Relevance of Technological Development To Economic Growth in Africa: A Position Paper

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Abstract
Technological development is increasingly pivotal to Africa's aspirations for productivity, growth, structural transformation, and global competitiveness. This position paper argues that technology should be viewed as an essential component of Africa's economic-growth strategy. Technology can enhance productivity, slash transaction costs, expand market accessibility, back up financial inclusion and create novel economic opportunities. However, its merits depend on complementary investments in human capital, digital infrastructure, energy, research and development, finance and effective institutions. Recent evidence shows that digital infrastructure promotes innovation in Africa, particularly when supported by human capital (Osei, 2024), while technological innovation and human capital jointly contribute to industrial productivity and competitiveness (Awode & Oduola, 2024). The paper examines the major technological opportunities and impediments shaping Africa's development, including digitalisation, artificial intelligence, automation, fintech, smart agriculture, digital health and emerging mobility. It further highlights continuous challenges such as insufficient infrastructure, unreliable energy, limited digital skills, weak research capacity, financing constraints and institutional gaps. The paper argues that addressing these constraints needs coordinated policies that join technological development with education, industrialisation, entrepreneurship and inclusive economic transformation. Africa must therefore move beyond technology consumption towards technology adaptation, production and

innovation. Empowering local technological capabilities and regional cooperation is necessary for ensuring that technological progress result in sustainable, inclusive and broad-based economic growth across the continent.

***Keywords**: Digitalisation, Innovation Interoperability, Productivity, Technology, Transformation*

1. Introduction

Technological change has become an important determinant of how economies produce, trade and compete, both locally and globally. Digital technologies, artificial intelligence, automation, mobile platforms and data-driven systems are transforming agriculture, manufacturing, finance, education, health and public services (Solomon & van Klyton, 2020; African Union, 2024). For Africa, this transformation presents both an opportunity and a development challenge. Technology can help overcome infrastructure constraints, reduce production and transaction costs, expand market access and improve productivity (Myovella et al., 2020; Nguimkeu & Okou, 2024).

However, narrow digital connectivity, inadequate skills, erratic energy supply, weak research capacity and constrained financing continue to limit the broader economic impact of technological adoption across the continent (Traoré et al., 2021; OECD, 2024; World Bank, 2024). Recent African evidence supports the importance of technological capability for growth. Kasongo and Makamu, (2024) discovered an important nexus between innovation and economic growth across African countries, while Awode and Oduola (2024) showed that technological innovation and human capital are closely related to industrial productivity and competitiveness. These findings suggest that technological progress is most meaningful when it is complemented with productive capabilities. In some African countries, many economic activities are still carried out using primitive technologies and old communication means. Examples abound in areas such as farming, where most farm work is done with the use of hoes, cutlasses, diggers and other olden days methods of planting and rearing which would not enhance speediness and qualitative harvest. (FAO 2026). With relevant technology, the continent stands to enjoy steady and speedy economic growth in many sectors of its economies; in education, health, communication, industries, agriculture and in international pedestal.

Unfortunately, the continent faces significant digital cum technological access gaps. The International Telecommunication Union (ITU, 2025) reports that only 38% of Africa's population used the Internet in 2024, compared with 57% in urban areas and 23% in rural areas bringing out the significant difference in internet use in various parts of the continent. Thus, technological progress cannot be assessed simply by the pervasiveness of digital services; affordability, skills, infrastructure and efficient use are equally important. Africa's technology policy environment is also evolving, prominent among them are: The African Union's Continental Artificial Intelligence Strategy (AUCAIS), (2024) places (AI) within the continent's development agenda, while Science, Technology and Innovation Strategy for Africa (STISA-2034 agenda) provides a broader framework for using science, technology and innovation to support Africa's transformation (African Union, 2025). Dah et al., (2025), however submitted that if technological development is placed at the center of Africa's economic growth strategy, with the consciousness of complementing it with well equipped human capital, industrialization, infrastructure, energy, research and effective institutions which form the environment of usage and operations for the technology, the continent would make a head way in its hunts for systematic economic growth and development. The central challenge, therefore is, can Africa develop the human capital,

infrastructure, institutions and productive capacity required to use technology effectively? Without these complementary factors, technological advancement could widen existing inequalities in the continent, firms and workers. Recent evidence from Africa shows that unequal access to digital infrastructure and skills can produce significant differences in employment and socioeconomic outcomes, while digital transformation may also widen existing spatial and social inequalities when access is uneven (Bokhari & Awuni, 2024; Girollet, 2024; Jieutsa et al., 2024). With appropriate investment in education, digital skills, electricity, broadband infrastructure, research and development, and supportive innovation policies, technological change can instead contribute to productivity, employment transformation and sustainable economic development, (Ketchiwou & Ngulube, 2023; Vurayai, 2024). From the foregoing, the questions to ask are; What are the sectors in Africa's economy that demands urgent and full impacts of technology? What are the major economic indicators that should be addressed and complimented with the modern technology? The objectives of this paper would be to; analyse the relevance of technology to some sectors of African economies and to unravel the major indicators which could drive African economy if complemented with appropriate modern technology.

Literature Review

African economies and technological relevance by Sectors.

Education

According to Kalyani (2024), technology has emerged as a catalyst for innovation in education, enabling educators to adopt student-centric pedagogies that cater to diverse learning styles and abilities. The learning process has been completely transformed by digital tools, multimedia materials, and interactive platforms, which have encouraged student participation, critical thinking, and problem-solving abilities. The accessibility of information through the internet has expanded learning opportunities beyond the confines of the classroom, encouraging self-directed learning and nurturing a lifelong quest for knowledge. Digital platforms, artificial intelligence, mobile learning, virtual classrooms and interactive learning tools have created new opportunities for personalised, flexible and collaborative learning. These technologies can improve access to educational resources, support teachers in delivering more engaging lessons, and enable students to learn at their own pace and in different learning environments. Recent evidence shows that digital technologies can enhance teaching and learning when they are appropriately integrated with sound pedagogical practices, while also promoting new forms of educational innovation (Wang et al., 2024). However, the benefits of educational technology depend on factors such as digital skills, reliable internet connectivity, electricity, affordability and effective teacher training. This is essential in developing countries, where infrastructure and digital-access gaps can debar the capacity of schools and learners to benefit fully from technological advancement.

Health

The landscape of healthcare delivery has seen transformative changes in recent years, with advances in technology playing a pivotal role in shaping the future of patient care. Among these technological innovations, telemedicine and remote patient monitoring have emerged as critical components, offering unprecedented opportunities to improve accessibility, improve patient outcomes, and optimize healthcare resource utilization. (Vudathaneni, et al,. 2024). According to Attaran (2022), direct access to data for patients and a more robust data-sharing infrastructure could better prepare the healthcare system to manage public health threats during emergencies,

such as the outbreak of deadly COVID-19 disease. Current technologies by the healthcare industry do not adequately address these requirements due to limitations related to privacy, security, and full ecosystem interoperability.

In the African context, these limitations are particularly obvious because healthcare digitalisation remains splitted across countries and health facilities. Many systems operate separate electronic health records, disease-surveillance platforms and health-information systems that cannot exchange data efficiently, limiting continuity of care and evidence-based decision-making. Studies have identified inadequate interfunctionality, weak data governance, limited technical capacity and uneven digital infrastructure as major constraints to digital-health development in Africa (Mamuye et al., 2023). These challenges are further compounded by unreliable electricity and internet connectivity, shortages of digital skills and concerns about patient privacy and cybersecurity, particularly in rural and underserved communities. Consequently, the effective application of emerging technologies such as blockchain, artificial intelligence, cloud computing and the Internet of Things (IOT) in African healthcare requires more than technological adoption; it requires dimensional functionability standards, stronger data-protection frameworks, investment in digital infrastructure and the development of appropriate technical and institutional capacity. (Degoot et al., 2025).

Manufacturing

The manufacturing sector is an important component of structural transformation in Africa because it converts agricultural and natural resources into higher-value products while creating employment, supporting technological upgrading and expanding domestic production capacity. Manufacturing can help African economies reduce excessive dependence on primary commodity imports, strengthen value chains and improve productivity. Recent evidence shows that manufacturing remains a viable pathway for structural transformation in Sub-Saharan Africa, although its contribution differs considerably across countries and regions (Diao et al., 2024). In addition, industrialisation, labour-force participation and improved electricity access have been found to enhance productive capacity across African economies, highlighting the importance of reliable infrastructure and human capital for manufacturing development (2024).

Despite its potential, Sié, (2023), notes that African manufacturing continues to face challenges including inadequate electricity supply, high production costs, limited access to finance, weak transport infrastructure, technological gaps and insufficient industrial skills. These constraints reduce productivity and international competitiveness of African firms. Recent evidence from 40 Sub-Saharan African countries indicates that digitalisation can improve labour productivity in manufacturing, suggesting that technologies such as automation, digital platforms and data-driven production can support industrial upgrading when complementary infrastructure and skills are available (Karacuka et al., 2025). Similarly, the African Development Bank reports that manufacturing value added reached about US$315 billion in 2023, but manufacturing still accounts for a relatively small share of employment and Africa remains heavily dependent on primary commodities.

Business/Commercial

The modern world has grown rapidly, driven by the emergence of supercomputers, intelligent robots, autonomous vehicles, distributed computing, big data systems, genetic engineering, and neurotechnology. These developments are central to the Fourth Industrial Revolution (4IR), which

has introduced technologies designed to complement human labour and improve efficiency across businesses and commercial activities generally. However, the increasing use of robotics and artificial intelligence is also contributing to the displacement and transformation of certain occupations. Consequently, significant social and long-term changes in employment, businesses and industries are likely to join the digital technological revolution. As technological development accelerates, workers' existing skills may become obsolete more quickly, bringing about an increasing need for continuous reskilling and adaptation to changing labour-market demands. (Sihite et al., 2021**).** This is particularly important for Africa because a large proportion of employment remains concentrated in agriculture, informal activities, low-productivity services and other occupations that may be vulnerable to technological restructuring. The continent also faces significant gaps in 4IR-related skills, making continuous training and reskilling increasingly important as technological adoption accelerates (Ketchiwou & Ngulube, 2023; Pitan & Muller, 2023; World Economic Forum, 2025).

Banking

Technology has become increasingly important to the banking sector in Africa because it enables banks to extend financial services beyond conventional physical branches. Mobile banking, internet banking, automated teller machines (ATMs), point-of-sale (POS) systems, mobile money and fintech platforms have reduced geographical and transaction barriers, particularly for rural and downtrodden populations. In many African countries, customers can now transfer money, make payments, save, access credit and manage accounts using mobile devices without visiting a bank branch. Evidence from 50 African countries shows that the adoption of mobile money contributes positively to financial inclusion, while digital transformation has also been associated with greater banking inclusion in Sub-Saharan Africa (Avom et al., 2023; Sodokin & Koriko, 2022).

The relevance of technology to African banking also extends to efficiency, accessibility and the development of new financial products. Digital platforms can lower the cost of delivering financial services, facilitate faster payments and enable banks and fintech firms to reach customers who have traditionally been excluded from formal finance. In Nigeria, for example, digital financial services have the potential to expand access to rural and underserved communities by exploiting widespread mobile-phone availability and relatively low-cost digital transactions (Wezel & Ree, 2023). However, technological banking development also requires adequate digital infrastructure, cybersecurity, data protection, digital literacy and appropriate regulation. Recent African research therefore stresses that the benefits of mobile and digital banking depend not only on technology adoption but also on addressing infrastructure, security and institutional constraints (Osabutey & Jackson, 2024).

Transportation and Communication

Transport policy makers are increasingly perplexed by the pace of change in their sector and by the increasing influence of external actors. This leads to a variety of responses, including "business as usual", technological optimism, technological fatalism and technological ignorance. Four areas of technological advancement relevant to transport are: Mobility as a Service (MaaS); unmanned aerial vehicles (drones); automated vehicles; and telehealth.

(a)Mobility as a Service (MaaS) and technological development in Africa

In Africa, MaaS is particularly relevant because urban transport systems are often fragmented, involving formal public transport alongside informal buses, minibuses, taxis, motorcycles, bicycles and increasingly app-based ride-hailing services. Technology can connect these different modes by providing real-time transport information, digital route planning, electronic payment, online booking, GPS tracking and data-driven traffic management.

Key technologies supporting MaaS in Africa

Technology	Application to MaaS in Africa
Smartphones and mobile apps	Journey planning, booking and access to transport services
GPS/GIS	Vehicle tracking, route optimisation and location services
Mobile money/digital payments	Electronic payment of fares and transport services
Artificial intelligence (AI)	Traffic prediction, demand forecasting and route optimisation
Big data analytics	Analysis of passenger movements and transport demand
Internet of Things (IoT) infrastructure	Connecting vehicles, roads, sensors and transport
Cloud computing	Processing and sharing large volumes of mobility data
5G/mobile internet	Faster communication between users, vehicles and platforms
Digital identity/data systems	User authentication and personalised mobility services
Electric-vehicle technology	Integration of e-mobility and shared transport into MaaS

Source: Authors Compilation (2026), based on (Ajayi et al., 2021); (Dzisi et al. 2023) & (Sogbe et al., 2026).

(b)**Unmanned Aerial Vehicles (UAVs) and Technological Development in Africa**

Unmanned Aerial Vehicles (UAVs), commonly called drones, are aircraft that can operate without a pilot physically on board. They can be remotely controlled or operate partly/autonomously using technologies such as GPS, sensors, cameras, artificial intelligence, wireless communication and automated navigation systems. In the African context, UAVs are particularly significant because they can help overcome some of the continent's geographical, infrastructural and logistical constraints. A systematic review of UAV adoption in Sub-Saharan Africa found that applications have been concentrated particularly in healthcare and agriculture, although the technology has potential across several other sectors. (Haula & Agbozo, 2020). A modern UAV can combine:
GPS + sensors + cameras + AI + mobile communication + cloud computing + data analytics.
The UAV is multifunctional, its usage has been found in healthcare delivery, agriculture, infrastructural constraint, disaster management, digital technology and economic development. These all have the various ways in which they impact African economy and influence its growth.

(i) UAVs in healthcare

Healthcare is one of the clearest African applications of UAV technology. Drones can transport blood, vaccines, medicines, laboratory samples and other medical supplies to areas where poor roads, long distances or seasonal conditions make conventional transportation slow or unreliable. Nyaaba and Ayamga (2021) identify these applications specifically in the African context. More recent evidence is even stronger. A 2026 scoping review covering 12 Sub-Saharan African countries found that drones have been used to transport blood products, vaccines, emergency medicines and diagnostic samples, with the obvious reported benefit being shorter delivery times

to remote and underserved facilities. The successful use of drone for wellness based logistics has been enviably recorded i**n** Madagascar, Nigeria Ghana, Rwanda, Malawi, and Senegal.

(ii)UAVs and agriculture in Africa

UAVs can also support the transition from traditional to precision agriculture. In a work by Haula and Agbozo (2020), it was established that with its unique features such as cameras and sensors, drones can provide aerial information about: crop health; soil and vegetation conditions; pest and disease outbreaks; irrigation requirements; farm boundaries; crop yields; and areas requiring fertiliser or pesticide application.

(iii) **UAVs and disaster management**

In disaster management, drones have been found to be of grate especially in mapping areas affected by floods, assessing destroyed infrastructure, locating affected communities, monitoring disasters and its intensity, supporting search-and-rescue operations and delivering emergency supplies to the displaced or caregivers. Their ability to rapidly obtain aerial information can be valuable where floods, conflicts or other emergencies make ground accessibility and motorability very difficult.

Despite the immeasurable benefits embedded in the use of UAVs, Africa as a continent is confronted with a number of upheavals and constraints which have long affected its adoption and popular usage. They include; regulatory restrictions limited technical skills, high initial costs ,data protection and privacy safety concerns, limited infrastructure. weak institutional coordination, sustainability and financing. However, the identified issues with the use of Unmanned Aerial Vehicles can be addressed through appropriate regulation, technical skills, data-protection mechanisms, financing and supporting digital infrastructure. UAV adoption should therefore be viewed as part of Africa's wider technological transformation rather than as a substitute for conventional infrastructure development (Adjei-Banuah et al., 2026).

(c) **Automated Vehicles in the African Context**

Automated vehicles (AVs) are vehicles that use technologies such as artificial intelligence, sensors, cameras, radar, GPS and vehicle-to-everything communication to perform some or all driving functions with limited human intervention. In Africa, AVs could contribute to safer and more efficient transportation by reducing human driving errors, improving traffic management and supporting mobility in rapidly growing cities. Their potential is particularly relevant in cities such as Lagos, Nairobi, Johannesburg and Kigali, where congestion, road-safety concerns and fragmented transport systems create substantial mobility challenges. Recent research on African smart mobility shows that artificial intelligence, the Internet of Things and big-data technologies are increasingly being explored as tools for addressing urban transportation problems, although African research and implementation remain relatively limited (Luke et al., 2025).

However, the application of automated vehicles in Africa faces important infrastructural, technological, institutional and socioeconomic constraints. AVs depend on reliable roads, visible road markings, traffic signs, digital connectivity, electricity, accurate mapping and appropriate regulatory frameworks, yet these conditions are unevenly available across African countries. (Gicha, et al.,2024). Research on developing countries identifies infrastructure readiness and public acceptance as major barriers to AV implementation, while African-focused studies also highlight the need to consider the continent's distinctive informal and shared-transport systems (Ofoegbu, 2023; Luke et al., 2025). Consequently, Africa's transition toward automated mobility

would require more than importing AV technology; it would require investment in road and digital infrastructure, electricity, cybersecurity, technical skills, legislation, data governance and public awareness. This approach would allow automated vehicles to develop alongside existing African transport systems rather than being treated as a technology that can simply be transferred from developed economies.

(d) Telehealth in Africa

Telehealth refers to the delivery of healthcare services through digital communication technologies, allowing patients to consult healthcare professionals, receive medical advice, obtain follow-up care and, in some cases, undergo remote monitoring without being physically present at a healthcare facility. In Africa, telehealth is increasingly relevant because large rural populations face geographical barriers, shortages of healthcare professionals and unequal access to specialist services. Mobile phones, internet-based consultations, SMS platforms and mobile-health applications are therefore being used to extend healthcare beyond conventional hospitals and clinics. Recent evidence from South Africa, Kenya and Nigeria shows that telemedicine is being applied in areas such as specialist consultations, maternal and child health, chronic disease management, HIV care and mental health services. In rural African communities, tele-rehabilitation has also demonstrated potential for improving access to rehabilitation services while reducing patients' travel requirements and associated costs (Oshomoji et al., 2024; Agbeyangi & Lukose, 2025). Despite its potential, the expansion of telehealth in Africa is constrained by unreliable electricity, inadequate broadband infrastructure, limited digital literacy, affordability problems, shortages of technically trained health workers and weaknesses in regulatory and data-protection frameworks. These challenges are particularly important in countries such as Nigeria, where recent systematic evidence identifies poor internet connectivity, power interruptions, inadequate technical expertise, weak regulation and organisational limitations as major barriers to telemedicine provision. Consequently, the effective development of telehealth in Africa requires more than simply introducing digital platforms; it requires investment in reliable electricity and broadband networks, healthcare-worker training, digital literacy, appropriate regulation and integration of telehealth into existing health systems. Recent reviews suggest that such measures are important for making telehealth more accessible, sustainable and equitable, particularly for rural and underserved populations (Agbeyangi & Lukose, 2025; Barriers & facilitators of provision of telemedicine in Nigeria, 2025).

Technology and Macroeconomic Indicators in Africa.

Technological Development and Economic Growth

Technology contributes to economic growth by improving the efficiency with which labour, capital and knowledge are used. It can increase productivity, reduce information and transaction costs, improve market coordination and create new products and services. These mechanisms are particularly relevant to African economies, where productivity constraints remain significant. Recent empirical evidence reinforces this argument. Kasongo and Makamu (2024), using evidence from African countries, establish a positive relationship between innovation and economic growth. Similarly, Awode and Oduola (2024) demonstrate that technological innovation and human capital jointly influence industrial productivity and competitiveness in Africa. The implication is that technology should not be regarded merely as an additional input into production; it is increasingly part of the process through which economies improve the productivity of existing resources.

However, technology adoption alone does not guarantee sustained growth. Countries that primarily import technologies without developing the skills and institutions required to adapt them may remain technologically dependent. Africa therefore needs to develop the capacity to use, adapt, improve and eventually produce technology.

Digital Infrastructure and Productivity

Digital infrastructure has become a form of productive infrastructure. Broadband networks, mobile communications, fibre-optic systems, data centres and digital platforms increasingly support business transactions, financial services, education, government administration and international trade. Osei (2024), using evidence from 28 African countries, finds that digital infrastructure positively affects innovation and that human capital strengthens this relationship. This suggests that investment in infrastructure produces greater benefits when people possess the skills required to use it productively. Similarly, Karacuka et al. (2024/2025) highlight the continuing debate over whether digitalisation translates automatically into higher labour productivity in African economies, reinforcing the need to examine the complementary conditions surrounding technological adoption. The ITU (2025) reports substantial progress in mobile broadband coverage across Africa but also identifies affordability, rural connectivity and digital skills as continuing constraints. Africa should therefore shift from simply expanding connectivity towards meaningful and productive connectivity.

Technology, Industrialization and Structural Transformation

Africa's technological agenda should be directly connected to industrialization. The expansion of telecommunications and fintech is important, but technological development must also support manufacturing, agriculture, mining, logistics, construction and other productive sectors. Technology can improve industrial productivity through automation, digital production systems, inventory management, data analytics and improved market information. In agriculture, digital platforms and precision technologies can strengthen production and distribution. In manufacturing, digital technologies can improve production efficiency and product quality. Awode and Oduola (2024) emphasized the importance of the interaction between technological innovation and human capital for industrial productivity and competitiveness in Africa. This reinforces the argument that technology should form part of a broader strategy for structural transformation rather than operate as an isolated digital-sector policy. The objective should therefore be technology-enabled industrialization, in which digital technologies support domestic production, value addition and regional supply chains.

Artificial Intelligence and Africa's Growth Opportunity

Artificial intelligence represents a new phase of technological development with applications across agriculture, healthcare, education, finance, manufacturing and public administration. Recent scholarship identifies substantial opportunities for AI to support sustainable development in Africa, while also highlighting constraints relating to infrastructure, skills, data and institutional capacity (Mienye & Jere, 2024). The African Union (2024) recognizes AI as a strategic area and promotes an Africa-centred approach based on responsible, equitable and development-oriented AI. The AU subsequently reinforced this direction through high-level policy discussions emphasizing African research, infrastructure, skills, data and home-grown AI solutions (African Union, 2025). The major challenge is ensuring that Africa does not become only a consumer of AI

technologies developed elsewhere. Building African AI capability requires investment in computing infrastructure, datasets, research institutions, technical skills, entrepreneurship and appropriate regulatory systems. African researchers and firms should also be encouraged to develop applications addressing local needs, including African languages, agriculture, healthcare and education. The strategic objective should therefore be to move from AI adoption to AI capability and innovation.

Human Capital and the Future of Work

Technology cannot generate sustained economic benefits without people who can use, maintain, adapt and develop it. Human capital is therefore a critical complement to technological development. Osei (2024) provides evidence that human capital and digital infrastructure are complementary in promoting innovation in Africa. Awode and Oduola (2024) similarly show that technological innovation and human-capital development are important to industrial productivity and competitiveness. Africa consequently needs stronger capabilities in engineering, computer science, data analysis, cybersecurity, AI, digital entrepreneurship and technical and vocational education. This is particularly important as automation changes the structure of employment. While some routine tasks may be displaced, technological development can also generate new occupations and industries. The policy response should therefore focus on equipping workers with skills that allow them to participate in emerging technology-intensive sectors rather than simply resisting technological change. Continuous training, digital literacy and technical education are increasingly important as technological change alters the skills required across occupations (Hötte et al., 2023). According to Organisatiion for Economic Cooperation and Development OECD, (2023), Investment in re-skilling can help workers transition from declining occupations to emerging technology-related activities and improve their ability to adapt to changing labour-market conditions. Such measures are particularly important because workers exposed to automation may not necessarily receive adequate opportunities for relevant training. Strengthening lifelong learning and vocational training can therefore help workers complement new technologies rather than be displaced by them. In this way, technological progress can contribute to employment creation, productivity improvement and more inclusive economic development (Heß, Janssen & Leber, 2023).

Technology and Financial Inclusion

Financial technology has demonstrated how technological innovation can expand access to economic services. Mobile money, digital banking and fintech platforms can reduce transaction costs and extend financial services to populations previously excluded from formal finance. Ahmad et al. (2023) find that mobile money and ICT contribute to economic growth and that mobile money can influence growth both directly and through financial inclusion. Similarly, Avom et al. (2023), using evidence from 50 African countries, find that mobile-money adoption promotes financial inclusion. Recent evidence also indicates that the benefits of digital financial services depend on institutional conditions. Senou and Houensou (2024) find that mobile-money use can contribute to poverty reduction in West African countries, while Osabutey and Jackson (2024) cautioned that issues of privacy, security, infrastructure and unequal distribution of benefits require policy attention. Technology should therefore be used to broaden economic participation while ensuring consumer protection, cybersecurity, financial literacy and effective regulation.

Research, Innovation and African Technological Capability

Long-term technological development requires domestic research and innovation capacity. Importing technology may accelerate short-term adoption, but it does not automatically create the knowledge needed to adapt technologies to African conditions or develop new ones. STISA-2034 places science, technology and innovation within Africa's broader development agenda (African Union, 2025). The implementation of this strategy also emphasizes research, human-capital development, innovation and institutional capacity (United Nations Economic Commission for Africa UNECA, 2026). African universities, research institutes, governments and private firms therefore need stronger connections. Research should increasingly address practical economic challenges and create pathways for commercialisation. Priority areas include agricultural technology, renewable energy, health technology, digital education, fintech, climate technologies and locally relevant AI applications.

Technology, Energy and Infrastructure

Technological development ultimately depends on physical infrastructure, particularly reliable electricity. Digital networks, data centers, manufacturing equipment and technology-based enterprises all require dependable energy. The technological and energy agendas should therefore be closely connected. Investments in renewable energy, mini-grids, storage systems and efficient electricity networks can strengthen digitalization while supporting environmental sustainability. This is especially important for rural Africa, where weak electricity infrastructure can reinforce the digital divide. Expanding connectivity without addressing energy constraints risks creating networks that remain underutilised.

Regional Integration and the African Digital Economy

Africa's fragmented national markets can restrict the scale available to technology firms and innovators. Regional integration can help overcome this constraint by creating larger markets and facilitating cross-border digital trade. The African Continental Free Trade Area provides an important platform for expanding regional commerce. Digital-payment interoperability, harmonised data regulations, cybersecurity cooperation, digital customs systems and common standards could reduce barriers to cross-border economic activity. A stronger continental digital market would also enable African technology firms to scale beyond their domestic markets. This is particularly important for start-ups and technology-based enterprises that require large markets to achieve economies of scale.

The Digital Divide and Inclusive Growth

Technological development can widen inequality when access is concentrated among wealthier households, large firms and urban populations. The ITU (2025) reports that Internet use in Africa in 2024 was 57% in urban areas compared with only 23% in rural areas. This gap highlights the importance of inclusive technological development. Rural broadband, affordable devices, digital-skills programmes and community-based digital facilities are necessary to ensure that technological progress reaches underserved populations. The objective should not simply be to increase the number of people connected to digital networks. It should be to ensure that individuals and firms can use technology productively for education, employment, entrepreneurship and business development.

Institutions, Governance and Technological Development

Technology operates within institutional environments. Effective digital economies require appropriate rules covering data protection, cybersecurity, intellectual property, competition, consumer protection and AI governance. Recent research reinforces the importance of governance. Saba and Ngepah (2024), examining the relationship between AI, governance, employment and economic growth in BRICS countries, find that governance conditions influence the relationship between AI and economic outcomes. Although the study is not exclusively African, South Africa's inclusion in the BRICS sample provides relevant comparative evidence. Africa therefore needs regulatory frameworks that protect citizens and businesses while allowing responsible technological experimentation. Strong institutions can also increase trust and encourage private investment in digital innovation.

Position: From Technology Consumption to Technology Capability

The central position of this paper is that Africa's technological agenda should progress through three stages: adoption, adaptation and innovation. The first stage involves adopting technologies that can immediately improve productivity and access to services. The second requires firms, universities and public institutions to acquire the capacity to adapt imported technologies to African conditions. The third involves developing and commercializing technologies of African origin. This progression is consistent with recent evidence showing that technology produces stronger development effects when complemented by human capital, infrastructure and institutional capacity (Osei, 2024; Awode & Oduola, 2024). However, Africa should not be viewed simply as a passive recipient of foreign technology. The rapid expansion of mobile money, digital financial services, e-commerce and technology-based entrepreneurship demonstrates the continent's capacity and readiness to adapt technologies to local circumstances. Evidence shows that mobile money and ICT adoption have contributed to financial inclusion and economic growth in Africa, while countries such as Kenya, Nigeria, South Africa, Egypt and Rwanda have developed increasingly active digital and technology ecosystems (Sovacool et al., 2022; Koo & Kim, 2023). Africa's objective should therefore not be technological self-sufficiency in every area. Rather, it should be the development of self-sufficient technology capable of reducing unnecessary dependence on the imported technologies to solve local problems and participate competitively in global technology value chains.

Policy Priorities

The position advances in this paper suggest seven broad priorities: expand affordable digital infrastructure, especially in rural areas. Strengthen digital and technical skills through formal education and vocational training. Increase research and development capacity and strengthen university-industry linkages. Support technology-based entrepreneurship through finance, infrastructure and business support. Connect technological development with industrialisation and domestic value addition. Develop African AI capability through investment in data, computing infrastructure, research and skills. Deepen regional digital integration to create larger markets for African technology firms. Progress should be measured not only by Internet penetration or the number of digital platforms but also by productivity, employment, innovation, enterprise development, income opportunities and inclusion.

Conclusion

Technological development provides Africa with an important pathway towards higher productivity, structural transformation and greater economic competitiveness. Recent African research shows that innovation, digital infrastructure and human capital are interconnected drivers of economic and industrial development (Kasongo & Makamu, 2024; Osei, 2024; Awode & Oduola, 2024). However, technology alone cannot guarantee economic growth. Its benefits depend on infrastructure, reliable energy, skills, finance, research capacity and effective institutions. The African Union's Continental AI Strategy and STISA-2034 demonstrate an increasing continental commitment to science, technology and innovation (African Union, 2024, 2025). Africa should therefore move beyond technology consumption towards adaptation, innovation and production. A development strategy that combines technological capability with human-capital development, industrialisation, regional integration and sound institutions would provide a stronger basis for inclusive and sustainable economic transformation. Ultimately, Africa's technological transformation will depend not simply on how rapidly new technologies are adopted, but on how effectively they are integrated into the continent's specific development realities. African countries need to strengthen local innovation ecosystems, support universities and research institutions, encourage technology-oriented entrepreneurship and create policies that enable firms to move from users of imported technologies to developers and producers of locally relevant solutions. Greater cooperation among African countries can also facilitate knowledge sharing, technology transfer and the development of regional digital and industrial value chains. If these efforts are supported by accountable institutions, adequate investment and inclusive access to technology, technological development can become more than a source of productivity gains; it can serve as a foundation for employment creation, industrial diversification, improved public services and broader improvements in living standards across the continent.

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