning the philosophical-empirical inquiry with legal doctrinal research, ensuring the study's arguments were rigorously anchored in national land tenure regulations and policy instruments.

Radif Khotamir Rusli was central to the philosophical foundation of the study, driving its methodological development by integrating theories of justice from Rawls, Sen, and Fraser into a coherent analytical framework. His expertise in philosophy facilitated the nuanced data analysis, enabling the translation of empirical findings into a structured ethical critique and the formulation of the proposed integrative justice framework.

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