

# The Role of Artificial Intelligence in Accelerating Digital Transformation Across Emerging African Economies

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Publication Date: 2025/11/12

## Abstract

Artificial intelligence (AI) has quickly become a hallmark of the digital transformation in the world, and it is fundamentally changing the way societies create value, provide services, and compete in a globalised world. In Africa, AI is a developmental challenge and a transformative opportunity in the emerging economies. The intersection of mobile technologies, data analytics, and machine learning is allowing African countries to skip the conventional industrial development trajectories, improve the delivery of social services, and trigger inclusive economic development. However, the potential barriers to the implementation of AI are structural flaws in the form of the lack of digital infrastructure, ineffective data management, and the absence of human capital. The paper will critically analyse the role of AI in enhancing the pace of digital transformation in the emerging African economies with interdisciplinary support of evidence in development economics, technology policy, and African innovation studies. It combines the knowledge of (Strusani and Hounghonon, 2019), Aly (2022), Ifeanyi et al. (2025), and Arakpogun et al. (2021) to give a more refined view of the way AI promotes innovation, productivity, and resilience. The paper argues that AI in Africa holds a future in context-sensitive policies to balance between the ambition of technology and ethical governance, inclusive participation and sustainable development objectives.

**Keywords:** *Artificial Intelligence (AI); Digital Transformation; Emerging Economies; Africa; Technological Innovation; Economic Development; Sustainable Development.*

## I. INTRODUCTION

The Fourth Industrial Revolution has brought the world together in a technological convergence that has never been seen before, where artificial intelligence (AI), big data, and digital platforms are transforming the way nations develop and compete. Being the main driver of this revolution, AI is the embodiment of efficiency, innovation, and development. In the African emerging economies, it is not only a technological breakthrough, but it is also a strategic route to address the limitations of development in the past and to speed up the digital revolution. Since Nairobi, Silicon Savannah, and Lagos, Yabacon Valley are starting to embrace AI-powered innovations to solve economic and social problems.

Digital transformation is the process of the systematic adoption of digital technologies into the production, communication, and governance systems, which changes the way economies operate and citizens interact (Aly, 2022). The core of this change lies in AI, which allows analysing data, recognising patterns, and making predictions based on them. In a place where the

infrastructure is weak, the level of industrialisation is low, and economic activities are informal, AI will offer the chance to jump over the traditional levels of development (IFC, 2019). African countries can become more productive, more efficient, and more inclusive by implementing smart solutions to the issues in agriculture, healthcare, finance, and education.

Nevertheless, the spread of AI on the continent is still unequal. The digital divide that has characterised Africa, characterised by a lack of broadband connectivity, bad electricity, and low digital literacy, has remained a stumbling block towards equitable adoption (ITU, 2019). The regulatory systems and governance are also changing gradually, and there are loopholes in data protection, accountability of algorithms, and ethical control (Arakpogun et al., 2021). Such difficulties threaten to strengthen the reliance on external technologies and information systems that may further increase inequality and digital addiction.

In spite of these limitations, there is an increasing pace of digital transformation. The use of AI in stimulating

sustainable development and institutional modernisation is becoming increasingly accepted by policymakers, investors and regional institutions. Rwanda has shown this increased commitment through initiatives like the National AI Policy, Nigeria has shown this commitment through the National Digital Economy Strategy, and the African Union has shown this commitment through the Digital Transformation Strategy (2020-2030). This article will discuss how AI can be used to hasten the digital transformation process in emerging African economies based on the endogenous growth and Schumpeterian innovation theories to determine how AI can contribute to inclusive development. It claims that the success of Africa in its attempt to harness AI will hinge on its capacity to enhance the ecosystems of innovations, investing in human capital, and creating governance systems that enhance efficiency and equity.

## II. LITERATURE REVIEW

### ➤ *Overview of AI and Digital Transformation in Africa*

The intersection of artificial intelligence (AI) and the digital transformation in the emerging African economies has become a central point of recent research, as the continent is becoming a participant in the Fourth Industrial Revolution. The current literature indicates optimism and worry. Although numerous people emphasise the fact that AI can help to speed up the growth and improve the delivery of services, some people also point to the institutional and ethical issues that may lead to increasing inequality. All in all, AI becomes a catalyst of development and a disruptive factor, and its effects depend on the local forces, the quality of governance, and the policy design to a large extent.

### ➤ *AI as a Driver of Economic Modernization*

According to Strusani and Hounbonon (2019), one of the most detailed studies of the potential development of AI in the emerging markets, AI was theorized as a device that improves human decision-making and automates cognitive processes in industries. The IFC considers financial inclusion progress in Africa to be the use of AI-based credit scoring systems like M-Shwari in Kenya and Branch in Nigeria, both of which use nontraditional data to determine creditworthiness. In addition to finance, AI helps in agricultural productivity and the transparency of the government. The IFC, however, is concerned that the lack of infrastructure, data capacity, and digital skills limits scalability, and it is necessary to invest in broadband, data centres, and digital education.

This productivity and AI adoption connection is also supported by empirical data provided by Aly (2022). Aly uses the data of developing economies and concludes that the indicators of digital transformation significantly correlate with the economic performance. Her work makes AI a productivity amplifier, which leads to efficiency and innovation and may decrease gender disparity in the workforce. However, she cautions that automation, in the absence of an inclusive policy, might only increase job

displacement among low-skilled workers, which has been a common theme in the world discourse on technological change.

### ➤ *Structural and Institutional Context*

Arakpogun et al. (2021) place AI into the political economy of the Global South, underlining the fact that African nations have specific obstacles in the form of poor governance, reliance on foreign technologies, and the lack of institutional capacity. They recommend problem-solving solutions that would make AI implementation consistent with the local needs, including food security, health access, and sustainable management of resources, instead of copying the Western policy templates. Ethical factors, such as data sovereignty, algorithmic fairness, and cultural inclusivity, are needed to avoid supporting inequalities.

Ifeanyi et al. (2025) further this discussion through the sectoral applications in Africa. Their research points to the example of AI innovations in Kenya with the Nuru crop diagnostic app and Rwanda with Zipline medical drones as examples of the localised technology that enhances productivity and service delivery. According to them, while AI enables Africa to jump the traditional industrial curves, local innovation ecosystems and the excessive dependency on imported technologies are threats to becoming dependent.

### ➤ *Social and Ethical Dimensions of AI*

Social implications and governance implications of AI are also discussed in the literature. Both the World Bank (2024) and OECD (2017) highlight the possibility of AI to improve the efficiency of the public sector by means of data-driven policymaking and automation. These include health surveillance and tax management system predictive analytics. However, the same technologies also create privacy and accountability issues in areas where the legislation on data protection is not strong. Both the European Commission (2019) and UNESCO (2019) support the idea of transparent and inclusive governance structures in order to make AI ethical.

An emerging wave of critical literature, such as Okolo (2024), is concerned about the so-called digital extractivism, with African-produced data driving AI systems globally run by corporations in the Global North. This process can be described as a new type of technological addiction, which explains why regional data governance and local innovation are crucial. The African Union Digital Transformation Strategy (2020-2030) is expected to resolve these problems by facilitating ethical principles and international cooperation.

### ➤ *Emerging Themes*

The literature is dominated by three themes. To begin with, AI is commonly known as an economic diversification and modernisation tool (African Development Bank, 2019). Second, the infrastructure and human capital are regarded as the preconditions of successful AI integration; the lack of data scientists and

engineers is the key barrier (PwC and London Stock Exchange Group, 2019). Third, the policy needs to respond to ethical and governance issues, including algorithmic bias and digital exclusion, which are context-specific (European Commission, 2019; Okolo, 2024). Finally, these observations highlight the idea that the effectiveness of AI in Africa is not only determined by the level of technological access but also by the effectiveness of the institutions, policies, and people in defining the application of AI.

### III. THEORETICAL FRAMEWORK

To consider the contribution of artificial intelligence (AI) to the rapid digital transformation of the emerging African economies, it is necessary to base the discussion on the theories of innovation and development. Three connected models, Endogenous Growth Theory, the Theory of Innovation and Creative Destruction by Schumpeter, and Diffusion of Innovation (DOI) by Rogers, provide an understanding of the role of AI in technological advancement, productivity, and social transformation. These theories, combined, describe both processes and circumstances under which AI promotes inclusive digital transformation in the African context.

#### ➤ *Endogenous Growth Theory*

Endogenous Growth Theory (Romer, 1990; Lucas, 1988) is the theory that long-term growth is an internal process that is driven by technological advancement and investment in human capital. It does not view innovation as an exogenous shock but as a consequence of planned investment, accumulation of knowledge and policy. In this context, AI is a type of technological capital which increases productivity by automating, analysing data, and optimising decisions. In Africa, AI will assist countries to overcome the conventional growth obstacles through knowledge generation and decreasing the cost of transactions (IFC, 2019). As Aly (2022) shows, those economies that invest in digital infrastructure and human capital gain faster productivity. Nonetheless, the adoption of AI can support the reliance on foreign technologies instead of creating domestic sustainable growth without robust education and training systems.

#### ➤ *Schumpeterian Innovation and Creative Destruction*

The theory of creative destruction by Schumpeter (1934) emphasises how innovation of technology destabilises the old systems of operation and introduces new industries and jobs. The concept of AI in Africa is the same, as it is replacing the old processes with the new ones, allowing the diversification of industries and entrepreneurship. Fintech applications like Kenya M-Shwari and Nigeria Branch are disruptive to traditional banking by making access more inclusive by using AI-driven credit scoring (IFC, 2019). On the same note, logistics and healthcare automation boost efficiency but have employment issues in the short term (Arakpogun et al., 2021; Ifeanyi et al., 2025). To deal with such disruptions, there is a need to have adaptive governance

structures that promote innovation while mitigating social displacement.

#### ➤ *Diffusion of Innovation Theory*

The theory of Diffusion of Innovation (DOI) by Rogers (2003) describes the spread of technological innovations in societies based on the communication, social norms, and perceived benefits. This model especially applies to Africa, where the spread of AI is highly uneven because of the differences in infrastructure, education, and institutional preparedness. Early adopters such as Rwanda and Kenya have implemented AI plans and innovation centres like Carnegie Mellon University Africa and iHub Nairobi, whereas other countries are lagging because of the insufficient resources and knowledge. DOI emphasises the value of regional ecosystems, sharing knowledge, and the involvement of the general audience in the further implementation of AI in different contexts.

#### ➤ *Integrating the Frameworks*

These theories provide a cohesive model for understanding AI-driven transformation in Africa. Endogenous Growth focuses on knowledge and investment; Schumpeterian Innovation describes disruption and renewal; and Diffusion of Innovation describes social adoption. Together, they allude to the fact that the success of AI implementation is determined by four important enablers: human capital, institutional adaptability, infrastructural preparedness, and cultural acceptance. According to Aly (2022) and Arakpogun et al. (2021), the developmental effect of AI is not determined by access to technology but by the possibility of matching innovation to local capabilities and governance priorities. These observations give a theoretical background to the contextual analysis of AI sectoral use and policy implications in the African context.

### IV. ANALYSIS AND DISCUSSION

The digital transformation of Africa is actively being influenced by artificial intelligence (AI), which presents the solution to the long-standing problems of productivity, service delivery, and social inclusion. However, the advantages of AI are not evenly distributed throughout the continent, and they largely extend to the differences in infrastructure, governance, and human capital. This section will examine the revolutionary role of AI in four key industries, namely, agriculture, healthcare, finance, and education, and will show its socio-economic implications at large.

#### ➤ *AI in Agriculture: Enhancing Food Security and Productivity*

Agriculture still plays a key role in much of the African economies and agrifood jobs throughout the continent. According to the Food and Agriculture Organization of the United Nations (2024) data, in 2022, agriculture provided approximately 48 percent of employment in Africa and the agricultural sector had 892 million people (26.2 percent of total employment) in the

world (some 1.3 billion people ([?]39.2 percent of the workforce) were involved in agrifood systems worldwide in 2021). In this regard, AI technologies, including precision farming, predictive analytics, and equipment sharing on a platform, can be used as viable solutions to enhance yields and market access. Examples of how machine learning can be used to optimise the use of inputs and predict crop diseases at their initial stages to enhance the productivity of smallholders include platforms such as Hello Tractor and diagnostic applications such as Nuru. Nonetheless, the availability of such tools is not even: in rural areas, there is a lack of connectivity, gaps in digital literacy, and reliance on externally created systems, which increases the issue of sustainability and data sovereignty. In order to offer inclusive benefits, the policy should focus on rural broadband, local capacity-building and governance structures that safeguard the data of the farmers and promote domestic innovation.

➤ *AI in Healthcare: Expanding Access and Efficiency*

The use of AI in healthcare is revolutionising service delivery through diagnostic tools, telemedicine and logistics. Zipline drones in Rwanda, which are operated by AI navigation, have transformed the distribution of medical supplies, and Ubenwa in Nigeria is a machine learning-based service that identifies birth asphyxia (Ifeanyi et al., 2025). Such innovations are indicative of creative destruction, as pioneered by Schumpeter, and are substituting old systems with more dynamic and efficient ones.

However, there are still ethical and regulatory issues. The application of patient data to algorithmic diagnostics fosters the issue of consent, bias, and privacy, particularly when legal frameworks are weak (European Commission, 2019). To avert the issue of data colonialism, whereby the health data of Africans is held by foreign companies, governments should enact strong data protection and inculcate the building of local capacities in health informatics.

➤ *AI in Finance: Driving Financial Inclusion*

One of the most visible AI success stories in Africa is that of fintech. M-Shwari and Branch are platforms that use AI analytics to provide credit and savings products to the unbanked in Kenya and Nigeria, respectively (IFC, 2019). These technologies have increased financial inclusion and women in the digital economy (Aly, 2022).

Nevertheless, the fast development of AI-based finance creates the problem of consumer protection and fairness. The social inequalities can be reinforced by the algorithmic bias, and the predatory lending practices are supported by the weak regulatory supervision. To achieve the balance between innovation and accountability, it is necessary to introduce transparent AI auditing and develop inclusive financial data policies (Arakpogun et al., 2021).

➤ *AI in Education: Building Human Capital*

Education is also being changed through AI by making the learning process personal and more accessible.

Such platforms as M-Shule in Kenya and UmojaLabs in South Africa provide adaptive and multilingual learning platforms to underprivileged communities (UNESCO, 2019). AI improves human capital formation, which is a key pillar of endogenous growth by improving learning outcomes and digital skills.

However, the problem of unequal digital access is a challenge. In most schools, the devices and good internet are not available, further increasing the disparity in education. To ensure fairness in the implementation of AI in curricula, policymakers should include AI in the curriculum, protect student data, and educate teachers on how to work efficiently with AI systems (Aly, 2022).

➤ *Broader Socio-Economic Implications*

Across sectors, AI is catalyzing productivity, entrepreneurship, and innovation hubs in cities such as Nairobi, Lagos, and Kigali (Aly, 2022; Ifeanyi et al., 2025). Nevertheless, it is still limited to the diffusion in middle-income economies, as the low-income countries are left behind because of the infrastructural and institutional shortages. The control of AI technology and data by foreigners also poses a threat to strengthen the dependency and restrict the value creation locally.

Socially, the adoption of AI brings about new forms of inequality and governance issues. The state efficiency can be improved by the algorithmic systems, yet these systems can facilitate surveillance and exclusion when not controlled. Therefore, according to Ifeanyi et al. (2025), ethical governance, which is based on transparency, accountability, and inclusion, is essential to ensure that AI can be used as a source of empowerment and not oppression.

Overall, the contribution of AI to the digital transformation of Africa is both revolutionary and complicated. It has huge opportunities for development and social advancement, but its advantages will be determined by the contextual governance, fair distribution, and investment in people and infrastructure.

## V. POLICY AND STRATEGIC IMPLICATIONS

Cognitive policies, institutional coordination, and strategic investment are the keys to the successful introduction of artificial intelligence (AI) into the digital transformation of Africa. Although improvement is being witnessed, sustainable change will need governments, the private sector and regional institutions to work together in the creation of enabling ecosystems that promote innovation and inclusion. The analysis reveals the following important priorities.

➤ *Strengthening Infrastructure and Connectivity*

The infrastructural deficit of Africa is a limiting factor to the adoption of AI. Africa has a very low rate of high-speed internet penetration (28 %) in comparison with the rest of the world (60 %) (ITU, 2019). AI systems are

unable to operate without stable electricity and broadband. It is therefore the responsibility of governments to focus on investment in digital infrastructure, broadband networks, cloud computing and data centres, using public-private partnerships (PPPs). The efforts of Kenya to partner with Microsoft on cloud-based education platforms demonstrate how PPPs can be used to close infrastructural inequalities and increase inclusion. The AI infrastructure should be integrated into the program as a regional priority in cross-border initiatives such as the African Union Programme for Infrastructure Development in Africa (PIDA).

➤ *Building Human Capital and Skills*

Sustainable AI development is still based on human capital. The problem with Africa is that there is a lack of talented experts in machine learning, data science, and software engineering (PwC & LSEG, 2019). Computational thinking and digital literacy should be incorporated into education systems at every level and higher education and vocational training should be AI-oriented. The examples of AI for Youth in Nigeria and the African Institute of Mathematical Sciences (AIMS) in Rwanda show that specific programs can eliminate the skills gap. Governments are also supposed to encourage research, innovation centres, and mentorship networks to develop the home talent and limit over-reliance on imported talent.

➤ *Promoting Data Governance and Ethical AI*

The growth of AI poses ethical threats to privacy, surveillance, and bias in the algorithms (European Commission, 2019). To overcome them, African countries should implement strong data protection systems that are sensitive to local values and developmental requirements. Some countries, such as Kenya, Nigeria, and South Africa, have passed laws that protect their data, however, the laws are not fully enforced. The Malabo Convention and the African Union AI Strategy are regional agreements that provide a template on how to harmonize standards. The control of national data assets, which promotes data sovereignty, is also necessary to prevent the so-called digital extractivism (Okolo, 2024) and enable local economies to gain access to their data.

➤ *Fostering Innovation Ecosystems*

The AI-driven growth needs dynamic innovation systems that support collaboration between startups, academia, and government. The current examples of clusters, including iHub in Nairobi and the Innovation City in Kigali, show the usefulness of public-private collaborations in the development of scalable, socially relevant AI solutions (Arakpogun et al., 2021). The expansion of these models requires specific incentives, tax exemptions for technology companies, seed financing, and intellectual property protection. More importantly, gender inclusion is essential to bridge the digital divide of participation and provide equal chances to access new opportunities.

➤ *Strengthening Governance and Regional Cooperation*

AI offers governments with strong means of attaining the Sustainable Development Goals (SDGs), yet it also poses a threat of exclusion and surveillance. To control the ethical use of AI in government service, policymakers need to implement open and participatory systems (Ifeanyi et al., 2025). To ensure the trust of the citizens, civic activities and algorithmic responsibility are crucial.

Finally, the cooperation at the continental level is important. For instance, the Digital Transformation Strategy (2020-2030) by the African Union and regional blocs like ECOWAS and SADC should promote common AI research centres, standardised regulations and cross-border innovation. International collaboration with organisations such as UNESCO and the World Bank should focus on equal transfer of technology instead of dependence.

## VI. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

Artificial intelligence (AI) has emerged as a force in speeding up the digital transformation in the emerging African economies. It is integrating into other sectors, including agriculture, healthcare, finance and education, which is transforming the development landscape of the continent and making it more efficient, innovative and inclusive. Through the ability of AI to process and predict data as well as automate the process, African countries are getting a chance never seen before to eliminate structural bottlenecks that have held growth and service delivery down for a long time. However, such a prospect is not evenly fulfilled, and the infrastructural constraints, the governance gap, and socio-economic inequalities still precondition the results.

The paper highlights that the transformative potential of AI is based on a number of factors that are interconnected factors, including technological preparedness, human capital, ethical governance, and collaboration in the region. From the perspective of the endogenous growth theory, AI is considered an asset of knowledge that can drive long-term growth with the condition of investments into education, research, and digital infrastructure. The innovation theory proposed by Schumpeter describes the dual nature of AI as a disruptive and generative force that can destroy the old industry and create new opportunities. The diffusion of innovation theory also emphasises the influence of the institutional adaptability, social acceptance, and contextual responsiveness in the development of the speed and inclusivity of AI adoption

While there is increased digital momentum, there are still significant challenges, such as inequality in access to technology, poor governance of data, and reliance on foreign AI systems, which pose a threat of enhancing the current inequalities and subjecting African economies to digital dependence. The continent will not be a producer of AI solutions but will continue to be a consumer without

any strategic policies that encourage local ownership and innovation.

Hence, to gain a fair digital transformation, the leaders of Africa need to focus on human-centred and situation-specific approaches, investing in a well-developed digital infrastructure, enhancing education and technical skills, and implementing clear and ethical data management. Also, the partnership between governments, academia, and the private sector will play a critical role in developing sustainable innovation ecosystems that will ensure that AI development is in line with the socio-economic priorities of Africa.

The study should further the empirical evidence of the long-term impacts of AI on employment, governance, and inequality in the future. Comparisons between African regions may show how the quality, political stability, and cultural settings determine digital results. Furthermore, trans-disciplinary research, which cuts across technology, social science, and ethics, will also be essential in making sure that the development of AI is based on the specific developmental conditions of Africa and not based on the models of other developed nations.

Finally, AI has a chance to re-establish the role of the African continent in the worldwide digital economy. To achieve this pledge, the people will require visionary leadership, an all-inclusive policy, and a promise to ethical innovation. When properly used, AI can become not a technological dream but a tool of transformative change to embrace the entire continent in terms of growth and sustainable development.

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