Applied Systems and Technologies Journal (ASTJ)

AI Policy, Infrastructure, and Neo-Colonial Dynamics in Africa

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Abstract- Many African nations are increasingly formulating national artificial intelligence (AI) policies. While these initiatives signal positive progress, their effectiveness is constrained by weak infrastructure and a fragmented digital economy. This paper situates Africa's AI policy responses within the global scramble for AI governance, showing how technological determinism, digital colonialism and entrenched social inequalities shape them. Current AI policy approaches often prioritise regulation and licensing as revenue-generating mechanisms for African governments. This imbalance risks stifling indigenous AI development, positioning Africa within neocolonial dynamics in which short-term fiscal priorities overshadow long-term investment in infrastructure, skills, and transformative innovation. This study adopted a conceptual and interpretive methodology, designed to analyse the interplay between AI policy, infrastructure, and neo-colonial dynamics in Africa. Guided by the dependency theory, neo-colonialism, digital sovereignty, and innovation systems, this study highlights Africa's marginal position in the global AI ecosystem. The paradox is stark: Africa supplies rare earths and critical minerals essential for AI development and data centres, yet it remains economically marginalised and benefits disproportionately from this contribution. Most of Africa's digital networks and routes continue to reflect colonial legacies, with limited inter-African communication. Although most African AI policies emphasise data sovereignty and ethics, fewer than 1% of global data centres are in Africa. Persistent challenges include siloed digital systems, limited investment in data science education, and brain drain, with Western AI systems benefiting while African AI systems remain underdeveloped. Cultural and linguistic exclusion further compounds these dynamics, as African languages and identities are underrepresented in AI ecosystems. Africa requires investments in infrastructure, regional cooperation, skills development, and policy frameworks. Recommendations include interoperable infrastructure, regional data centres, public-private partnerships, and talent retention.

Keywords: Artificial Intelligence; Digital Infrastructure; Data Sovereignty; Neo-Colonialism; Brain Drain; African Languages in AI

Article info: *submitted January 1, 2025, revised February 2, 2025, accepted March 15, 2025*

1. Introduction

Artificial Intelligence (AI) is rapidly emerging as a transformative force across Africa, with governments demonstrating growing ambition by establishing data centres and formulating national AI strategies. By 2025, at least 226 Tier I and II data centres were operational in 39 African countries, with countries such as Benin and Egypt upgrading facilities to comply with AI standards, including Egypt's plan to build a "cutting-edge domestic data centre" [1]. Such developments reflect Africa's will to engage in the global AI revolution. Yet, beneath this momentum lie critical gaps. Though strategies have no standing (legally), they inform what decisions are made, and they shape agendas, priorities, and future paths; lack of solid foundations can exacerbate these vulnerabilities, such as unreliable electricity or climate change. The next challenge of Africa's AI aspirations is infrastructure. Africa, which alone makes up almost a fifth of the world's population, has less than 1% of global data-processing capacity [2; 25]. The reduced availability of high-powered machines, reliable electricity, and digital connectivity has hampered local innovators, even though AI is expected to contribute over $1 trillion to Africa's economy by 2030.

Furthermore, the energy-intensive nature of AI development is projected to result in energy consumption equivalent to that of the Netherlands by 2027 [1], raising pressing concerns for a continent already struggling with shortages and sustainability challenges. Africa's AI trajectory is tied to neocolonial dynamics, more than infrastructure, beyond one's infrastructure. Digital colonialism refers to the domination of digital infrastructures and data flows by powerful corporations and states, creating long-term dependencies that reproduce inequalities and extend colonial patterns into the digital sphere [107]. Digital colonialism is illustrated by the appropriation of African data for training systems developed in Silicon Valley, undermining data sovereignty and duplicating earlier examples of resource extraction [19]. Large technology firms-specifically Amazon (AWS), Microsoft (Azure), and Google (GCP) – dominate the global cloud and AI infrastructure market, controlling more than 60% of enterprise spending worldwide. This concentration of power places critical infrastructures and datasets under the control of a few

corporations, raising concerns about dependency and digital sovereignty in less-developed regions [113]. Such dominance illustrates how corporate actors play a central role in shaping neo-colonial dynamics in the digital era.

Governance models, such as Nigeria's 2024 National AI Strategy and Kenya's 2025 draft, are aspirational and rudimentary, with limited enforcement and cultural diversity, as reflected in the African Union's Data Policy Framework [3]. AI is frequently presented as a logical answer to government dysfunction, inequality and infrastructure deficit. There are reports which emphasise the prevalence of "technosolutionism", in which AI is presented as a panacea for corruption, social change and conflict [21].

This type of deterministic framing is reiterated through global narratives and strategies, for example, the AU's Continental AI Strategy, which emphasises AI's transformative potential but risks reproducing external forces and constraining public engagement [7]. That said, Africa's dependence on imported AI technologies also reflects external dependence. The vast majority of AI solutions used on the continent are imported and often lack local context [67]. This dependence is problematic for sovereignty and inclusivity and poses challenges, including limited computing resources, poor data governance, and failure to create sovereign AI models grounded in indigenous data and infrastructure [26]. Countries with robust democracies, such as South Africa and Ghana, can capitalise on AI for inclusive development, while others risk exacerbating inequalities [22].

Also, fragmented regulatory landscapes reflect differences in governance capacity: early adopters, such as Egypt, Ghana, and Rwanda, are making progress, while many countries have yet to catch up [37]. Exclusion and marginalisation remain urgent challenges for AI designers, and mainstream narratives surrounding AI frequently privilege the interests of capitalist systems and technology at the expense of distributive equity systems [44]. Most governments' AI policies are framed by compliance regimes centred on traditional frameworks, which generate state revenue rather than activating the innovation ecosystem [24]. For example, an IMF review of AI regulation highlights that policy actions are largely orientated toward economic impacts, with regulation tied to growth and industrial advantage rather than primarily ethics or inclusion [111]. Similarly, research on BRICS-Plus countries demonstrates a bidirectional relationship between AI adoption and tax revenue, indicating that states explicitly integrate AI into fiscal systems to enhance revenue collection [112].

Although regulation is critical for holding institutions accountable, an overemphasis on licensing fees may discourage startups, researchers, and small businesses from exploring AI solutions. This creates barriers to entry and slows the development of AI technologies in indigenous AI industries. This imbalance mirrors a wider trend of favouring short-term fiscal gains rather than long-term investment in infrastructure, skills and innovation. Without equal parts of regulation and conducive measures, AI is more likely to be symbolic than transformative. Too much regulation without investment maintains dependence on external systems; local innovators are discouraged, while foreign ones control the market.

This study makes two contributions. To theory: it synthesises technological determinism, social determinism, dependency theory, neocolonialism, and digital sovereignty to show that Africa's weak infrastructure, limited skills base and revenue-focused AI frameworks create a neocolonial trap, a phenomenon no single theory can explain on its own. To policy: it argues that before African nations can talk about data sovereignty, they first need connected infrastructure and regional data centres; without these, sovereignty is rhetorical. Regulating for revenue rather than fostering innovation and development only deepens dependency.

2. Theoretical Frameworks

This analysis of Africa's AI policy, infrastructure, and neocolonial dynamics requires insight through several lenses that illuminate how technology, society, and global power dynamics intersect. The theoretical lenses that orient this study around five primary constructs – technological determinism, social determinism, dependency theory, neocolonialism, and digital sovereignty – focus our efforts on understanding this phenomenon.

A. The dialectic of deterministic technology v. social forces

The debate concerning African AI adoption has often been fragmented along the lines of technological and social determinism. According to technological determinism, AI constitutes an autonomous agent of social revolution, and the mere existence of "advanced" tools signals the need for structural shifts in government and labour [70]. This view erases African states, viewing them as needing to simply "adapt" to a "pre-defined" technological future [60]. And national narratives also paint AI as a transformational force that will bring the continent toward a new era of development, much like a global mantra of "technosolutionism". These deterministic framings may mask some of the structural constraints – such as a lack of infrastructure and energy shortages – that drive AI adoption. Social Determinism (or the Social Construction of Technology), however, argues that AI is not a neutral influence but is contingent on the social, political and economic interests of its makers. In the African context, this framework indicates that AI policies tend to mirror Western normative values and that the "social forces" driving development are mainly located in Silicon Valley or Beijing rather than in Addis Ababa or Lagos [64].

B. Core-periphery theory and dependency theory

Dependency theory offers a way to examine why African AI ecosystems are anchored to foreign infrastructure. Historically used to explain economic underdevelopment, the theory is applied today to the concept of "digital dependency" [51]. It argues that the world's digital economy is organised in a way that "Core" nations (technological leaders) gain from the "Periphery" (Africa), which continues to be a consumer of high-tech goods but produces the raw materials used to utilise those goods. This dependence can be seen in the AI world in reliance on foreign submarine cables, proprietary cloud platforms (e.g., AWS, Azure), and foreign-developed large language models (LLMs). Yet, in the postcolonial world, global integration occurs on asymmetrical terms and potentially at the expense of Africa's permanent "peripheral" status within the global AI value chain [27]. Data and Talent Extraction: Neo-Colonialism Frameworks. Based on the ideas of Kwame Nkrumah, the Neo-Colonialism Framework examines how power is exercised not over territory but over economic and technological practices [74]. In the AI literature, this is referred to as "Data Colonialism" or "Techno-Neocolonialism" [17]. This model has two broad extractive means:

- Extraction of data: Africans become a gigantic storehouse of "raw data" that multinationals collect and train algorithms on to provide to African markets as end-products.

- Talent Extraction: A "digital brain drain" is taking place, with the continent's top AI-related researchers and engineers being absorbed into Western corporate ecosystems, causing local institutions to be hollowed out and to fail to strengthen native capacity to function [66].

C. Digital Sovereignty

Digital sovereignty emphasises the right of nations to govern their own digital infrastructures, data, and platforms. advocating for autonomy and equitable participation in the digital order [29]. To alleviate these extractive dynamics, Digital Sovereignty Theory is one key normative concept. It delineates how a state (or regional bloc, as in the case of the African Union) can determine its digital destiny by controlling the flow of data, its physical infrastructure (Data Centre's), and setting rules consistent with local cultural and strategic interests [29]. Digital sovereignty in Africa is not only about regulation but also 'infrastructural sovereignty'—physical control over the 'backbone' of the digital globe [8]. From this perspective, the African Union's Data Policy Framework envisages a continental way forward to align governance on sovereignty, but remains an aspiration in practice [97; 93]. Thus, African states can move away from merely consuming foreign intelligence to becoming architects of a "Sovereign AI," guided by the languages and needs of indigenous communities [6], by controlling local datasets and computing power.

3. Methodology

This study is conceptual and interpretive, designed to analyse the interplay between AI policy, infrastructure, and neo-colonial dynamics in Africa. Our methodology unfolded in three steps:

Step 1: Developing the initial line of argument

We began by examining the demands of the AI environment in Africa, focusing on three interrelated dimensions: infrastructure, policy, and neo-colonial dynamics. Drawing on our expert knowledge of the field, we identified recurring challenges, including fragmented networks, revenue-oriented policy frameworks, and global dependencies. This process shaped the initial line of argument: that Africa's AI policy responses are constrained by infrastructural deficits and embedded within neo-colonial dynamics that prioritise short-term fiscal gains over long-term innovation and sovereignty.

Step 2: Integrating literature and policy sources

We then conducted a comprehensive literature review, engaging with scholarly works, policy papers, and regional reports. Sources were selected to capture both African perspectives and global debates on digital colonialism, digital sovereignty, and innovation systems. Through critical reading and thematic synthesis, we aligned our expert insights with published scholarship to strengthen and validate our argument.

Step 3: Theoretical interpretation and synthesis

Finally, we situated our findings within established frameworks, namely dependency theory, neo-colonialism, and innovation systems, to interpret how infrastructural deficits and policy orientations reproduce Africa's marginal position in the global AI ecosystem. This interpretive synthesis highlighted paradoxes, such as Africa's role as a supplier of critical minerals even as it remains economically marginalised in AI development.

4. Colonial Legacies, External Routing, And Limited Inter-African Communication

The topology and architecture of most of Africa's digital networks have been profoundly shaped by colonial interests. Undersea fibre and submarine cables, which form the backbone of global connectivity, were historically designed to link African territories outward to the Global North for resource and labour extraction rather than inward to support inter-Africa trade [69]. This structural design entrenched dependency, privileging external connections while neglecting intra-African integration and trade. Building African digital networks on these routes means Africa's digital topology and infrastructure mirrors colonial trade routes, reinforcing patterns of extraction and dependency rather than fostering regional autonomy. The way Africa's digital networks have been shaped by colonial interests is not unique; similar patterns can be observed in Latin America and Asia. In Latin America, researchers note that digital infrastructures and AI systems often reproduce colonial hierarchies, embedding marginalised communities within structures of domination [104]. Others highlight how multinational corporations dominate the region's digital services, a dynamic described as "data colonialism" that mirrors earlier resource extraction [105]. Asia presents a comparable picture, where multinational corporations and foreign governments extract data and impose surveillance regimes, effectively colonising the region's digital future [106]. Yilmaz [107] adds that Asia's digital infrastructures replicate traditional colonial hierarchies through monopolisation and extractive capitalism.

Maintaining this status quo means that internet traffic within Africa continues to be routed through hubs in the Global North. This increases latency, raises costs, and subjects African communications to foreign jurisdictions and corporate control and undermines growth [99]. Similarly, AI development and adoption are constrained and reinforced by colonial legacies of external dependency, and, despite emerging AI policies, the continent's participation in the global AI-driven economy remains shaped more by foreign institutions than by locally owned systems. The absence of robust intra-continental fibre networks increases communication costs. This dependence not only undermines efficiency but also perpetuates Africa's marginal position in the global digital economy [82].

A. AI Policy ambitions and structural constraints

Although many African states have drafted AI policies and strategies, their ability to participate meaningfully in the AI-driven economy is constrained by historical legacies and persistent underinvestment. Western technology firms like Alphabet, Microsoft, and OpenAI have secured lasting dominance in AI by leveraging vast investments, resources, and data, ensuring disproportionate advantages even if costs decline [15]. Policy frameworks being developed by African countries often emphasise regulation, sovereignty and ethics, but without material foundations such as regional data centres, interoperable systems, and contextual datasets [101], sovereignty risks remaining symbolic. Infrastructural deficits mean that even well-intentioned policies cannot deliver transformative outcomes that impact the socioeconomic conditions of local communities [15; 41], leaving Africa dependent on external AI systems for socioeconomic development. A similar situation is evident in Latin America, where governments have introduced digital sovereignty agendas and ethical guidelines, but the region continues to rely heavily on infrastructure controlled by multinational corporations, limiting autonomy in practice [104; 105). In Asia, regulatory initiatives and harmonisation efforts through ASEAN highlight sovereignty and ethics, but uneven readiness across member states and

dependence on global technology providers constrain effective implementation [106; 107].

Claiming sovereignty can only be meaningful in the Global South if, in parallel, it addresses both economic inequalities and dismantles dependency structures embedded in digital capitalism [33]. Without substantial investment in secure fibre networks and interoperable platforms, African nations remain vulnerable to external influence and unable to assert meaningful control over their digital futures. Sovereignty in the digital age requires material foundations, not just policy rhetoric [88]. Around 400 million people in Sub-Saharan Africa remain financially underserved, and with 78% of the population lacking broadband coverage or mobile internet access [41], the absence of foundational infrastructure underscores how digital sovereignty in the region is relegated to rhetoric rather than reality.

B. Barriers to regional integration

Fragmented infrastructures also hinder regional integration. The lack of interoperable systems prevents the creation of shared datasets and collaborative innovation platforms that could strengthen Africa's collective bargaining power [31]. Instead of fostering regional cooperation, current arrangements reinforce isolation, leaving each country to navigate global digital markets alone. This fragmentation undermines efforts to build continental strategies for AI development and weakens African countries' ability to negotiate equitable participation in global AI value chains [103]. This disconnect illustrates how high-profile AI initiatives in Africa, often pursued through partnerships with global technology firms, generate visibility and prestige but remain misaligned with the continent's pressing infrastructural and socioeconomic realities [35]. Europe has sought to overcome this challenge through the Gaia-X initiative, which establishes federated data spaces, trust frameworks, and interoperability tools to secure digital sovereignty and enable cross-border collaboration [109]. In Asia, ASEAN has promoted harmonised digital policies through its Digital Integration Framework Action Plan, aiming to reduce fragmentation and foster interoperability among member states, though progress remains uneven [108]. South America, meanwhile, has advanced national AI strategies in countries such as Brazil, Argentina, and Chile, but regional integration is constrained by reliance on foreign cloud providers and uneven infrastructure development [114]. These comparisons highlight that while Europe and Asia are building the material foundations for integration and South America is making incremental progress, Africa's fragmented infrastructure continues to limit its ability to translate policy ambition into collective digital sovereignty.

Much of the discourse around AI in Africa focuses on algorithmic bias and inequities in global systems. While these critiques are valid, they risk becoming hollow if they are not accompanied by concrete strategies to address these inequalities. Critique alone cannot dismantle systemic bias and structural dependency; it must be accompanied by infrastructure investments, capacity building and proactive engagement [59; 83]. Developing regions must invest in interoperable infrastructures, automation, contextual datasets, and skills development to ensure that AI systems reflect local realities. By fostering regional cooperation and building technical capacity, Africa can begin to self-determine its AI narratives rather than being shaped by external forces [15].

Ultimately, Africa's path to digital sovereignty requires tangible investment, regional collaboration, and systemic transformation [69]. This shift is not merely technical but political, dismantling neocolonial structures, redefining Africa's place in the global AI ecosystem and ensuring that digital development serves local needs rather than external interests.

5. Policy Ambitions Vs. Infrastructure Realities

AI has emerged as a strategic priority across Africa, with several governments drafting national policies in hopes that these frameworks will help the continent harness AI's potential for socioeconomic development. The African Union (AU) adopted its Continental Artificial Intelligence Strategy in 2024, recognising AI's potential as a driver for attaining the Sustainable Development Goals and Agenda 2063 [6]. Similarly, the Southern African Development Community (SADC)'s blueprints emphasise regional cooperation in digital transformation, encouraging member states to align national AI strategies with global and continental frameworks [94]. Countries such as Rwanda, South Africa, Nigeria, and Kenya have published draft AI strategies and policies [21]. This reflects growing recognition of AI's transformative role in shaping Africa's socioeconomic development and keeping up with global developments

When analysing these frameworks, a central theme emerges. African countries value digital sovereignty, local content creation, socioeconomic transformation, ethics and governance. The AU strategy explicitly prioritises sovereignty, calling for harmonised regulations and cross-border standards to prevent "digital colonialism" [31]. Scholars argue that algorithms are never neutral; they embed the interests and biases of their designers [59; 76; 92]. The self-determination and equitable outcomes central to African AI frameworks can only be achieved by embedding local oversight and contextual datasets. Ethical AI in Africa, therefore, requires not only policy safeguards but also infrastructure and governance structures rooted in African values and inclusive participation.

Many strategies emphasise regulation, ethics and sovereignty but lack funding for data centres, local computing capacity, and interoperable systems [53]. Without infrastructure, sovereignty remains largely theoretical, leaving African nations dependent on external cloud providers and foreign technology firms. This dependency undermines the very autonomy that African AI policies and frameworks seek to establish.

Unreliable electricity networks, high connectivity costs and informal online payment platforms prevent many young people from acquiring technical skills. As a result, AI is likely to deepen risks, bias, and inequality rather than fostering inclusion, unless foundational deficits in connectivity and infrastructure are addressed [67].

Several countries illustrate the tension between ambitious frameworks and weak infrastructure. Nigeria has issued AI guidelines and announced plans for a national AI strategy, yet struggles with unreliable electricity and limited broadband penetration [81]. Rwanda has positioned itself as a continental leader with ethical AI guidelines, but its infrastructure remains concentrated in urban centres, leaving rural communities isolated [89]. Kenya has invested in AI literacy and policy development, but weak digital public infrastructure continues to constrain adoption [21]. Despite enduring economic pressures and infrastructural constraints, Zimbabwe is beginning to undergo digital transformation, with its AI strategy anticipated to drive innovation in agriculture, mining, and fintech, fostering renewed human development [26; 80]. These examples reveal a central tension: Most African AI policies speak boldly of sovereignty and ethics, yet investment in infrastructure remains limited. Instead,

licensing fees and permits take priority, effectively making revenue collection a function of regulation. Consequently, policy ambition outruns infrastructural reality, and premature regulation stifles rather than enables innovation.

Ultimately, Africa cannot build a sovereign digital future if its data remains in the custody of external actors and receives little investment in digital self-determination. Sovereignty requires not only policy pronouncements and frameworks but also investment in infrastructure, contextual datasets, and skills development. Algorithms are never neutral; they reflect the values and interests of their designer and broader digital politics. For Africa to shape AI in ways that serve the socioeconomic needs of its people, it must confront the dependency structures embedded in digital capitalism and prioritise building resilient, inclusive systems that align with local needs and values [88].

6. Manual Systems, Digital Silos, And Data Fragmentation

The persistence of manual systems, the proliferation of non-interoperable digital silos, and the resulting data fragmentation constitute critical barriers to Africa's artificial intelligence readiness, fundamentally limiting the continent's capacity to generate the comprehensive, contextual datasets required for machine learning development. Where digitisation has occurred, systems operate as isolated silos that lack interoperability; a scoping review of electronic health records in Sub-Saharan Africa concluded that "the lack of interoperability with other digital health systems poses a substantial barrier" to effective digital health transformation, preventing routine data exchange across facilities and platforms [65]. The consequences for AI development are profound: the absence of large, deidentified, integrated datasets from African contexts reduces opportunities to train robust, locally relevant models and perpetuates algorithmic bias, as populations from low-resource settings remain systematically underrepresented in global machine learning resources [90]. Technical barriers, including limited adoption of standards and non-interoperable architectures, combine with organisational obstacles such as fragmented project governance, low institutional capacity, and security concerns to prevent the data pooling necessary for AI innovation [5]. Without urgent investment in interoperable infrastructure and capacity building to transition from manual systems to integrated digital ecosystems, African nations will be unable to generate the contextual datasets essential for developing AI systems that reflect local epidemiological patterns, cultural contexts, and healthcare needs.

The consequences of data fragmentation are profound for AI development. Diallo et al. [30] argue that global AI readiness assessments fail to capture African realities, partly because fragmented datasets prevent accurate measurement of progress. A recent report on Africa-relevant open datasets identifies quality inconsistencies and infrastructure gaps as barriers to AI innovation, despite the growing availability of open resources. These limitations exacerbate algorithmic bias, as imported datasets often marginalise African languages and cultural contexts. Pasipamire and Muroyiwa [86] emphasise that fairness in AI cannot be achieved without local investment in datasets and mitigation strategies, while Ketere [47] calls for decolonising AI to reduce biases against African linguistic and cultural identities. The real challenge, therefore, is capacity building. Aryee et al. [11] stress that AI capacity in Africa requires investment in education, governance, and infrastructure to ensure that the continent can shape its own AI trajectory rather than remain dependent on external actors.

7. The Infrastructure Deficit

Africa's AI-driven digital transformation literature reveals a sharp tension between optimistic "leapfrogging" narratives and persistent structural constraints. Reviews of digital payments and mobile money highlight rapid growth, super-apps, and AI-enabled fraud detection and credit scoring [39], yet simultaneously document enduring exclusion tied to rural connectivity gaps, high data costs, weak security practices, and fragmented regulation that limit adoption and degrade the data available for AI models [50; 77]. Infrastructure-focused analyses of Tier III/IV data centres and AI-intensive energy systems frame these as neutral engines of growth and data sovereignty but pay far less attention to ownership, external dependencies, or how energy-hungry AI workloads intersect with inequality and local energy access [2; 62].

Conceptual and comparative work converges on familiar bottlenecks: infrastructure deficits, skills shortages, weak institutions, and lagging governance—and calls for investment, but often grounded in secondary data and high-level frameworks, providing limited empirical evidence on how AI actually reshapes inclusion, labour, or state capacity on the ground [1; 9; 10; 96]. More critical accounts foreground opportunity costs, data colonialism, and exploitative annotative labour, arguing that AI investments can crowd out essential services and lock African economies into roles of data extraction and low-value digital labour rather than building autonomous AI capability [35; 43]. Governance-oriented studies map fragmented, sectoral regulatory patchworks and emphasise the need for coherent, context-specific AI and fintech regulation, yet tend to treat law as a largely technical fix, underplaying the politics of enforcement capacity and asymmetric power with global platforms [56; 73; 96]. Collectively, this body of work shows that infrastructure, data quality, interoperability, and governance are binding constraints on AI-enabled finance and digital transformation but remain weakest where distributional questions are most pressing: who gains, who loses, and what alternative public-interest digital infrastructures might look like in African contexts.

8. Brain Drain And Neo-Colonial Continuities

Although many African countries are developing national AI strategies and policies, their implementation is hindered by systemic challenges. Governments recognise AI's potential for economic growth and social development, yet weak educational pipelines, limited infrastructure, and external dependency constrain progress [6]. This gap between policy ambition and practical capacity reflects deeper historical legacies of underdevelopment hindering Africa's socioeconomic development. One major obstacle is Africa's underdeveloped STEM education. Many African graduates leaving universities are underprepared for AI innovation, as the education system lacks resources, relies on outdated curricula, and has limited access to advanced technologies. Studies highlight that while AI can transform education, structural inequalities persist, preventing students from acquiring essential skills [28; 32]. A survey of 174 African universities found that only 31% offer dedicated AI programmes and 34% offer data science degrees, with AI courses accounting for just 1.5% of total enrolments in specialised digital skills [52]. Without strong STEM pipelines, AI policies remain aspirational rather than actionable and transformative at scale.

Africa invested $14 million in AI startups in Q2 of 2025, a meagre 0.02% of the global total [12]. By contrast, U.S. startups dominated the funding boom, securing $39.7 billion across 728 deals, accounting for nearly 84% of worldwide investment. Even

when policies articulate ambitious visions, the infrastructure to support research labs and innovation hubs remains insufficient. Global firms, such as Google, have begun investing in African AI research; however, these efforts remain externally driven [6; 61].

The lack of employment opportunities at home contributes to brain drain, as young African talent migrates to the global North for better education and careers. Analysts describe this as one of Africa's most pressing crises, with intellectual wealth haemorrhaging abroad, where African resources are used to develop the West rather than itself, a continued neocolonial system [57]. Despite these contributions, Africa has failed to build sovereign AI systems, highlighting the persistence of dependency structures [52]. Although Africa accounts for nearly 19% of the world's population, it contributes only 5% of the global AI workforce, leaving its vast economic potential in sectors such as agriculture, healthcare, finance, and manufacturing largely untapped due to a shortage of skilled professionals [52].

Africa provides rare earth minerals, essential for semiconductors and batteries, and human capital fuels global AI, yet the continent remains excluded from its benefits. These dynamics reflect neo-colonial continuities in the digital age. Just as colonial powers extracted raw materials and controlled networks of information, today's global technology firms dominate data infrastructures and AI platforms. Scholars warn that digital colonialism perpetuates dependency, with Africa's data and talent exploited externally [19; 88; 31]. True sovereignty will require breaking these cycles through investment in education, infrastructure, and locally owned systems.

9. Resource Contribution Without Economic Participation

Africa plays a pivotal role in driving the global AI ecosystem by supplying rare earths and critical minerals essential for semiconductors, GPUs, and data centre infrastructure. Countries such as the Democratic Republic of Congo, South Africa, and Zimbabwe are major global suppliers of cobalt, platinum, and other strategic materials [18; 52]. Yet, despite being indispensable to the global supply chain, African countries often remain at the margins of the digital transformation value chain, exporting raw materials while failing to participate in the downstream AI ecosystem and its interdependent layers [72].

AI development is capital-intensive, requiring not only hardware, power, and cooling but also advanced skills, data ecosystems, and sovereign governance frameworks [49]. Africa's limited investment in these areas means that, while it supplies the raw materials, it does not reap proportional benefits from the knowledge-intensive, high-margin AI economy. This asymmetry entrenches dependency, keeping African countries confined to primary extractive roles instead of shaping AI development. The absence of a unified vision, regional thinking, and coordinated strategy risks leaving Africa as a mere exporter of natural resources, forfeiting the transformative potential of its mineral wealth for sustainable socioeconomic development in the AI race [72].

Structural inequalities embedded in global value chains exacerbate Africa's exclusion. Many countries, particularly in Africa, lack the leverage, expertise, and negotiating power to secure favourable terms with dominant players such as the United States-based technology firms, thereby limiting their economic gains and reinforcing structural inequalities in the AI value chain [45]. This imbalance mirrors historical colonial patterns, in which Africa provided raw materials but was systematically denied access to industrial and technological advancements [88].

These dynamics carry significant policy implications for resource governance. African governments must move beyond extractive models toward frameworks that prioritise beneficiation, local value addition, and equitable resource management [6]. Policies should encourage partnerships that transfer technology and skills rather than perpetuate dependency. AU and SADC have begun to emphasise digital sovereignty, but resource governance must be aligned with AI strategies to ensure that critical minerals are leveraged for continental development rather than for external profit [18]. Investing in AI within resource-constrained environments often disproportionately benefits urban elites, exacerbating digital divides and marginalising rural and low-income populations [35; 78], who comprise more than half of the population. While AI adoption across the continent has the potential to transform industries, it also introduces new challenges [102].

Limited broadband penetration, unreliable electricity, and weak educational pipelines prevent many young Africans from acquiring the skills necessary to participate in AI innovation [36]. The digital divide is most pronounced in rural areas, where poor connectivity and limited technological infrastructure restrict access to AI-powered services such as precision agriculture and healthcare, online education, and e-commerce [68]. Even when AI hubs and startups emerge in urban centres, rural and low-income populations remain excluded from opportunities to benefit from digital transformation.

Without deliberate investment in education, research, and infrastructure, the continent risks remaining a supplier of raw inputs while others capture the value of innovation [95]. Sovereign digital futures will require breaking neo-colonial continuities, building resilient local digital ecosystems, and ensuring that AI serves inclusive development rather than reproducing dependency [88].

10. Cultural And Linguistic Exclusion

AI ecosystems today are largely shaped by Western languages and ways of knowing, leading to the systematic exclusion of African languages and cultures. This dynamic reproduces new forms of digital and algorithmic neo-colonialism [54; 63; 64]. Most large language and speech technologies are designed for a small group of high-resource languages. The result is language bias and epistemic injustice: dominant cultures become richly expressible, while African epistemologies are constrained and underrepresented [40; 71]. The European Language Grid and eTranslation have been developed to provide interoperable infrastructures that support all 24 official EU languages, reducing language bias and enabling multilingual digital services [16; 24]. Southeast Asia alone hosts over 1,000 languages, and countries like China have invested heavily in domestic AI and language technologies [79; 106]. South America has made progress through national AI strategies in Brazil, Argentina, and Chile, but much of the region's infrastructure still relies on foreign cloud providers, and indigenous languages remain marginalised on digital platforms [109].

From education to governance, these gaps erode trust and fairness [86; 91; 100]. At the policy level, African data-governance frameworks only partially address cultural diversity and inclusion, leaving Indigenous and local communities vulnerable to marginalisation and algorithmic oppression [13]. In response, scholars call for localised datasets and Afrocentric, culturally grounded AI architectures. These would embed African languages, value systems such as Ubuntu, and regional socio-economic realities into both model design and governance

[38; 75; 63]. This makes it difficult to build high-quality local datasets and systems, reinforcing dependency on external platforms and expertise [13; 54; 64].

11. Skills Gap And Low Investment In Data Science

Data science professionals from developing countries lack access to systematic training, mentoring, and supportive research environments, implying that capacity-building efforts are reactive and fragmented rather than strategic [20; 48]. Similarly, studies of practising data professionals in South Africa show that even where programmes exist, they often underemphasize real-world data work, communication, and soft skills, producing graduates misaligned with labour-market needs [23]. This weak skills pipeline is compounded by low, inconsistent investment in data science and AI.

Commentaries on Africa's data science landscape argue that most governments fall well short of research-funding targets and rely heavily on external donors, thereby distorting priorities and discouraging long-term institutional planning [46]. In higher education, AI integration is repeatedly portrayed as aspirational but hamstrung by underfunded digital infrastructure, lack of institutional policy, and inadequate lecturer training [55; 84; 98]. A critical limitation of this body of work is its tendency to frame Africa primarily in deficit terms, with relatively little empirical analysis of successful, home-grown models. While some interventions, such as intensive AI bootcamps in Nigeria, demonstrate short-term gains in skills and illustrate promising, practice-oriented approaches [4], they are rarely evaluated beyond immediate self-reported learning outcomes.

Moreover, the often-cited scarcity of African datasets is acknowledged in sectoral domains like radiotherapy, where shortages of local clinical data, absence of AI-related curricula, and lack of technical staff delay AI deployment [58], yet few studies move beyond high-level calls for "more data" to discuss governance, community ownership, or the political economy of data production. Recent work on AI and curriculum transformation in South African universities goes further by critiquing the reliance on Western datasets and epistemologies as a form of "digital colonialism," warning that if AI is adopted uncritically, it may deepen rather than bridge inequalities [42; 54]. However, these decolonial perspectives remain marginal compared with technocratic capacity-building narratives.

Overall, current scholarship convincingly documents skills and investment gaps and offers convergent recommendations: graduate-level programmes, faculty development, stronger funding, and multi-stakeholder partnerships [48; 24; 16; 46; 98]. Yet it remains weak in rigorous impact evidence, comparative analysis of different capacity-building models, and the inclusion of local communities in defining which kinds of data science and AI capacity are desirable. Future research needs to move from mapping deficits to systematically testing and scaling context-sensitive, Afrocentric interventions that build skills, expand locally governed datasets, and ensure that increased investment translates into equitable and sustainable AI ecosystems.

12. Towards A Holistic Ai Strategy For Africa

Most of Africa's AI policy responses, shaped by both technological determinism and entrenched social inequalities, reflect the continent's position within the global scramble for AI governance. To achieve meaningful adoption across key socioeconomic sectors, developing countries must pursue a holistic AI strategy that integrates infrastructure, investment, and human capital into coherent policy frameworks. At the core of policy formulation must be a recognition of inequality, not only in access to education but also in access to the digital infrastructure and digital literacy [34]. AI policies should therefore prioritise infrastructure expansion alongside investments in digital literacy and technical training, ensuring that AI development aligns with African realities.

Most of Africa digital ecosystems is fragmented, shaped by colonial legacies and uneven national capacities, hinder the scaling of AI solutions [88]. Regional cooperation through bodies such as the African Union and SADC can harmonise standards, pool resources, and reduce duplication. A coordinated approach would allow African states to negotiate collectively with global technology firms, mitigating the risks of digital colonialism [31]. Current AI policies show that data sovereignty and regulation are central to AI policy formulation. Public-private partnerships (PPPs) can play a critical role in building local data centres and expanding digital networks, reducing reliance on foreign cloud providers. By fostering PPPs, governments can leverage private investment while retaining regulatory oversight, ensuring that data generated within Africa serves local development goals [87]. AI systems trained primarily in the Global North often sideline African contexts, languages, and cultural realities because African realities are not digitally visible. Promoting African-led innovation, such as building local datasets, ensures that AI tools reflect local realities and values [14]. This requires investment in indigenous research institutions, support for startups, and policies that encourage the creation of culturally and contextually inclusive datasets.

Unlike generic AI models trained on data from the Global North, which do not cater for local needs, localised applications reduce bias and enhance contextual relevance. For example, agricultural AI models trained on African soils and climatic conditions will produce more accurate insights than imported models, while educational AI models that incorporate African languages and cultures are effective, as they ensure inclusivity and address contextual issues [85]. AI applications such as precision farming, predictive analytics for weather patterns, and digital platforms for market access enhance productivity and food security [14].

AI in education offers transformative potential, particularly through adaptive learning platforms that tailor content to individual student needs. This can alleviate the shortage of teaching facilities. Importantly, AI can support the inclusion of African languages, bridging linguistic divides that often marginalise rural learners. This can improve comprehension as early childhood learners learn better through their mother tongue. Teacher support tools, such as automated grading and resource recommendation systems, can also alleviate workload pressures, especially in Africa, where teacher-to-learner ratios are high [102].

Scaling AI applications across Africa requires collaboration between governments, higher education institutions, private firms, and civil society. For instance, an AI-enabled agricultural platform developed in Kenya could be adapted for similar contexts in Tanzania or Uganda [87]. Ultimately, Africa's AI future depends on aligning infrastructure, investment, and skills with robust policy frameworks, while prioritising sector-specific applications that address pressing socioeconomic challenges.

13. Conclusions

AI has become a strategic priority across Africa, with continental and regional bodies such as the African Union and

SADC advancing frameworks that emphasise digital sovereignty, ethics, and socioeconomic transformation. Yet despite these ambitions, structural barriers such as fragmented digital systems, weak infrastructure, and limited investment in research and development continue to undermine readiness. The persistence of manual systems, non-interoperable siloed systems, and scarce contextual datasets restricts Africa's ability to train robust, locally relevant models, perpetuating algorithmic bias and reinforcing dependency on external platforms and expertise. At the same time, Africa's role as a supplier of critical minerals essential for AI hardware highlights the paradox of resource wealth without proportional socioeconomic benefits, leaving the continent confined to extractive roles and dependence on Western technologies.

Most of Africa's AI adoption is further shaped by competing narratives of technological determinism, which views AI as an autonomous driver of social revolution, and social determinism, which emphasises the political, economic, and cultural interests embedded in its development. Cultural and linguistic exclusion compounds these challenges, as African languages and epistemologies remain underrepresented in AI ecosystems, reproducing digital colonialism and embedding bias into everyday applications.

Many countries in the Global South, including African nations, have begun to formulate national AI policies and legal frameworks. This is in response to global technological shifts, signalling meaningful progress towards digital transformation and the adoption of 4IR technologies. However, enacting such policies is insufficient, as the African continent faces substantial infrastructure deficits, fragmented digitalisation, and a nascent digital economy. Our results reveal that African nations' policies prioritise regulation and licensing as revenue-generating mechanisms while stifling innovation ecosystems. These risks suffocate indigenous AI development and reinforce neocolonial dynamics in which short-term fiscal priorities overshadow long-term investment in transformative innovation, skills, and infrastructure. Our study highlights Africa's marginal position in the global AI ecosystem, shaped by the dependency theory, digital sovereignty challenges, and entrenched inequalities.

Despite supplying rare earths and critical minerals essential for GPUs and data centres, Africa benefits the least from the global AI economy. Full participation in the AI economy is constrained by inadequate infrastructure, as Africa hosts fewer than 1% of global Tier IV data centres. Most systems remain manual, hindering the development of local datasets. Persistent challenges such as siloed digital systems, limited investment in data science education, and the migration of skilled youth to the global North perpetuate exclusion. The cultural and linguistic underrepresentation of African languages and systems further compounds Africa's limited participation in shaping the AI ecosystem.

The results highlight that Europe, Asia and the Americas are making incremental progress in the AI ecosystem, and Africa's fragmented infrastructure limits its ability to achieve digital sovereignty. Digital networks reflect and perpetuate colonial legacies, with limited inter-African communication and minimal investment in contextual datasets. Although many policies emphasise ethics and data sovereignty, these are not complemented by the establishment of local data centres. This undermines Africa's ability to train models that reflect its realities and languages, thereby perpetuating algorithmic bias and dependence on external systems. A holistic strategy is required for Africa, one that integrates infrastructure investment, regional cooperation, and skills development with robust policy frameworks. Critically, Africa must scale up interoperable infrastructure and regional data centres, fostering public-private partnerships to develop contextual datasets.

The causal relationship operates as follows: colonial-era digital network design produces fragmented, non-interoperable data silos, which directly limit AI readiness by preventing the formation of comprehensive datasets needed for machine learning. This infrastructural deficit then shapes policy outcomes, with limited taxable digital activity, African governments prioritise licensing fees and revenue collection over long-term infrastructure investment, creating a self-reinforcing cycle. Global inequality compounds this dynamic: because Africa exports critical minerals but not computing power or data centre capacity, it remains confined to low-value extraction, which causes AI policies to focus on regulation rather than capability-building.

Critical steps for participating in the global AI ecosystem include embedding African languages in AI systems and retaining talent through capacity building. These steps will not only strengthen Africa's digital sovereignty but also enable AI systems to capture local languages and contexts, fostering greater inclusivity and representativeness. Although drafting AI policies is a positive step, it must move beyond symbolism toward a systemic transformation that reflects its socioeconomic needs and cultural realities. Africa should invest in digital infrastructure, reform higher education curricula, and foster innovation ecosystems. Only then can African nations reposition themselves from mere suppliers of critical minerals to active participants in the global AI landscape, thereby reaping the economic benefits. Without this shift, Africa will not achieve and secure digital sovereignty, will remain dependent on the West, and will not reap any meaningful socioeconomic benefits from AI development, constraining sustainable growth and equitable participation in the digital economy.

14. Recommendation

Establish interconnected regional data centres across Africa within the next five years, coordinated through the AU digital transformation strategy. Progress should be measured by uptime, cross-border connectivity, and the percentage of African datasets hosted locally.

Create national data repositories in at least 20 African countries by 2030, with mandates for cultural practices and local realities. Success can be tracked by dataset size, diversity of languages represented, and the number of AI models trained on them.

Universities should immediately embed AI and data science modules into all STEM curricula, while governments provide AI scholarships. Innovation hubs should be established in each regional economic bloc, with measurable outputs such as patents filed or startups launched.

Balanced regulation: shift policy focus from revenue licensing-oriented to innovation-driven incentives. Governments should allocate ICT budgets to startup incubators and reduce licensing fees for AI labs. Impact can be measured by the number of registered startups and the 3-year survival rate.

Fund projects that embed multiple African languages into AI systems by 2030, alongside philosophical frameworks like Ubuntu. Progress should be tracked by language coverage in NLP benchmarks and adoption rates of inclusive AI tools in public service.

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