Towards a Transdisciplinary Governance of Artificial Intelligence in Africa

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Abstract

The governance of artificial intelligence (AI) in Africa faces competing pressures from demands for regulatory intervention alongside concerns about institutional capacity, innovation costs, and economic vulnerability. Debates surrounding algorithmic discrimination, biometric surveillance, and extractive data practices by global platforms have sharpened questions about the appropriate roles of states, markets, and civil society in governing AI systems. Yet existing governance scholarship tends to address these questions through either ethical principles or state-centric regulatory frameworks, leaving a significant analytical gap where law and technical design intersect.

This article introduces legal-technical governance as an analytical framework for examining Africa's emerging AI regulatory landscape. Distinguishing governance from regulation, the article argues that AI governance in Africa is already distributed across data protection statutes, fintech guidelines, cybersecurity frameworks, and content moderation policies imposed by global platforms, making a broader, systems-level analytical tool both necessary and timely. Legal-technical governance foregrounds the co-constitutive relationship between legal norms and technical operations, including data labelling, model training, and algorithmic auditing. It accounts for the various actors shaping AI outcomes, from multinational technology firms to standards bodies and affected communities.

To examine the gaps where legal frameworks and technical systems diverge, the article draws on Dooyeweerd's modal aspects as a philosophical lens. Applied to African AI governance domains, this framework reveals how institutional fragmentation, infrastructural dependency, and global platform dominance undermine state-centred regulatory models. The article concludes by advancing legal-technical governance as a productive framework for scholarship and policymaking at the intersection of law, technology, and development in Africa.

Keywords

Legal-technical AI; transdisciplinary governance; artificial intelligence in Africa.

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1 Introduction

Recent developments on the African continent mirror global debates about the desirability, efficiency, and legitimacy of regulating rapidly advancing technologies including artificial intelligence (AI). Concerns about regulatory overreach, threats to innovation, institutional weakness, and the cost of compliance have fuelled arguments in favour of market-led governance and self-regulation, echoing positions taken by some industry actors in Europe and Silicon Valley.[1] In the context of Africa, these concerns intersect with longstanding anxieties about regulatory capacity, infrastructural deficits and economic precarity. Nevertheless, controversies surrounding algorithmic discrimination, biometric surveillance, fintech failures and data extraction practices carried out by global technology platforms have re-centred questions about the appropriate roles of the state, markets, civil society and international actors in AI governance.[2] These developments create fertile ground for re-examining governance frameworks beyond narrow regulatory or ethical paradigms, suggesting a need for a more comprehensive analytical framework or regulatory mechanism that can account for the deep interaction between legal and technical systems.

As AI systems become embedded in digital economies, governance frameworks increasingly confront debates about their efficiency and legitimacy. Governance is a contested concept, invoked across diverse disciplines to describe how organisations, networks and institutions steer their activities and coordinate collective action. In essence, governance refers to "the processes by which human organisations, whether private, public, or civic, steer themselves".[3] Governance encompasses "systems of rule … designed to ensure safety, prosperity, coherence, stability and continuance".[4] Multiple definitions of governance exist, ranging from democratic governance to network governance and "new governance". While these existing concepts of governance emphasise hierarchy, markets, or decentralised networks, the generic definition is useful because

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1 Roski *et al* 2021 *Journal of the American Informatics Association* 1583-1584; Campos "Necessary Cognitive Turn" 129; Currie *et al* 2025 *Journal of Information Technology* 239; Marchant, Tournas and Gutierrez 2020 *Jurimetrics* 5-8.

2 Nyabola *Digital Democracy.*

3 Quoted in MacDonald *Governance of Health Research* 22.

4 Rosenau "Governance in the Twenty-first Century" 14.

it accommodates both state-centric and distributed forms of authority, an essential flexibility when analysing AI ecosystems characterised by multinational technology firms, weak regulatory oversight and diverse technical actors.

Governance and regulation are often used interchangeably, but they represent distinct, though highly intertwined, concepts crucial for understanding the management of complex domains like AI. Regulation, broadly understood, involves attempts, intentional and structured, to influence or control behaviour. Specifically, regulation can be seen as a codified mechanism of governance, typically involving legally binding rules, standards and oversight imposed by an authoritative body (like a state or international organisation). Classical accounts treat regulation as a state-driven command-and-control activity backed by legal sanctions.[5] Modern governance scholarship recognises a wider family of regulatory modalities including co-regulation, self-regulation, market regulation, standards bodies, and algorithmic rule-making embedded in digital infrastructures.[6] In African AI contexts, regulation is already distributed across data protection statutes, fintech guidelines, cybersecurity frameworks, procurement standards, and content moderation policies imposed by global platforms. This blurring of roles reinforces the value of treating regulation as one instrument within the broader field of governance, rather than as synonymous with it.

Studying AI from a governance perspective is not new. Indeed, a substantial and fast-growing body of literature now examines the political economy, ethical implications, data infrastructures and institutional responses to AI systems globally.[7] Yet, as highlighted in continental dialogues and recent policy debates such as those on the European Union's (EU's) *Artificial Intelligence Act*,[8] a vacuum persists in understanding and implementing legal-technical governance, that is, governance that analytically integrates legal concepts, regulatory tools and the technical architecture of machine-learning systems.[9] While existing work tends to focus on ethics, high-level principles or state-centric regulation, very little scholarship examines how law and technical design co-constitute AI governance in African contexts. This article begins to address that vacuum by articulating legal-technical

5 Majone 1994 *West European Politics.*

6 Abbott and Snidal "Governance Triangle".

7 Floridi and Cowls "Unified Framework of Five Principles".

8 Sousa e Silva 2025 *Journal of Intellectual Property, Information Technology and Electronic Commerce Law* 36; Justo-Hanani 2022 *Policy Sciences*; Gille, Tropmann-Frick and Schomacker 2024 *Internet Policy Review*.

9 Buitrago-Perez *et al* 2025 *Jornadas Nacionales de Investigación en Ciberseguridad* 5; Alboaie, Cuomo and Alboaie 2022 *Lucrări Ştiinţifice, Seria Agronomie* 239; Selvadurai 2025 *IJLIT* 13-14.

governance as an analytical framework suitable for examining Africa's emerging AI regulatory systems.

This article is structured in five subsequent sections designed to develop and apply the legal-technical governance framework to AI in Africa. Section 2 articulates the legal-technical governance framework, establishing its rationale, core concepts and the goals it seeks to achieve in modern regulatory environments. Section 3 then examines the pervasive legal-technical governance gap, identifying specific manifestations of this divergence such as legal provisions with embedded technical concepts and the corresponding need for hybrid expertise that necessitate a new approach. Section 4 introduces Dooyeweerd's modal aspects[10] as an analytical lens, proposing this philosophical perspective as a robust tool for rigorously examining and categorising the observed gaps identified in the preceding section. Section 5 presents an applied analysis of these gaps in African AI governance domains, providing illustrative sketches to demonstrate how the legal-technical perspective uncovers weaknesses across real-world policy and governance efforts. Section 6 concludes the piece.

Applying governance as an analytical framework for AI allows for the examination of the constellation of actors, technical infrastructures, regulatory instruments and institutional practices that jointly shape AI outcomes. In this article the specific focus is on *legal-technical governance* – a hybrid approach that foregrounds both the legal norms governing AI and the technical operations through which AI systems act in the world. This framework recognises the multiplicity of actors (states, private technology firms, standards bodies, civil society, and affected communities) and acknowledges that control over AI is exercised through both legal rules and technical processes such as data labelling, model training and algorithmic audit systems. This positioning enables the systematic examination of how governance manifests in Africa, where institutional fragmentation, power asymmetries, infrastructural dependency and global platform dominance complicate state-centred regulatory models. Legal-technical governance accordingly incorporates classical legal regulation alongside disciplinary mechanisms embedded in code, datasets and automated decision processes.

2 Articulating the legal-technical governance framework

The term "governance" is often used loosely in AI policy circles, sometimes as a proxy for ethics, sometimes as shorthand for regulation. Yet the proliferation of AI ethical principles and their limited implementation has led many scholars to question the efficacy of ethics-only approaches in

10 Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 1-4.

addressing harm.[11] The legal-technical governance lens provides a more comprehensive and analytically robust framework. First, the challenges arising from AI in Africa, including data colonialism, algorithmic discrimination, the opacity of biometric systems, and dependence on foreign cloud infrastructures are fundamentally governance problems. They concern the organisation of authority, responsibility and control across legal, institutional and technical domains. Second, governance as an analytical framework allows the examination of the relationships between actors such as states, multinational firms, civil society, technical experts, and affected communities, and how these relationships shape AI outcomes. Third, legal-technical governance enables not merely descriptive analysis but also normative inquiry: What should AI governance aim to achieve? Who should exercise authority? What technical and legal instruments are necessary, legitimate and feasible?

In articulating this framework, it is acknowledged that several alternative approaches such as ethical analysis, human rights frameworks, economic regulation and technological risk assessment can also illuminate aspects of AI governance. However, the legal-technical approach provides a uniquely systemic perspective that captures both the legal conditions and the technical operations that jointly shape AI outcomes. Other analytical frameworks such as human rights, economics, ethics, technological risk assessment etc. offer valuable insights but lack the systemic reach of governance. Ethical guidelines are non-binding, which means they lack the enforcement power necessary to discourage harm and misconduct. They also fail to clearly define the different roles and responsibilities of a government and the private sector. As Selvadurai notes, most AI guidelines focus only on the application of AI, neglecting the entire life cycle and the risks that can arise earlier in the development process.[12] A human rights approach suffers the same fate as that of ethical guidelines. The development of human rights frameworks predates the digital era, which means they cannot fully regulate the novel harms presented by AI systems. Moreover, Fukuda-Parr and Gibson observe that while human rights, values and ethical principles are significant, they can only be relegated to guiding principles.[13] However, contemporary AI governance frameworks such as the EU *AI Act* and the Organization for Economic Co-operation and Development (OECD) *Recommendation on Artificial Intelligence* demonstrate attempts to operationalise ethical AI principles in ways that reinforce and could give practical effect to human rights protections in the context of AI systems. A legal-technical governance approach integrates

11 Munn 2023 *AI and Ethics* 870-872; Morley *et al* 2021 *Minds and Machine* 242; Rességuier and Rodrigues 2020 Big *Data & Society* 2.

12 Selvadurai 2025 *IJLIT* 10.

13 Fukuda-Parr and Gibbons 2021 *Global Policy* 34.

these perspectives while offering a holistic lens that captures the interplay between law, institutions and technical infrastructures. As such, it is particularly well-suited to analysing AI in African contexts, where governance arrangements remain emergent, fragmented and deeply influenced by global technological power shifts and asymmetries. This article draws on this framework to examine domains such as intellectual property (IP), surveillance, financial services, data governance, and algorithmic fairness, and explores how African scholars have begun to apply legal-technical approaches to address these gaps.

Law remains a foundational component of governance, but the relationship is neither exclusive nor exhaustive. Under a positivist account, law comprises enforceable rules articulated by state institutions, often with sanctions attached.[14] However, in digital environments law interacts with technical architectures, with platform policies that mimic quasi-legal norms, and with soft-law instruments such as ethical guidelines or industry standards.[15] For Africa, where formal legal institutions often exhibit resource constraints, fragmentation or slow responsiveness, law plays a crucial but not singular role in shaping AI governance. The legal-technical governance framework therefore treats law as a core mechanism within governance, while also recognising that regulatory functions are also performed through technical standards, data infrastructures, algorithmic protocols and non-state institutions. This broader orientation mirrors contemporary realities such as the influence of platform content policies on political discourse in Kenya[16] or the impact of biometric vendor standards on policing practices in South Africa.[17]

In applying any analytical framework to AI governance, it is essential to identify the goals toward which governance is directed. While AI presents unique technical properties such as opacity, adaptivity and scale, it shares with other regulated domains the need to ensure social benefit, to mitigate harm, and to maintain public trust. Drawing on African scholarship and global governance principles,[18] the normative goals of legal-technical AI governance can be summarised as follows: ensure socially beneficial AI by supporting innovation that advances public welfare, development and

14 Hart *Concept of Law*.

15 Lessig *Code.*

16 Maweu 2019 *African Journalism Studies* 62-76.

17 Turner and Khan 2024 https://lrc.org.za/docs/the-use-of-facial-recognition-technology-in-south-africa-2/.

18 OECD 2024 https://www.oecd.org/en/topics/ai-principles.html; UNESCO 2022 https://www.unesco.org/en/articles/recommendation-ethics-artificial-intelligence 20-23; Nwangele *et al* 2021 *International Journal of Multidisciplinary Research and Growth Evaluation* 313-314; AU 2024 https://au.int/en/documents/20240809/continental-artificial-intelligence-strategy 28.

economic inclusion;[19] minimise risks and protect rights, particularly in areas prone to discrimination, surveillance or exclusion;[20] preserve public trust in AI systems and institutions responsible for AI oversight;[21] promote accountability and transparency across both legal and technical layers;[22] and ensure equity and fairness, especially given the socio-technical vulnerabilities present in many African contexts.[23]

These goals correspond to broader governance values including effectiveness, legitimacy, clarity, comprehensiveness, efficiency, adequacy, uniformity and simplicity. In AI governance, effectiveness demands that legal and technical mechanisms genuinely reduce risks such as algorithmic discrimination or data exploitation.[24] Legitimacy requires inclusive processes, transparent decision-making, and sensitivity to local socio-political contexts.[25] Clarity and uniformity call for coherent regulatory definitions of key technical terms such as "algorithmic transparency" or "bias" that align with technical realities.[26] Adequacy and comprehensiveness require that governance mechanisms cover the full lifecycle of AI systems, from data collection to deployment.[27] Efficiency and simplicity demand that processes such as AI audits or data governance

19 Gwagwa *et al* 2020 *African Journal of Information and Communication* 2; Nwangele *et al* 2021 *International Journal of Multidisciplinary Research and Growth Evaluation* 313-314; OECD 2024 https://www.oecd.org/en/topics/ai-principles.html; Effoduh, Akpudo and Kong 2024 *Data and Policy* 4.

20 Green Digital Working Group 2016 https://felixreda.eu/wp-content/uploads/2017/02/Green-Digital-Working-Group-Position-on-Robotics-and-Artificial-Intelligence-2016-11-22.pdf 4; Pasipamire and Muroyiwa 2024 *Frontiers in Research Metrics and Analytics* 5; Nwangele *et al* 2021 *International Journal of Multidisciplinary Research and Growth Evaluation* 313-314; OECD 2024 https://www.oecd.org/en/topics/ai-principles.html; Effoduh, Akpudo and Kong 2024 *Data and Policy* 6.

21 Eke *et al* "African Perspectives of Trustworthy AI" 8-10; Ndiaye "Building Trustworthiness" 56.

22 UNI Global Union 2017 https://uniglobalunion.org/wp-content/uploads/uni_ethical_ai.pdf 6-7; Jaldi 2023 https://www.policycenter.ma/sites/default/files/2023-07/PP_13-23%20%28Jaldi%20%29.pdf 20-22; Nwangele *et al* 2021 *International Journal of Multidisciplinary Research and Growth Evaluation* 313-314.

23 AU 2024 https://au.int/en/documents/20240809/continental-artificial-intelligence-strategy 28; Pasipamire and Muroyiwa 2024 *Frontiers in Research Metrics and Analytics* 5; Nwangele *et al* 2021 *International Journal of Multidisciplinary Research and Growth Evaluation* 313-314.

24 Arora *et al* 2023 *Information and Organization* 5.

25 De Fine Licht and De Fine Licht 2020 *AI & Society* 923-924.

26 Potter 2025 https://doi.org/10.48550/arXiv.2504.13957 9-10.

27 Matthews 2023 https://ieeeusa.org/assets/public-policy/committees/aipc/How-Should-We-Regulate-AI.pdf 10; Papagiannidis, Mikalef and Conboy 2025 *Journal of Strategic Information Systems* 6.

obligations are feasible for institutions with limited resources.[28] In the African context, these goals are particularly important as the continent navigates a fragmented landscape of national data laws and the limited adoption of regional frameworks like the *Malabo Convention*, which contributes to complicating the creation of the contextually relevant datasets necessary for equitable AI adoption. A legal-technical governance framework may address African data challenges by bridging the gap between symbolic policy recognition and the technical infrastructure required for data availability.[29] As Adebara demonstrates, Africa currently suffers from what she calls "language data flaring", the systemic neglect and poor management of linguistic data resulting from a misalignment between colonial-era language policies and the data requirements of modern AI.[30] A legal-technical approach provides a solution by moving beyond abstract data protection to mandate the proactive "institutionalisation" of indigenous language in education and governance in order to increase data availability.[31] This involves aligning legal mandates (such as national digital agendas that recognise indigenous languages) with technical investments in digital public infrastructure, such as open-source indigenous-language keyboards and digitised archival repositories.[32] By synchronising these layers, the framework can transform "low-resource" environments into robust, contextually relevant data ecosystems, ensuring that data governance serves to build local capacity rather than just to regulate its absence.

Legal-technical governance is an approach to governance that is very relevant to the governance of AI. Legal-technical governance, as developed in this article, refers to the network of formal and informal processes through which legal norms, regulatory instruments, institutional arrangements and technical infrastructures jointly steer the development, deployment, and oversight of AI systems. This is governance in which law and technology operate not as separate domains but as interconnected modalities of control, interpretation and social ordering.[33] Analytical attention is thus directed to processes such as standard-setting, compliance mechanisms, algorithmic auditing, human-machine decision structures, and the interactions between statutory obligations and technical architectures. This article aims to conceptualise legal-technical governance in ways that

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28 Lucaj, Van der Smagt and Benbouzid "AI Regulation is (Not) All You Need" 1274; Davalas, Angelaki and Beretas 2025 *Universal Library of Engineering Technology* 4.

29 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 4.

30 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 2.

31 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 9.

32 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 10.

33 Veale and Borgesius 2021 *Computer Law Review International* 97-112.

illuminate the realities and challenges of governing AI in African jurisdictions.

3 The legal-technical governance gap

As AI systems become embedded in digital economies, governance frameworks increasingly confront disputes and regulatory questions that intertwine legal norms with technical complexities. Across multiple domains, IP, data protection, automated decision-making, digital trade, and platform governance, African policymakers face the same challenge articulated in broader global scholarship: the persistent and widening legal-technical gap.[34] This gap arises when legal frameworks evolve more slowly than rapidly advancing technologies, leading to uncertainty, inconsistent implementation, and difficulty in enforcement.

One dimension of the gap concerns whether technological systems comply with existing legal provisions. As seen with digital trade and obligations imposed by data protection regulations such as the EU's *General Data Protection Regulations*, complex technical systems can struggle to satisfy detailed legal requirements around data protection, consent and cross-border transfers.[35] African AI ecosystems face similar challenges: determining whether automated decision systems comply with equality or non-discrimination freedoms or rights,[36] ensuring data governance practices comply with national data protection statutes; evaluating explainability requirements for opaque AI systems,[37] etc. Without integrated legal-technical evaluation, compliance becomes uncertain or inconsistent.

A second dimension concerns whether law responds adequately to technological change. As various scholars have noted, legal frameworks often remain reactive, struggling to keep pace with disruptive technologies.[38] The African context is no exception: many national strategies recognise the lag between fast-moving AI innovations and slower regulatory processes. Key risks include unclear liability rules for harms caused by autonomous systems; outdated IP doctrines applied to AI-

34 Oluka 2024 *International Journal of Applied Research in Business and Management* 219.

35 Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 1-4; Tahir and Tahir 2024 *Mayo Communication Journal* 3; Kahn 2025 *American Journal of Scholarly Research and Innovation* 147.

36 Pasipamire and Muroyiwa 2024 *Frontiers in Research Metrics and Analytics* 5; Mubangizi 2024 *Perspectives of Law and Public Administration* 378.

37 Effoduh 2024 https://carnegieendowment.org/research/2024/04/a-global-south-perspective-on-explainable-ai?lang=en; Shehu and Obafemi 2025 *International Journal for Research Trends and Innovation* 407.

38 Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 3-4; Rwetembula 2024 *East African Journal of Law and Ethics* 144-145; Townsend *et al* 2023 *Frontiers in Pharmacology* 4-7; Losi and Mkhwanazi 2025 *International Journal of Engineering Inventions* 48.

generated works; the slow adaptation of consumer protection frameworks to algorithmic marketplaces; and delays in recognising digital-first evidence or contracts. This reactive pattern widens the legal-technical gap.[39]

A third dimension involves whether legal frameworks provide formal recognition to digital or automated systems like the United Kingdom (UK's) *Electronic Trade Documents Act*'s recognition of electronic trade documents.[40] African-focussed examples include the recognition of electronic signatures and smart contracts; the admissibility of digital records in litigation; and the recognition of algorithmic decision-making in administrative processes.[41] When these technologies lack legal status, innovation stagnates and enforcement becomes difficult.

Legal instruments frequently incorporate technical or scientific terms, the application of which requires specialist interpretation. As Antunes and Pimentel argue, some legal provisions contain legal-scientific dualism, where scientific terms acquire legal meanings distinct from their technical definitions.[42] Interpretation therefore requires careful navigation between legal doctrine and technical accuracy. This dynamic also mirrors the challenge noted in privacy regulation: legal concepts of "singling out" or "anonymisation" may diverge significantly from the technical realities of data re-identification risks.[43] In the African AI governance context, similar dualism emerges around certain terms. These include algorithmic transparency, databases, de-identification, automated profiling, and technical safeguards. Applying legal interpretive rules to these terms without considering their technical meaning risks producing flawed or unenforceable outcomes.

There is a need to incorporate both legal and technical expertise for the sound interpretation of legal-technical provisions. This is directly relevant to AI governance in Africa, where many regulatory bodies, the data protection authorities, competition authorities, consumer protection bodies and communications regulators often lack in-house technical capacity. A hybrid legal-technical approach helps avoid contradictory regulatory outcomes; the misinterpretation of technical processes; uncertainty for innovators; and rigid, unscalable rules unsuitable for machine-learning systems.

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39 Khan 2024 *Obiter* 678-679; Osundare 2025 *African Journal of Legal Research* 29; Townsend and Botes 2023 *South African Journal of Bioethics and Law* 38-40; Adeleke and Razzano 2024 *Development* 17.

40 See Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 5.

41 Van Eck and Agbeko 2024 *PELJ* 14-17.

42 Antunes and Pimentel "Reflecting on the Legal-technical Interface" 2-5.

43 Altman *et al* 2021 *Boston University Journal of Science and Technology Law* 2.

4 Dooyeweerd's modal aspects as an analytical lens

Dooyeweerd's philosophical framework offers a comprehensive, non-reductionist way to analyse reality by distinguishing various fundamental ways of being, known as modal aspects.[44] These aspects are irreducible, meaning one cannot be fully explained by another, yet they are interconnected. For analysing complex systems like AI governance, the framework helps to conceptualise how legal and technical domains interrelate across multiple modalities. These include the lingual (communication of algorithmic decisions, transparency reports, communication, information transmission, data representation), the social (social relationships, coordination of action, collective behaviour, trust, participation, multi-stakeholder governance), the economic (resource allocation, cost of compliance, data markets, efficiency), the aesthetic (design, harmonisation of user experience, legibility of interfaces, harmony), the formative or technical (AI systems' architecture, datasets, models), and the juridical or legal (fairness, due process, liability, rights-protection and responsibility). By viewing AI systems and their regulatory environment through this lens one can avoid the reductionism of focussing solely on the legal (juridical) or the technical (formative) aspects, and instead analyse the coherence and potential conflicts between these modalities such as when the efficiency goals of the economic aspects clash with the fairness requirements of the juridical aspect, or when the technical capabilities of a system violate its lingual (informational) or social requirements. This multi-aspect analysis helps prioritise key issues such as explaining algorithmic outcomes to affected communities,[45] ensuring that technical safeguards align with legal equity rules,[46] designing user interfaces that communicate rights clearly,[47] and balancing economic efficiency with social legitimacy.[48] AI policy frameworks across Africa can use this holistic model to avoid narrow, single-domain regulation that focusses predominantly on one dimension of AI oversight such as legal compliance or technical standards without integrating the legal, technical, economic, and social considerations reflected in emerging continental initiatives such as the African Union (AU) *Continental AI Strategy* and the *Africa Declaration on Artificial Intelligence*.

There is a need for transdisciplinary knowledge, integrating technical and legal domains into a new discipline sometimes described as legal engineering.[49] Rather than siloed expert input, this involves the co-design

44 Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 8-15.
45 Brown *et al* "Toward Algorithmic Accountability" 1-2, 9-10.
46 Judianto *et al* 2025 *Journal of Social Sciences Utilizing Technology* 46-48.
47 Nakao *et al* 2022 *ACM Transactions on Interactive Intelligent Systems* 4-6.
48 Taeihagh 2025 *Policy and Society* 8, 9.
49 Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 6-8; Bex 2025 *AI & L* 265-266.

of concepts and shared vocabularies. For Africa, this implies developing cross-trained regulatory professionals, embedding computer scientists in legal drafting teams, creating interdisciplinary AI oversight units, and supporting academic training programmes blending law, engineering, philosophy and public policy. Such measures would foster sustainable AI governance architecture.

Alternative dispute resolution (ADR) is important for disputes with intertwined legal and technical dimensions, especially in cyberspace and IP disputes.[50] For Africa ADR could play a crucial role in resolving disputes over algorithmic discrimination, mediating platform liability conflicts, handling cross-border data disputes, and settling IP issues around AI-generated works. Technical arbitrators can interpret algorithmic evidence, while legal experts ensure due process. A combined arbitral panel can better address the complexity of AI-driven conflicts.

For African regulators, key implications include the need for shared legal-technical vocabularies; the development of automated discrimination detection tools; building argumentation frameworks to assess fairness in black-box systems;[51] and embedding interdisciplinary oversight in both public and private institutions. This reinforces the broader need for hybrid governance.

5 Legal-technical gaps in African AI governance domains

With the legal-technical governance framework and Dooyeweerd's multi-aspectual lens established, this section presents illustrative examples of the legal-technical gap across key African AI governance domains, each highlighting specific domains where legal rules and technical systems misalign or evolve at different speeds. The sketches illuminate how these gaps manifest across intellectual property, surveillance, financial services, cybersecurity, defence, consumer protection, data governance and explainability in African AI contexts.

IP emerges as a prominent field in which the legal-technical gap raises difficult questions of ownership, inventorship, access to data, and equitable benefit sharing. Various literature highlights how AI-driven innovations pose legal uncertainty regarding authorship and the status of AI-generated works, particularly in Africa, where socio-economic vulnerabilities amplify risks related to data privacy, the misappropriation of Indigenous knowledge, and unclear rights over training data.[52] The misalignment between traditional IP

50 Singh 2023 *Brazilian Journal of Alternative Dispute Resolution* 81-83; Noerhadi 2022 *International Journal of Cyber Criminology* 89-91.

51 Carmichael, Stalla-Bourdillon and Staab 2016 *IEEE Intelligent Systems* 52-54.

52 Mupangavanhu 2025 *Law, Development and Democracy*; Mbonye, Moodley and Nyika 2024 *South African Journal of Information Management*; Olubiyi and

concepts and the collaborative, data-driven nature of AI innovation has also been identified. IP laws across Africa must adapt to technical realities such as the algorithmic co-production of outputs and hybrid human–machine creativity.[53] An analysis of national and regional AI strategies in Africa shows that existing IP systems do not yet adequately address the technical complexities of AI processes, especially around access to quality data, human-centred design, and the integration of Indigenous knowledge systems.[54] Together these reveal a fragmented coexistence between fixed legal categories and fluid, data-driven AI technical processes, a classic manifestation of the legal-technical gap.

In the domain of data governance, the legal-technical gap is most acutely visible in what Adebara terms "language data flaring", where the absence of technical support for indigenous languages effectively excludes millions from the digital ecosystem.[55] While many African states have legal frameworks that symbolically recognise indigenous languages, a misalignment exists with the technical reality: these languages are rarely integrated into mainstream digital interfaces like keyboards or search engines, and local broadcasting laws often mandate the deletion of media archives after as little as 90 days.[56] This creates a systemic "literacy gap" where fluent speakers are unable to contribute to the digital commons due to a lack of technical tools and because they lack written proficiency in those languages.[57] Consequently, the legal-technical gap in this domain manifests as a failure to synchronise regulatory recognition with the technical preservation and digitisation efforts necessary to prevent the wasteful "burning" of Africa's unique linguistic and cultural data resources.

Other types of legal-technical gap exist, as exemplified by calls for *sui generis* legislation for AI simply because of its perceived novelty. There are arguments that existing South African legal instruments (such as the *Protection of Personal Information Act*, the *Consumer Protection Act* and the *Patents Act*) already address many issues raised by AI systems.[58] The gap here is not an incapacity of law but the policy misconception that AI's technical novelty requires bespoke regulatory treatment. This example demonstrates a conceptual legal-technical gap arising from mismatched

Irumekhai 2024 *ABUAD Law Journal;* Oriakhogba 2022 *South African Journal of Intellectual Property Law.*

53 Mupangavanhu 2025 *Law, Development and Democracy* 39-51.

54 Rens 2025 https://researchictafrica.net/research/intellectual-property-policy-for-just-ai-in-africa/ 16.

55 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 2-3.

56 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 8.

57 Adebara 2025 https://www.cigionline.org/static/documents/no.216_Adebara.pdf 4.

58 Mbonye, Moodley and Nyika 2024 *South African Journal of Information Management* 6-7; Bottomley 2024 https://cipit.strathmore.edu/wp-content/uploads/2024/09/A-Comparative-Analysis-of-the-need-for-sui-generis-Artificial-Intelligence.pdf 19-20.

expectations about the need for new law rather than from actual doctrinal insufficiency. Further, most African populations face literacy constraints that limit their ability to understand AI-driven decisions. Current explainable AI (XAI) techniques rely heavily on textual and technical modes of communication that are not meaningful to end-users.[59] This creates two gaps: a technical-to-user gap, where explanations are not intelligible, and a legal-technical compliance gap, where "right to explanation" obligations cannot be fulfilled if users cannot understand model outputs.

Nigeria's cybercrime landscape features sophisticated, AI-enabled criminal activity, while law enforcement lacks the corresponding technical capacity. Current laws assume conventional cyber-security processes that do not match the complexity of AI-driven attacks.[60] The gap arises because technical systems used by criminals evolve faster than legal frameworks, predictive policing tools are not adapted to the Nigerian sociotechnical context, and technical models such as Term Frequency-Inverse Document Frequency (TF-IDF) and logistic regression outperform law enforcement's existing investigative methods, yet remain underutilised.[61] This demonstrates a legal-technical gap characterised by enforcement incapacity.

There is also a widening gap between the technical capabilities of AI-powered surveillance systems and the slow development of African privacy and human rights regulations.[62] The mismatches include AI-enhanced facial recognition and predictive policing without legal safeguards, opacity (the "black box problem" of AI) limiting meaningful oversight, foreign technology companies exercising technical control over African surveillance infrastructures, raising questions of "data colonialism",[63] and inadequate national laws that do not contemplate algorithmic monitoring. This produces a high-stakes legal-technical gap affecting human rights.[64] For financial inclusion, AI-driven credit scoring uses proprietary models based on alternative data.[65] Regulators cannot easily interpret or audit such systems, which constrains their ability to enforce fairness and transparency

59 Bernardo and Seva 2024 *Informatics* 19.
60 Akindipe and Adam 2025 *Global Journal of Engineering, Design and Technology* 2.
61 Eldho *Crime Category Classification* 8.
62 Dinan, Frans and Harvey 2024 https://lrc.org.za/docs/ai-surveillance-and-the-impact-on-human-rights-and-democracy/ 6.
63 Singh 2022 *Just Africa* 45; Lawyers Hub 2025 https://www.lawyershub.org/Digital%20Resources/Reports/Africa%20AI%20-%20Privacy%20Report.pdf 76; De Freitas 2025 https://www.policycenter.ma/sites/default/files/2025-10/PP_38-25%20%28Marcus%20Vini%CC%81cius%20De%20Freitas%29.pdf 4.
64 See Antunes and Pimentel "Reflecting on the Legal-technical Interface" 2-5.
65 Chitturi 2025 *IPHO–Journal of Advance Research in Social Science and Humanities* 4.

obligations.[66] In consumer protection, certification and attestation mechanisms lag behind AI product development.[67] While the *Consumer Protection Act* and trademarks law provide frameworks for certifying product quality, they are not yet calibrated to the technical attributes of AI systems such as interpretability, robustness, or vulnerability to manipulation.[68] The legal-technical gap here concerns both auditing capability and conceptual compatibility between consumer protection laws and AI product characteristics.

The fragmented state of African data governance and the inability of existing legal frameworks to handle the technical complexities of cross-border data flows, data localisation, and platform-level data extraction are also illustrative of the legal-technical gap.[69] The technical processes of data extraction, cloud hosting, training data movement, and algorithmic optimisation routinely circumvent or exceed the enforcement capabilities of current laws. The gap therefore manifests as an implementation and sovereignty deficit.

Autonomous weapons systems (AWS) introduce the most extreme form of the legal-technical gap: automated life-and-death decision-making governed by regional legal instruments that were not designed for machine autonomy.[70] Technical issues around malfunction, the dual-use potential and the lack of human oversight intersect with legal norms concerning human rights, humanitarian law and accountability. The inability of current African regional instruments to fully address AWS capabilities exemplifies the deep structural misalignment.

The illustrative sketches presented in this section clearly demonstrate the practical consequences of the legal-technical governance gap across various African AI domains, including data protection, digital identity systems and cross-border digital trade. These examples confirm that the discordance between rapid technological development and existing non-hybrid legal frameworks results in persistent regulatory ambiguity, institutional capacity deficits, and the inconsistent application of legal norms to technical realities. Furthermore, the analysis reveals that this gap often manifests in an inability to account for the social and economic impact of automated systems, undermining governance goals related to clarity and

66 Goodness *et al* 2025 https://www.researchgate.net/publication/390172601_AI_and_Credit_Scoring_Assessing_the_Fairness_and_Transparency_of_Machine_Learning_Models_in_Lending_Decisions 3.

67 See Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 1-4.

68 See Joneidy, Rahimian and Arciszewski 2024 *Law and Business* 1-4.

69 King'ori 2025 https://fpf.org/wp-content/uploads/2025/06/June-Issue-Brief-Cross-Border-Data-Flows-in-Africa.pdf.

70 Ahmad *et al* 2025 *Journal of Engineering, Science and Technological Trends* 3.

comprehensiveness. The necessity of closing this structural and interpretive gap, made explicit by this applied analysis, underscores the urgent need for constructive and principled interventions.

6 Conclusion

Africa's AI governance landscape stands at a pivotal moment. As AI systems shape digital trade, identity, public services, and markets, challenges including legal-technical dualism, hybrid concept formation, disciplinary divergence, reactive regulation, and interpretation fragmentation, are directly applicable to the continent's policy environment. A transdisciplinary legal-technical approach offers Africa a way to develop future-proof AI governance. It enables the coherent interpretation of hybrid legal-technical provisions, enables predictable, scalable regulation aligned with technological realities, meaningful accountability for automated systems as well as improved fairness, safety, and trust in AI-driven governance.

African policymakers should prioritise knowledge integration, hybrid concept development, and holistic multi-aspect frameworks to build resilient AI governance informed by both legal principles and technical realities.

Following from the foregoing and based on the recommendations for hybrid concept development, three principles apply directly to Africa's AI governance. First, co-design. Legal and technical experts should jointly design regulatory concepts such as definitions of algorithmic transparency or explainability rather than importing concepts from one domain into another.[71] Second, keeping separate but coordinated legal and technical definitions would prevent confusion, especially where terms (e.g., "fairness", "identity", "anonymisation") carry different meanings.[72] Third, using test cases, hypotheticals and real-world scenarios would improve clarity and ensure that AI regulations remain practically enforceable in African contexts.[73]

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71 See Adeleke and Razzano 2024 *Development* 15-18.
72 See Adeleke and Razzano 2024 *Development* 18-20.
73 See Adeleke and Razzano 2024 *Development* 20-23.

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List of Abbreviations

ADR	alternative dispute resolution
AI	artificial intelligence
AI & L	Artificial Intelligence and Law
AU	African Union
AWS	autonomous weapons systems
EU	European Union
IJLIT	International Journal of Law and Information Technology
IP	intellectual property
OECD	Organization for Economic Co-operation and Development
PELJ	Potchefstroom Electronic Law Journal
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
XAI	explainable artificial intelligence