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Innovation to Impact: Implementing Artificial Intelligence (AI) Policies for Africa's Development

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Abstract:
This study highlighted the importance of African countries in implementing AI policies for the full use of technologies in their development. The study used a desktop research technique. This includes various literature sources for analyzing the current state and potential of AI policies in African countries. The study identified that AI policies in Africa are in their infancy stages, and very few African countries have AI policies in place. At present, only 8 countries in the continent have implemented AI policies. Countries such as Nigeria and South Africa do not have AI policies in place. The study also identified the lack of robust AI policy frameworks in African countries as a significant barrier to leveraging AI for development. This study offers valuable insights for policymakers and technology stakeholders in African countries. Furthermore, it will be beneficial for researchers and scholars interested in AI and AI policy and those contributing to scholarly literature in this field. Regarding field relevance, this research pertains to the disciplines of technology policy, public policy, development studies, sociology, and public administration. This study offers perspectives on what African countries should consider when developing their AI policies. The study also highlighted challenges that have undermined the adoption and effective implementation of AI policies across the continent. This study emphasized the necessity of collaborative action, visionary leadership, and evidence-based policymaking to create effective AI policies in Africa.

Keywords: Artificial intelligence, Africa, Development, Innovation, Technology policy

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创新产生影响：实施人工智能政策促进非洲发展

摘要：
本研究强调了非洲国家实施人工智能政策以充分利用技术发展的重要性。该研究采用了桌面研究技术。这包括各种文献资料，用于分析非洲国家人工智能政策的现状和潜力。研究发现，非洲的人工智能政策尚处于起步阶段，很少有非洲国家实施人工智能政策。目前，非洲大陆只有8个国家实施了人工智能政策。尼日利亚和南非等国家没有制定人工智能政策。该研究还发现，非洲国家缺乏强有力的人工智能政策框架，这是利用人工智能促进发展的重大障碍。这项研究为非洲国家的政策制定者和技术利益相关者提供了宝贵的见解。此外，它将有益于对人工智能和人工智能政策感兴趣的研究人员和学者以及为该领域学术文献做出贡献的研究人员和学者。就领域相关性而言，本研究涉及技术政策、公共政策、发展研究、社会学和公共管理等学科。本研究提供了非洲国家在制定人工智能政策时应考虑的观点。该研究还强调了阻碍整个非洲大陆采用和有效实施人工智能政策的挑战。这项研究强调了协作行动、富有远见的领导力和基于证据的政策制定对于在非洲制定有效的人工智能政策的必要性。

关键词：人工智能、非洲、发展、创新、技术政策。

1. Introduction

Artificial intelligence (AI) has emerged as a transformative force that changes economies, industries, and societies worldwide. The potential to drive innovation, enhance productivity, and solve complex challenges has garnered increasing attention across the globe, especially during COVID-19 and post-COVID-19 (Borenstein & Howard, 2021; Adams, 2022). According to a projection by PricewaterhouseCoopers (PwC) in its seminal report in 2017, AI would contribute US$15.7 trillion to the global economy in 2030, with increased productivity contributing about US$6.6 trillion and consumption side effects providing US$9.1 trillion (PwC, 2017). Ironically, in PwC's forecast, the growth for Africa when it comes to AI was so minute that it did not contribute strongly to the numbers mentioned compared to countries in Europe, North America, and China (Adams, 2022). To provide a more precise perspective, the estimated financial gains for the markets in Africa, Oceania, and low-income Asian markets are approximately $1.2 trillion, while China's estimated gains are approximately $7.0 trillion, North America's are $3.7 trillion, and Northern Europe's are $1.8 trillion (Eke et al., 2023). These figures show that AI development and use are still in the infancy stages in Africa.

Arakpogun et al. (2021) emphasized that the belief that a significant number of jobs could be displaced due to AI automation has been a hesitant factor for many people in Africa despite the benefits of AI in bringing socioeconomic changes to the continent. The development of a vibrant ecosystem based on five stakeholders is required. This includes policymakers, universities, large companies, start-ups, and multi-stakeholder partnerships.

AI technology is growing across Africa with over 2400 companies specializing in AI, of which 41% are start-ups (Jaldi, 2023). The crucial factors needed for the full utilization of these companies and technology adoption are sadly lacking across the continent as many countries in Africa still lack the necessary infrastructure, governance, and policies for AI.

According to Jaldi (2023), several countries in North America, Europe, and Asia have actively developed AI policy frameworks to enable them to exploit the full benefits of AI to realize the growth of their countries. The Organisation for Economic Co-operation and Development (OECD) (n.d.) found that over 60 countries and territories developed AI policy initiatives.

Africa exhibits a delay in comprehensive AI policy formulation that could facilitate the effective utilization of AI for its development. Adams (2022) argued that the AI policy framework in Africa remains in its nascent stages. Consequently, numerous AI companies operating in Africa are not fully obligated to utilize their resources for the development of the respective countries in which they operate. Adams (2022) resolved that the African continent is predominantly influenced by numerous foreign technology companies and firms whose operations do not necessarily align with the realization of national developmental priorities, primarily due to the absence of established policies to regulate the functioning of these technologies and organizations. Some firms, according to Adams, exclude women from their organizations. In light of this, this study underscores the importance of AI policies as they will contribute to Africa's development. It seeks to examine the challenges hindering AI implementation in Africa and the considerable steps that should be taken toward the formulation of AI policy. To achieve this aim, the study answers the following questions: What is Africa's

attitude toward AI? How can AI contribute to Africa's development? What challenges hinder AI implementation in Africa? Finally, what key considerations must African policymakers consider when developing AI policies?

To support the arguments and findings of the study, a desktop study was conducted to gather relevant and substantial information. A wide range of literature sources (books, articles, reports, and policy papers) were consulted to analyze the current state and potential of AI policies in Africa.

As Adams (2022) asserted, policymakers in Africa must prioritize the development of local AI capabilities and capacities to advance Africa's economic growth and social transformation. However, for this to materialize, appropriate AI policies must be implemented. Thus, this study is of significant importance as it offers valuable insights for policymakers and stakeholders involved in AI in Africa. In addition, it will help to contribute knowledge to the advancement of AI agendas in Africa and benefit researchers and scholars interested in AI and AI policy.

2. Methodology

The study used a desktop study approach. This entails using relevant literature, case studies, and policy reports that address "AI," "AI in Africa," and AI and development.

Online databases like EBSCO, JSTOR, and Sabinet, and platforms like Google, Google Scholar, and ResearchGate were utilized to search for relevant documents, articles, papers, e-books, and reports related to AI and development in Africa. The search terms used were "artificial intelligence," "AI," "Africa," "AI and Africa's development," "AI policy," and "AI in Africa".

To improve the replicability of this study, a PRISMA 2020 flow diagram (Figure 1) was used. More precisely, some eligibility criteria were considered.

a) Articles, reports, and documents must be in English. Based on this criterion, the literature search identified 300 relevant sources.

b) Subsequently, the materials were limited to publications from 2018 to 2024. This restriction reduced the number of materials obtained to 178.

c) From the 178 sources, duplicate articles and non-academic blog entries were excluded, resulting in a final corpus of 106 literature materials.

d) The remaining materials were screened to answer the research questions and provide evidence on how AI can contribute to Africa's development.

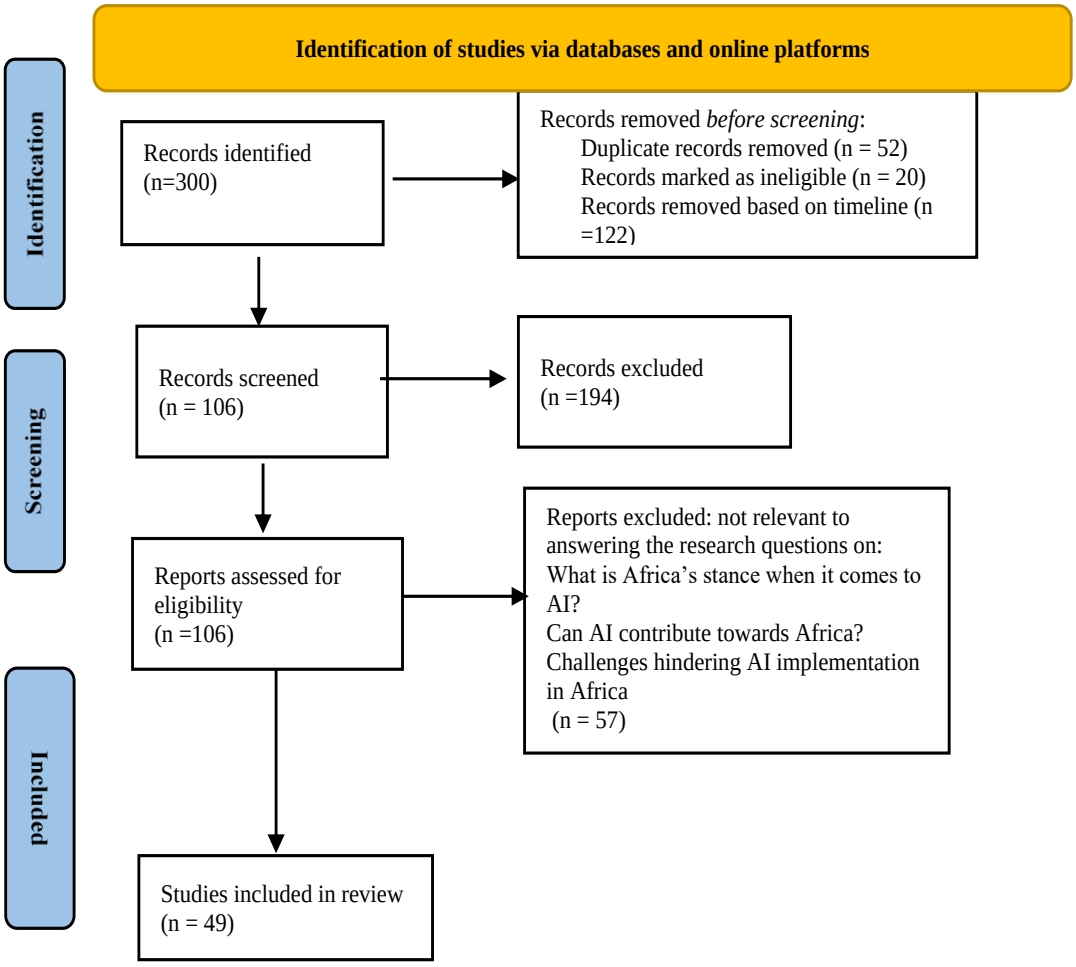

Figure 1. PRISMA 2020 guide on review (The author)

Subsequently, only 49 materials were analyzed and reviewed in-depth to provide answers to the questions.

3. Africa and AI Revolution

The narrative surrounding AI has been of a Western-centric endeavor (Panchia, 2023). However, a parallel revolution has begun to unfold across Africa, with the continent emerging as a hotbed for technological innovation, particularly in the areas of AI (Jaldi, 2023; Darams, 2024). Since COVID, AI has witnessed an unprecedented rise, despite being present in some technological ways for decades. Its transformative potential destined to reshape work and human development is being felt tangibly around the globe. From healthcare to agriculture, to finance and education, the impact is observed across diverse sectors.

In Africa, the adoption of AI is increasing. This has been fuelled by a growing number of start-ups, government initiatives, and international collaborations with countries. For instance, there are over 100 AI start-ups across various regions in Africa, and they have secured over $140 million in seed funding, with Nigeria having the highest investment in its fintech sector (Arakpogun et al., 2021). Ironically, despite Nigeria garnering the highest investment in the continent, South Africa has the highest number of AI start-ups (26), followed by Nigeria (20), Kenya (9), Tunisia and Zimbabwe have 6, while Egypt and Ghana have 5. Apart from start-ups, research hubs have been established. For example, the Robotics and Agent Lab (RAL), established in 2007 by the University of Cape Town, South Africa, focuses on the development of robotics and computational intelligence (Ferrein & Meyer, 2012); the Data Science Africa (DSA) (2024), which has been in operation since 2013, provides a platform through summer schools and workshops for AI practitioners and researchers across Africa to network, discuss, and share knowledge about the development and usefulness of AI. These workshops have been held in Ethiopia, Ghana, Kenya, Nigeria, Tanzania, and Uganda (Data Science Africa, 2024). IBM and Google also opened research labs in parts of Africa. IBM opened AI labs in Nairobi, Kenya, and Johannesburg, South Africa, in 2013 and 2019, respectively; Google also opened a lab in Accra, Ghana (Hao, 2019). Apart from the research hubs and laboratories, associations have also been created to engage and promote participation in AI in Africa. For example, the Women in Machine Learning and Data Science (WiMLDS) seeks to engage with and promote women's participation in AI. They also have chapters in Algeria, Botswana, Kenya, Morrocco, Nigeria, and Uganda (Feast, 2019). There is also the Africa Girls Can Code Initiative (AGCCI) to train and mentor girls in coding (Gwagwa et al., 2020).

AI has precipitated significant socioeconomic transformations across Africa as nations increasingly deploy their capabilities to tackle pressing issues. Kenya, Nigeria, South Africa, and Ghana stand at the forefront of the movement, harnessing AI technology to confront local challenges and foster innovation (Gwagwa et al., 2020; Ade-Ibijola & Okonkwo, 2023).

In healthcare, AI-powered solutions are revolutionizing disease diagnosis, treatment planning, and patient care. For example, in South Africa, the company hearX (2018) developed an AI-based mobile app that detects hearing loss in children, enabling early intervention and treatment. Similarly, in Kenya, the start-up Ilara Health is using AI to improve access to medical diagnosis in underserved communities (Villgro Africa, n.d.).

In agriculture, AI is used to optimize crop yields, improve livestock management, and mitigate the effects of climate change. For example, Zenvus in Nigeria delivers insights to farmers through AI applications (Pedro et al., 2019). HelloTractor in Nigeria is also deploying AI-powered platforms to connect smallholder farmers with tractor services, increasing productivity and reducing labor costs. Moreover, AI-driven weather forecasting systems help farmers make informed decisions about planting, irrigation, and pest control (Javaid et al., 2023).

Likewise, in finance, AI is revolutionizing banking insurance and investment services, making them more accessible and efficient. Mobile payment platforms like M.Pesa in Kenya; Mama Money and Mukuru in South Africa, and Kudi in Nigeria have already transformed the way people conduct financial transactions (Ade-Ibijola & Okonkwo, 2023; Shaikh et al., 2023). AI-powered credit-scoring algorithms have also made greater financial inclusion possible for underserved populations.

Interestingly, despite AI's significant contribution to Africa's economic growth, the 2023 government AI readiness index reveals that Sub-Saharan Africa has the lowest average score among regions, highlighting challenges to government AI adoption (Oxford Insights, 2023). However, there have been notable advancements. For instance, Rwanda became the first country within the low-income bracket to publish an AI strategy, while Senegal and Benin also followed suit, marking the first AI strategies in mainland Sub-Saharan Africa and ending Mauritius's five-year monopoly in the region (Oxford Insights, 2023). Ethiopia is currently finalizing its strategy, while Nigeria's strategy is reportedly under development, and South Africa has yet to implement one (Oxford Insights, 2023; Code for Africa, 2024). This trend contrasts with what is observed in other parts of the world, where the most developed or largest economies tend to lead the creation of national AI strategies.

Comparing Africa's AI results with those of developed countries, Adams (2022) attributed the success of these countries to the presence of strategic AI policies. This underscores the importance of Africa establishing a robust and practical AI policy framework because it has immense potential to drive continent

development.

3.1. Potential of AI for Africa's Development

AI has immense promise in addressing critical developmental challenges in Africa. With its transformation prospects, AI offers innovative opportunities to foster sustainable growth and improve the quality of life of African citizens. Thus, this section addresses how AI can relieve most pressing challenges in Africa and propel the country toward a transformative impact. This includes key areas:

3.1.1. Revolutionizing Agriculture

Africa's agricultural sector holds immense growth potential but faces challenges like low crop yields and inefficient resource management, which have contributed to food insecurity in the country (Ehui, 2020). However, agricultural problems and food insecurity can be mitigated using AI technologies. Crop diseases and disasters can be predicted, and farmers can be forewarned to ensure better preparation. In addition, these tools can help farmers make better decisions to enhance agricultural productivity, optimize resource utilization, and mitigate climate risks. Machine learning models can analyze vast weather datasets to predict droughts and floods with greater accuracy (Prodhan et al., 2022). This empowers farmers to adapt their planting schedules and choose drought-resistant crops, fostering resilience in the face of climate change. AI algorithms analyze data collection from drones and sensors, enabling farmers to make data-driven decisions about irrigation, fertilization, and pest control, which optimizes resource utilization and leads to increased crop yields (International Food Policy Research Institute, 2020). In Kenya, AI-powered agricultural platforms such as Farm Drive and UjuziKilimo provide farmers with actionable insights and advisory services based on real-time data, empowering them to make informed decisions and improve farm productivity (FAO, 2017; Otieno, 2021).

3.1.2. Revolutionizing Healthcare

For a continent struggling to meet the minimum World Health Organization (WHO) (2010) recommendation of 23 skilled healthcare professionals (physicians, nurses, and midwives) per 10,000 people, AI proposes an opportunity to revolutionize healthcare delivery by providing access to a wide range of individuals, particularly those who live in underserved and rural areas. AI-powered telemedicine platforms can facilitate remote consultations and patient monitoring, bridging gaps in access to quality healthcare services and improving healthcare outcomes in rural and remote communities (World Health Organization, 2010). AI-powered diagnostic tools, such as machine learning, algorithms, and image recognition systems, can enable accurate and timely diagnosis of diseases. This can lead to more timely treatment interventions and improved patient outcomes (Siemens Healthineers, n.d.). For example, in Rwanda, the deployment of AI diagnostic solutions has significantly improved healthcare outcomes by reducing diagnostic errors and early disease detection (African Development Bank, 2022).

3.1.3. Education Transformation

Education is fundamental to human capital development and economic prosperity. AI technologies can transform education in Africa by expanding access to quality education, personalizing instruction, and enhancing learning experiences. AI-powered educational platforms like Squirrel AI, ChatGPT, Thinkster Math, and intelligent tutors, provide an opportunity to improve learning outcomes and reduce educational inequalities. For example, in Rwanda, there is an AI-powered learning tool Ubongo (n.d.), which enables students to learn at their own pace and in a way that is most engaging for them. In Kenya, Eneza Education (2017), a company that provides virtual classrooms to both primary and secondary school students, is available on any type of mobile phone. Eneza allows students to take topical quizzes, ask teacher questions, and access Wikipedia and a dictionary offline.

3.1.4. Boosting Financial Inclusion

Financial inclusion is critical for poverty reduction and inclusive economic growth. AI technologies offer innovative solutions to expand access to financial services, facilitate digital payments, and enhance risk assessment and credit scoring. AI-driven fintech platforms, such as mobile banking apps, peer-to-peer lending platforms, and digital credit scoring systems, enable individuals and small businesses to access financial services and credit facilities, thereby fostering entrepreneurship and economic empowerment. For example, platforms like M-Pesa in East Africa are used to access creditworthiness, which facilitates access to microloans and financial services for individuals and small businesses (World Bank, 2022); in Nigeria, Paystack and Flutterwave have made businesses easier by establishing innovative, convenient payment solutions and fostering financial inclusion (Pierrine, n.d.).

3.1.5. Infrastructure Development

Infrastructure development is essential for Africa's ongoing development and growth. AI has demonstrated its potential to contribute significantly in this regard. AI technologies offer innovative solutions to optimize infrastructure planning, maintenance, and management, thereby improving the efficiency, resilience, and sustainability of critical infrastructure assets. AI-driven tools and systems can be used to monitor critical infrastructure assets such as roads, bridges, and utilities. It also predicts maintenance needs, thereby enhancing reliability. For instance, the deployment of an AI-powered traffic management system in Ghana has improved urban mobility and reduced congestion by

optimizing traffic flow and signal timing (Agyapong & Ojo, 2018).

3.2. Challenges in Implementing AI in Africa

Despite the potential for AI to drive development across Africa, the continent faces numerous challenges that undermine its adoption and effective implementation. These challenges were identified through a review of the AI literature and are discussed below.

3.2.1. Limited Technological Infrastructure

One of the most pressing challenges hindering the implementation of AI in Africa is inadequate technological infrastructure. For instance, internet penetration across the continent remained low, estimated at 28% in 2019 (Olawale et al., 2023). This deficit in internet penetration can be attributed to a lack of reliable electricity and insufficient investment in internet infrastructure, including fiber optic cables, base stations, and cell towers (Olawale et al., 2023).

The absence of essential resources, such as reliable electricity and robust Internet connectivity, greatly impedes the effective deployment and use of AI technologies in Africa. Apart from this, there is the digital divide in terms of technological infrastructure, with rural and underserved areas facing significant barriers to access to technology. It was established by the World Bank (2022) that approximately 100 million Africans living in remote regions do not have access to mobile cellular networks.

3.2.2. Shortage of Skilled Workers

The shortage of skilled AI professionals poses a barrier to AI implementation in Africa (Ajadi, 2020; Bianco, 2021). The intricate nature of AI technologies necessitates specialized expertise, for which there exists a supply-demand imbalance. For example, according to the Permanent Secretary of the Ministry of ICT, Rwanda is suffering from a shortage of AI specialists. There are about 10 AI engineers in the country, despite the role of AI in offering credible solutions to many challenges facing the country (Iliza, 2019). Research has also shown that there needs to be more trained AI specialists in Ethiopia (Olawale et al., 2023), and this is the case for many African countries.

Specialized expertise in data science, machine learning, algorithm development, programing competencies are among the required skills for effective adoption and use of AI applications (Ade-Ibijola & Okonkwo, 2023), and these skills are currently in short supply across the continent. In addition, there is the "brain drain" phenomenon where highly skilled individuals migrate to more developed regions, further worsening talent shortage (Ombogo, 2023). This action restricts the availability of AI specialists capable of advancing innovation and implementation in Africa.

3.2.3. High Cost of Technological Tools and Equipment

The high cost of AI technologies and equipment presents a significant hurdle for many African countries, particularly those with limited financial resources (Arakpogun et al., 2021). Acquiring AI hardware, software, and other infrastructure incurs substantial costs, making it difficult for governments, businesses, and organizations with limited budgets to invest in AI initiatives. In a report by the Alliance for Affordable Internet (A4AI), African countries inhabited nine of the ten affordable spots in terms of internet access with expenditures ranging from 12 % to 44% of GDP (Access Partnership, n.d.). Additionally, ongoing maintenance, training, and upgrades further add to the financial implications of AI technologies, making AI implementation financially challenging for many stakeholders.

3.2.4. Quantifiable and Quality Data

The importance of quality data for AI development in Africa cannot be overstated. AI initiatives heavily depend on both the quality and quantity of data to deliver accurate information or responses to users in various contexts. Without sufficient and reliable data, AI systems may fail to perform effectively. The absence of quality data reflecting demographic variables poses a challenge in Africa (Olawale et al., 2023). Across many African countries, data collection processes suffer from fragmentation, inconsistency, and incompleteness, resulting in sparse and unreliable datasets. Consequently, this obstacle increases the likelihood that algorithms will not be adequately tailored to meet user requirements. According to Ade-Ibijola and Okonkwo (2023), machine learning can only be as good as the data provided.

3.2.5. Ethical and Regulatory Considerations

The absence of clearly defined ethical guidelines and regulatory frameworks for AI presents challenges to its implementation in Africa (Okolo et al., 2023). AI has been associated with numerous ethical issues, particularly concerning accountability, safety, data privacy, transparency, informed consent for data usage, algorithmic fairness and bias, and socioeconomic risks (Olawale et al., 2023). The use of biased data in AI systems has been observed to aggravate socioeconomic inequality (Association for Progressive Communications, 2019).

These concerns underscore the necessity for robust regulations governing AI development. Furthermore, the potential impact of AI on employment, education, inequality, and human rights requires careful attention to ensure that AI technologies benefit all segments of society. In essence, there is an urgent need for clear regulations and ethical guidelines for AI development in Africa.

3.2.6. Cultural and Societal Factors

Africans are very skeptical about adopting and using technology because of cultural and societal influences (Ade-Ibijola & Okonkwo, 2023). Citizen perceptions of technology, attitudes toward automation, and cultural norms surrounding data sharing and privacy are essential. According to Sey (2020), attitudes are a predictive factor that affects the adoption of new products. Chatterjee and Bhattacharjee (2020), assessing the adoption of AI in higher education, revealed that individuals' behavioral intentions to use AI in higher education are influenced by their attitudes. In other words, if students possess negative perceptions of these technologies, such as chatbots in education, they will be reluctant to adopt and utilize them. Positive perception of an innovation accelerates its adoption.

4. Policy Framework for AI Adoption in Africa

AI offers potential benefits and challenges for African nations. However, the policy responses needed to recognize and fully utilize the potential of AI are less clear.

Developing and implementing a comprehensive policy framework is crucial for fostering the adoption and sustainability of AI technologies in Africa. Such a framework is vital because it offers incentives and regulatory measures to optimize the advantages of AI while mitigating potential risks and challenges. Adams (2022) asserted that Africa continues to be predominantly influenced by foreign technology and AI companies, which do not necessarily support national developmental priorities because no concrete policies are in place. According to Onuoha (2019), only 17 out of the 55 African Union states had enacted comprehensive legislation concerning data protection and privacy. These countries are Angola, Benin, Burkina Faso, Cape Verde, Cote D'Ivore, Gabon, Ghana, Lesotho, Madagascar, Mali, Mauritius, Morocco, Senegal, Seychelles, South Africa, Tunisia, and Western Sahara (Onuoha, 2019, p. 60).

Meanwhile, regarding the 2020 Government AI Readiness index globally, only five African countries emerged as global leaders: Mauritius (45th), South Africa (59th), Seychelles (68th), Kenya (71st), and Rwanda (87th) (Sey, 2020). In 2022, there was a subtle shift in the top five African countries according to the Global Government AI Readiness Index. Mauritius retained its lead (57th), followed by Egypt (65th), South Africa (68th), Tunisia (70th), and Morocco (87th) (Oxford Insights, 2022). According to Oxford Insights (2022), these countries excelled due to their commendable performance in the Government Pillar, which encompasses criteria such as having a national vision for AI, the advancement of online services, the implementation of data protection and privacy laws, and the establishment of cybersecurity strategies. However, in 2023, there was an improvement in Africa's AI readiness, as recorded in the 2023 Global Index. Three countries (Senegal, Rwanda, and Benin) have published new national strategies, and Ethiopia has announced a forthcoming strategy (Oxford Insights, 2023). Likewise, Cote D'Ivore, Namibia, and Rwanda have announced that they are working with UNESCO's recommendation on the ethics of AI (Oxford Insights, 2023).

Mauritius maintains its position as the regional leader with a score of 53.27, followed by South Africa, Rwanda, Senegal, and Benin comprising the top five positions (Table 1). Mauritius's strength lies mostly in the Government Pillar, while South Africa leads the region in the technology, data, and infrastructure pillars. According to Oxford Insight, South Africa is the only country in Sub-Saharan Africa to score above the global average for the technology sector pillar.

Table 1: AI Readiness Ranking

Tab 1

Global Ranking	Country	Total Score	Government Pillar	Technology Pillar	Data and Infrastructure Pillar
61	Mauritius	53.27	69.82	30.63	59.35
62	Egypt	52.69	68.19	40.11	49.77
77	South Africa	47.28	37.82	40.22	63.79
84	Rwanda	45.39	67.82	27.87	40.48
88	Morocco	43.34	37.54	35.69	56.79
91	Senegal	42.58	59.65	27.67	40.43
97	Benin	41.37	61.38	24.46	38.29
101	Kenya	40.19	40.03	28.95	51.58
103	Nigeria	39.88	44.94	24.49	50.21
110	Botswana	38.84	34.82	29.20	52.50
112	Seychelles	38.11	36.44	19.50	58.37
120	Algeria	35.99	30.10	30.56	47.30
125	Namibia	35.37	32.02	28.30	45.80
132	Uganda	33.44	38.06	20.96	41.30
135	Gabon	33.09	25.12	27.67	46.47
137	Tanzania	32.86	35.46	20.71	42.42
138	CoteD' Ivore	32.78	34.33	20.28	43.73
140	Ethiopia	32.59	37.29	20.35	40.11
141	Ghana	32.58	34.66	23.23	39.87
143	Zambia	32.36	32.32	20.33	44.42

Source: Oxford Insight, 2023

Table 2: Government Pillar criteria

Tab.2

Dimension	Description
Vision	Does the Government have a vision for implementing AI?
Governance	Are there the right regulations and ethical frameworks in place to implement
Ethics	AI in a way that builds trust and legitimacy
Digital Capacity	What is the existing digital capacity within the Government?
Adaptability	Can the Government change and innovate effectively

Source: Oxford Insight,2023

Table 3: Technology Sector Pillar criteria

Tab.3

Dimension	Description
Maturity	Does the country have a technology sector capable of supplying Governments with AI technologies?
Innovation Capacity	Does the technology sector have the right conditions to support innovation?
Human Capital	Are there the right skills in the population to support the technology sector?

Source: Oxford Insight,2023

Table 4: Data and Infrastructure Pillar criteria

Tab. 4

Dimension	Description
Infrastructure	Does the country have a good technological infrastructure to support AI technologies?
Data Availability	Is there a good availability of data that could be used to train AI models?
Data Representativeness	Is the data available likely to be representative of the population as a whole?

Source: Oxford Insight (2023)

The AI strategies of Rwanda, Senegal, and Benin concluded Mauritius's five-year period as the sole nation in the region with an AI strategy. Paradoxically, these three nations are classified as low-income (Rwanda) or middle-income (Senegal and Benin) countries, in

contrast to Mauritius (upper middle income), the most economically advanced (South Africa), or the largest economy (Nigeria) in Africa (World Bank, n.d.). South Africa and Nigeria do not have AI strategies. However, Nigeria's strategy is reportedly in development (Oxford Insights, 2023).

While most countries in the region lack AI strategies, task forces have been established and progress has been made in data protection policies and government digital transformation, which are essential foundations for government AI readiness. For example, Nigeria enacted a new data protection act in 2023, replacing its 2019 Data Protection Regulation with more comprehensive legislation; Senegal published its National Data Strategy which was developed with the non-profit Smart Africa and German development Agency GIZ (Oxford Insights, 2023). In February 2018, Kenya established its Distributed Ledgers Technology and AI Taskforce, which subsequently published its final report in July 2019 (Onuoha, 2019). In Tunisia, the Secretary of State for Research initiated the country's AI task force in April 2018, with support from the UNESCO Chair on Science, Technology, and Innovation Policy (Onuoha, 2019). South Africa established the Presidential Commission on the Fourth Industrial Revolution in April 2019 (Onuoha, 2019). Additionally, in April 2019, Uganda launched its Expert National Task Force on the Fourth Industrial Revolution Technologies (Onuoha, 2019). These countries find ways to build their AI expertise and extend policy capacity. However, they do not have policy documents to guide AI. According to Adams (2022), Mauritius, Egypt, and Rwanda were the first African countries to devise national AI strategies to serve as policy responses to AI.

4.1. Key Policy Considerations for AI in Africa

The success of AI depends heavily on the availability of policies to power the AI ecosystem in a country. Jaldi (2023) highlighted the pivotal role that countries in North America, Europe, and Asia have played in shaping AI policy frameworks within their regions. Through these initiatives, they have effectively harnessed the potential of AI, thereby driving socioeconomic growth. Africa exhibits a lag in comprehensive AI policy formulation, with notable exceptions including Mauritius, Egypt, and Rwanda. This has reduced the full utilization of the opportunities AI offers. Therefore, this section analyzes key policy areas that African policymakers should consider when developing policies.

4.1.1. Gender Inclusivity

Women in Africa are probably marginalized by AI. According to Gwagwa et al. (2020), women are typically disadvantaged by data and algorithm biases that reflect and amplify inequities already existing in the continent. Africa is already laced with inequality, and this is reflected in its digital divide. According to Gwagwa et al. (2020), Africa is the only continent whose digital gender gap has widened since 2013. Of the 60% of African women who own a mobile phone, only 18% have Internet access, and over 200 million are left unconnected (Onuoha, 2019). Thus, new technologies have the potential to magnify existing inequities. Therefore, attention must be paid to the differential impacts of AI on women.

Policy provisions must be tailored to ensure that AI adoption is inclusive and does not perpetuate social inequality.

4.1.2. Infrastructure Development

It is imperative that African governments implement policy measures aimed at establishing and maintaining secure, reliable, and conducive infrastructure to facilitate the development and utilization of AI, e.g., investing in digital infrastructure such as broadband connectivity and cloud computing can facilitate widespread access to AI technologies.

4.1.3. Regional Cooperation

This is an important policy option for developing common regulatory responses to AI. Regional policy frameworks can harmonize regulations, facilitate knowledge sharing, and create an attractive environment for AI investments. For instance, the 2014 AU Convention on Cybersecurity and Personal Data is a key African continental instrument related to AI. There is also the African Union Commission's (2022) Data Protection Framework, which emphasizes data ownership, privacy, and security. Various regional economic organizations have implemented acts and programs to facilitate the integration of AI within their respective jurisdictions. For instance, the 2010 Supplementary Act on Personal Data Protection within ECOWAS is binding on community member states. The East African Community has established a legal framework for cyber laws, and the Southern Africa Development Community (SADC) implemented a model law on data protection in 2012 (Onuoha, 2019). National Governments can build on these frameworks and contextualize them to suit their specific countries.

In addition, regional collaboration allows African Nationals to conduct joint assessments of their existing AI policies and infrastructures. This promotes a learning curve where countries can share best practices in AI policy development and regulations and learn from each other's experiences.

4.1.4. Data Availability

Data availability and quality are fundamental to AI development. The success of AI is heavily dependent on the availability of robust data to train models. However, many African countries face challenges related to data collection, management, and accessibility.

To harness AI's full potential, Africa must prioritize

data privacy and transparency and safeguard its data resources from exploitation. It is crucial to note that for there to be an effective implementable AI policy, data must be effectively managed. By leveraging collective data resources, countries can build larger and more diverse datasets, enhancing the performance and accuracy of AI systems tailored to African contexts. For example, the efficacy of machine learning methodologies is fundamentally contingent upon the quality of the input data (Abejide & Okonkwo, 2023).

4.1.5. Prioritizing Ethical Value

Building trust in AI is paramount. Policies should promote the development and deployment of ethical AI that upholds fairness, transparency, and accountability. This includes establishing mechanisms to address biases in algorithms and ensuring human oversight of AI decision-making processes.

4.1.6. Research and Development

Africa needs a vibrant AI research ecosystem to drive innovation and solve local challenges. Policies should encourage public-private partnerships to invest in AI research and development. Additionally, fostering collaborations with international research institutions can accelerate technological advancements throughout the continent (World Bank, 2023).

4.1.7. Policy Flexibility

The aim of AI policy should be to foster responsible innovation not stifle it. Regulations should be flexible and adaptable to keep pace with the rapid evolution of AI technologies.

4.1.8. Taking Ownership

Policies will be ineffective if they do not address the specific conditions of the areas they are intended for. Therefore, AI policies should be contextualized to align with each country's developmental stance. It is crucial to consider each country's cultural and societal environment when developing AI policies because they must account for potential biases and unequal impacts on different socioeconomic and demographic groups within society. Neglecting these factors can worsen existing inequities.

5. Conclusion: An AI-Driven Future for Africa

This study examined AI policies in Africa and how their implementation can impact Africa's development. It was revealed in the study that AI policies in Africa are still in their early stages, as only a few countries in Africa have established AI policies to regulate the adoption and utilization of AI technologies and firms. Countries like Mauritius, Rwanda, Senegal, Morocco, Egypt, Rwanda, Benin, Sierra Leone, and Tunisia are currently the only African countries to have developed and implemented AI policies. In contrast, many other African nations have concentrated on establishing AI task forces, data protection policies, and government digital transformation initiatives. However, these efforts alone are insufficient to fully exploit the potential of AI. Without comprehensive AI policies, it is challenging to maximize AI's capabilities, thereby impeding its potential to drive development across the continent.

As stressed in this study, AI holds immense promise in terms of fostering development in Africa across various sectors. This includes and is not limited to healthcare, agriculture, education, and finance. AI technologies can provide innovative solutions to longstanding challenges experienced in these areas, creating new opportunities for growth and promoting sustainable development. However, realizing this potential depends on the establishment of a comprehensive policy framework and the resolution of several challenges.

This study identified several key challenges that must be addressed to ensure effective adoption and implementation of AI policies across the continent. These challenges include infrastructure challenges, skill gaps, the high cost of technological tools and equipment, ethical and regulatory uncertainties, data privacy and security, and cultural and societal factors. Some of these challenges must be addressed before the formulation of AI policies, and others must be considered during policy development. By addressing these issues, African countries can better harness the power of AI to drive sustainable and inclusive development. This study underscores the importance of addressing these challenges to prevent them from undermining the adoption and effective implementation of AI policy across the continent.

The study proposes critical policy considerations for the development of AI policies for African nations. These considerations encompass infrastructure development, data availability, research and development, prioritization of ethical values, building upon existing frameworks, ensuring policy flexibility, and establishing ownership of these initiatives.

These policy considerations will have a transformative impact when coupled with visionary leadership, innovative partnerships, and evidence-based policymaking.

To conclude, the path toward an AI-driven future for Africa requires a comprehensive, well-formulated, and effectively implemented framework that will enable the easy flow and utilization of technologies for the benefit of all. By building upon existing regional policy frameworks, taking ownership, investing in appropriate infrastructure, prioritizing ethical value, and fostering a skilled workforce, African nations can fully harness the power of AI to address societal challenges and drive sustainable development.

6. Limitations and Further Study

A limitation of this study is the absence of an in-depth examination of specific African countries' positions on AI policy. Additionally, the scope of the literature review was limited due to time and resource constraints.

Future research should examine individual African countries to understand the reasons behind the absence of AI policies. Moreover, a comparative analysis of countries with and without established AI policies could provide valuable insights into the utilization, benefits, and challenges experienced in implementing AI technologies. Such research will contribute to a better understanding of the factors influencing AI adoption and potential pathways to enhance AI-driven development across the continent.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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