



From Basic Literacy to Digital Literacy: Building Foundational Skills for the 21st Century in Africa

Jean Faustin Kaffo¹, Landry Kengne²

¹National Institute of Statistics (NIS) of Cameroon, kaffojfaustin@gmail.com

²Sub-regional Institute of Statistic and Applied Economics (ISSEA), Yaoundé-Cameroon,
student.landry.kengne@issea-cemac.org

Corresponding Author: kaffojfaustin@gmail.com

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Abstract

This study examines structural barriers hindering Africa's effective adoption and integration of Artificial Intelligence (AI) to enhance human capital efficiency. Similar to past industrial revolutions, the fourth industrial revolution—driven by AI—acts as a technological engine of growth in the Solow framework. Using a descriptive and comparative approach based on quantitative data, the paper identifies the key barriers to AI adoption across the continent. According to results, over 50% of Africans lack internet access, preventing them from benefiting from AI-driven productivity gains. Furthermore, 64% of African countries have no national AI strategy, highlighting limited awareness of AI's transformative potential. West and Central Africa appear to be the least prepared regions. To overcome these challenges, long-term solutions include accelerating electrification and expanding internet coverage, while short-term strategies focus on reforming education curricula and providing continuous AI training for teachers. Additionally, developing AI models accessible via mobile messaging services could promote inclusive access, even for users without smartphones. Integrating AI into education and training systems is not optional—it is essential to ensure that technological progress contributes to equitable and sustainable development in Africa.

Keywords: Literacy, Structural weaknesses, Artificial Intelligence, Machine Learning, digital, skills, human capital

1. Introduction

Since classical economic theory, human capital has been widely considered as the most important factor of production. It encompasses the knowledge, skills, and health that enable individuals to contribute productively to the economy. In the African context, where industrial and technological sectors remain underdeveloped, human capital should be the principal engine of growth. However, this potential remains underexploited due to persistent challenges such as low educational attainment, limited access to professional training, and widespread health problems. Therefore, strengthening human capital through education and skills development is central to Africa's long-term growth and transformation. However, in the 21st century, education must go beyond traditional literacy to include digital competencies. In this vein, Garry Falloon (2020) emphasized the need for education to evolve from digital literacy toward broader digital competence, especially in teacher education frameworks. The ability to read and write is no longer sufficient for full participation in modern economies. Digital literacy—which encompasses the capacity to access, evaluate, and use digital technologies effectively—has become a key determinant of employability, innovation, and social inclusion. For

Africa, where over 60% of the population is under 25 years old¹, investing in digital skills is not merely an educational reform but an economic imperative.

Despite remarkable progress in expanding access to basic education, Africa still faces a significant digital divide. Many schools, particularly in rural areas, lack access to computers, the internet, and trained teachers capable of integrating technology into learning (Mouongue K. and Ndyababo Rutazihana P., 2024). Furthermore, gender disparities and socioeconomic inequalities continue to restrict digital access for large segments of the population. The International Telecommunication Union (ITU, 2022) notes that women and low-income populations are less likely to have access to the internet, digital devices, or digital skills training. Consequently, the transition from basic to digital literacy remains uneven and incomplete. Simultaneously, Africa is witnessing a wave of innovation driven by educational technologies (EdTech) and artificial intelligence (AI). Initiatives such as mobile learning platforms, AI-assisted teaching tools, and national digital literacy programs demonstrate growing recognition of the need to equip learners with 21st-century skills. If scaled and coordinated, these efforts could unlock the continent's human capital potential and prepare its workforce for the digital economy. This study examines how African countries can accelerate the shift from basic to digital literacy to strengthen human capital and drive inclusive growth. It explores the current state of literacy and digital skills, analyzes barriers to progress, and highlights opportunities to leverage AI and EdTech for effective learning. By focusing on this transition, the study contributes to policy debates on how education can serve as both a social equalizer and a catalyst for sustainable economic development in Africa.

2. Methods

2.1. Literature Review and Conceptual Framework

2.1 Theoretical Foundations

Human Capital Theory, rooted in the works of Adam Smith (1776) and later developed by Schultz (1961) and Becker (1964), emphasizes that investment in education, training, and health enhances individuals' productivity and income potential. In this framework, education is not only a social good but also an economic investment that increases labor efficiency and drives long-term growth.

In Africa, where physical capital and industrial infrastructure are limited, human capital is the continent's most abundant and strategic asset. However, this resource is often underutilized due to deficiencies in educational quality, limited access to technology, and weak alignment between the skills taught in schools and those demanded by the labor market. The UN Economic Commission for Africa (UNECA, 2023) highlights skill mismatches and digitalization gaps as major barriers to leveraging Africa's human capital. Therefore, strengthening human capital through digital literacy and modern education systems is essential for transforming Africa's demographic potential into an engine of economic growth.

The Digital Divide Theory examines inequalities in access to and use of information and communication technology (ICT). According to Norris (2003) and van Dijk (2013), the digital divide operates at three levels:

- **Access divide:** unequal access to infrastructure and connectivity;
- **Skills divide:** differences in digital literacy and ability to use technology effectively;
- **Usage divide:** disparities in the ways digital tools are applied for education, business, or innovation.

In Africa, all three divides coexist and reinforce one another. Rural schools often lack internet connectivity and computers; teachers may not have the digital skills to integrate ICT into instruction; and many learners use mobile devices primarily for entertainment rather than education. Bridging these divides requires targeted investments in infrastructure, teacher training, and inclusive EdTech initiatives that reach marginalized groups such as women, rural youth, and persons with disabilities.

2.2. Empirical Review

Recent empirical studies indicate that AI-driven instructional approaches can substantially reduce training/learning time while preserving learning quality. Experimental evidence from university-level interventions shows learning-time reductions on the order of **25%** with no statistically significant decline in assessment scores or learner confidence, illustrating that well-designed AI/interactive tutoring approaches can increase efficiency in knowledge acquisition. In the Kenyan higher-education context (Matere, 2024), Matere's evaluation of AI tools reports a strong positive relationship between access to AI tools and instructional effectiveness; the study documents a high correlation between AI tool use and measures of teaching and learning effectiveness ($r = 0.781$; $p < 0.001$), suggesting that institutional access to AI platforms is associated with better educational outcomes.

Despite demonstrated benefits, the systematic integration and availability of AI tools remain limited in many African universities. Matere's study finds that AI tools are frequently not readily available across Kenyan institutions and that adoption is uneven across disciplines and campuses — a pattern reflected more broadly in higher education across the region. Oloyere et al. (2025) examine that comparative surveys across Sub-Saharan Africa indicate growing student awareness of generative and programming-oriented AI tools (e.g., ChatGPT, Codey, GitHub Copilot) and an appreciation of their potential to personalize learning and democratize access to programming knowledge. Nonetheless, student recognition of potential does not yet imply uniform institutional adoption or curriculum integration.

Context-specific empirical research from West Africa shows that AI literacy and its educational impact are multi-dimensional. Asghar et al.'s study of Ghanaian and Nigerian university students uses an affective-behavioral-cognitive-ethical (ABCE) lens and finds that affective factors (motivation, self-efficacy) positively influence cognitive learning outcomes when mediated by behavioral engagement (purposeful use, collaboration) and ethical understanding. Students with higher intrinsic motivation engaged more deeply with AI topics and were more likely to apply AI concepts rather than relying on memorization. These findings underscore the need to consider affective and ethical elements, in addition to technical skill, when integrating AI into curricula.

Complementary research on intelligent tutoring and reinforcement-learning-driven pedagogies has demonstrated algorithmic approaches to reduce the required training time while maintaining performance. Alam et al. develop a deep-reinforcement-learning policy for an intelligent tutor that selectively determines when students should solve or skip problems; their work documents reductions in required training time with preserved learner performance, offering a technical pathway to the time-savings reported in other empirical studies.

3. Methodology

This study adopts an analytical and comparative research design to examine how African countries are transitioning from basic to digital literacy and how artificial intelligence (AI) and educational technologies (EdTech) contribute to this process. The analytical dimension focuses on identifying patterns, trends, and relationships between human capital indicators and the development of digital skills. The comparative dimension enables cross-country evaluation of strategies, progress, and challenges in different African contexts.

3.1 Data Sources, Indicators and Variables

This study uses secondary data from multiple international databases, including the World Bank, UNICEF, and the AI Talent Readiness Index for Africa (2025). Countries are selected based on data availability and recency for key indicators such as school enrollment, literacy, ICT skills, and infrastructure readiness. Specifically, the non-school attendance rate comes from UNICEF's 2022 database, which compiles information from the most recent MICS and DHS surveys conducted in African countries. The adult literacy rate (population aged 15 and above, both sexes) and ICT skills in the education system are obtained from the World Bank database, with the latest data for most countries dating from 2019. Indicators on individuals using the Internet and electricity penetration are

also sourced from the World Bank. Information on the existence of a national AI strategy is drawn from the AI Talent Readiness Index for Africa (April 2025).

The study examines a combination of quantitative and qualitative indicators reflecting both educational and technological dimensions.

Key indicator include:

- **Literacy indicators:** adult and youth literacy rates, school enrollment rates, and completion ratios.
 - **Digital access indicators:** internet penetration rates, mobile and broadband subscriptions, and access to ICT in schools.
 - **Digital literacy programs:** number and scope of government or private initiatives promoting ICT and AI education.
 - The **AI Talent Readiness Index** is a composite measure calculated according to the following formula

$$\text{Index Score} = 0.4 \times \text{Digital Skills Score} + 0.35 \times \text{Data \& Infrastructure Score} + 0.25 \times \text{Government Readiness Score}$$

These indicators collectively provide a multidimensional picture of how human capital development aligns with digital transformation.

3.2 Analytical Approach

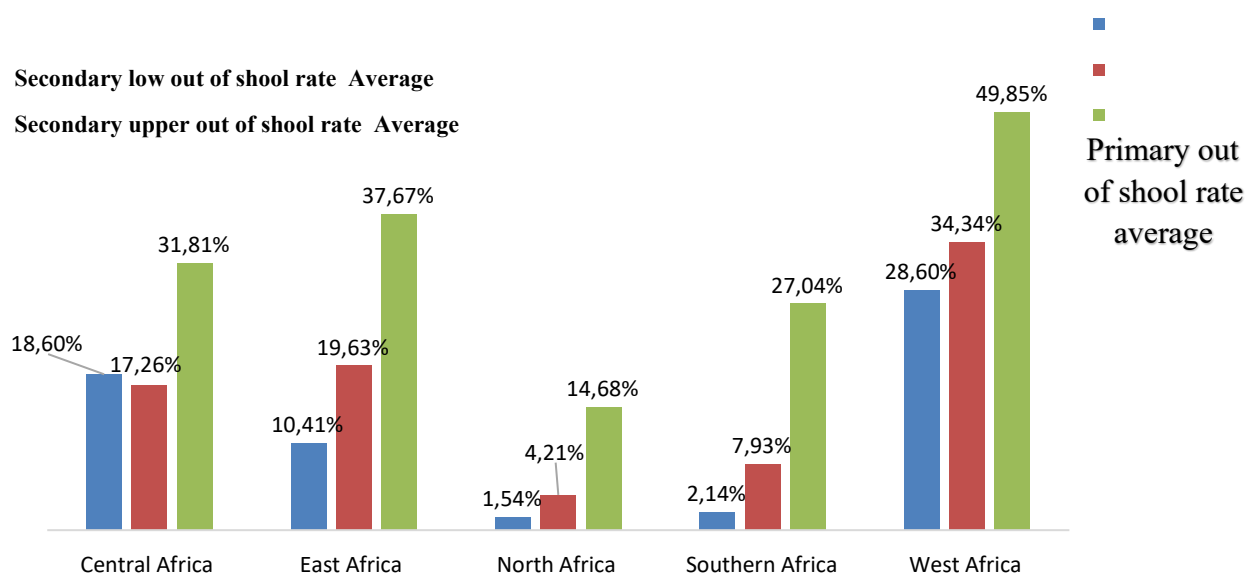
This study employs a mixed-method analytical approach that combines descriptive statistics, comparative analysis, and qualitative review. Quantitative data will be analyzed using graphs, and summary statistics to visualize progress in literacy and digital access over time. Cross-country comparisons will be made to highlight differences and similarities in digital literacy outcomes, policies, and implementation strategies. This comparison will help identify best practices and policy lessons transferable across contexts. Given the descriptive nature of the research, **Microsoft Excel** is used for data cleaning, computation, and visualization.

By integrating quantitative and qualitative approaches, this methodology provides a comprehensive understanding of how digital literacy initiatives interact with broader human capital development goals in Africa. The comparative perspective also enables the identification of effective strategies and contextual challenges that can inform regional and continental policy frameworks.

4. Results

4.1 Basic Literacy

Education is the cornerstone of human capital formation and a prerequisite for digital literacy. Although African countries have made remarkable progress in expanding access to education, substantial disparities remain between regions and educational levels. An analysis of school enrollment data across subregions reveals both encouraging progress and persistent exclusion patterns, particularly at the secondary level.



Sources: Author's calculation based on UNESCO, World Bank

Fig. 1: average out-of-school rates by educational level and subregion

Figure 1 shows that North Africa and Southern Africa have made substantial progress in ensuring access to primary and secondary education. North Africa records the lowest out-of-school rates, with only 1.54% of children excluded from primary education and 14.68% from upper secondary education. This reflects long-term investments in universal education policies, stronger infrastructure, and relatively high income levels.

Southern Africa also performs well, with low primary exclusion (2.14%) and moderate levels of upper secondary (27.04%). These outcomes are linked to better governance, educational spending, and targeted programs that support girls' education and rural inclusivity. East Africa demonstrates intermediate performance, with only 10.41% of children out of school at the primary level but significantly higher rates at upper secondary (37.67%). Countries such as Kenya and Rwanda have achieved near-universal primary enrollment through free education policies but still face challenges in ensuring that students transition to higher levels.

In contrast, West and Central Africa continue to record alarmingly high exclusion rates across all educational levels. In West Africa, nearly one in three children (28.6%) do not attend primary school, while half (49.85%) are excluded from upper secondary education. This highlights persistent structural issues, including poverty, early marriage, child labor, and weak public education systems. Similarly, Central Africa's out-of-school rate remains high, particularly at upper secondary level (31.81%), reflecting limited post-primary infrastructure and ongoing socio-political instability in several countries.

At the continental level, the average out-of-school rate increases sharply with education level—from 15.4% at primary to 36.7% at upper secondary, indicating that school dropout and low transition rates remain major bottlenecks in Africa's education systems.

Table 1 : average adult literacy population over 15 years

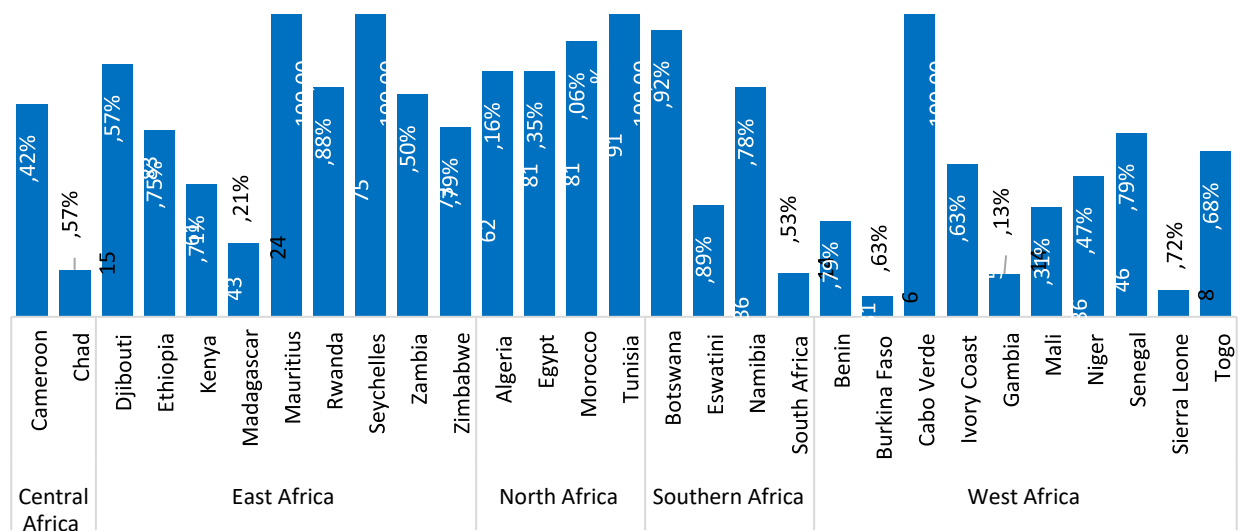
Sub-region	Mean	Std	Max	Min
Central Africa	67,40%	24,83%	94,40%	22,30%
East Africa	65,74%	29,40%	95,90%	0,00%
North Africa	61,04%	34,37%	81,40%	0,00%
Southern Africa	68,70%	38,81%	91,50%	0,00%
West Africa	50,56%	16,08%	86,80%	32,00%

Sources: Author's calculation based on UNESCO, World Bank

The average adult literacy rate in Africa (population aged 15 and above) is 61.32%, reflecting both progress and persistent disparities across subregions. The data reveal a highly uneven educational landscape, with literacy rates ranging from 50.56% in West Africa to 68.70% in Southern Africa, and standard deviations indicating wide internal disparities within most regions. Southern Africa (68.7%) and Central Africa (67.4%) record the highest literacy levels, suggesting relatively stronger education systems, more inclusive policies, and the presence of continuing education and adult learning initiatives. East Africa (65.74%) also shows moderate advancement, although its high variability (standard deviation of 29.40%) points to significant inequality in educational access across countries in the region. In contrast, North Africa, despite achieving lower out-of-school rates and notable progress in universal basic education, has an average adult literacy rate of 61.04%. This paradox likely reflects historical educational exclusions, particularly among older generations and women, which continue to depress the region’s overall literacy. The most concerning situation remains in West Africa, where the adult literacy rate averages only 50.56%, with some countries recording rates as low as 32%. This means that nearly one in two adults lacks basic reading and writing skills, severely limiting the region’s human capital. The weak literacy base constrains the workforce’s ability to acquire digital skills, adapt to technological innovations, and participate effectively in the knowledge economy.

Overall, the analysis highlights that Africa’s educational landscape is characterized by dual progress and inequality. While certain regions, especially Southern and parts of North Africa— are moving toward universal primary education and improved adult literacy, others, particularly West and Central Africa— continue to face structural challenges of access, retention, and quality.

Percentage of Secondary School



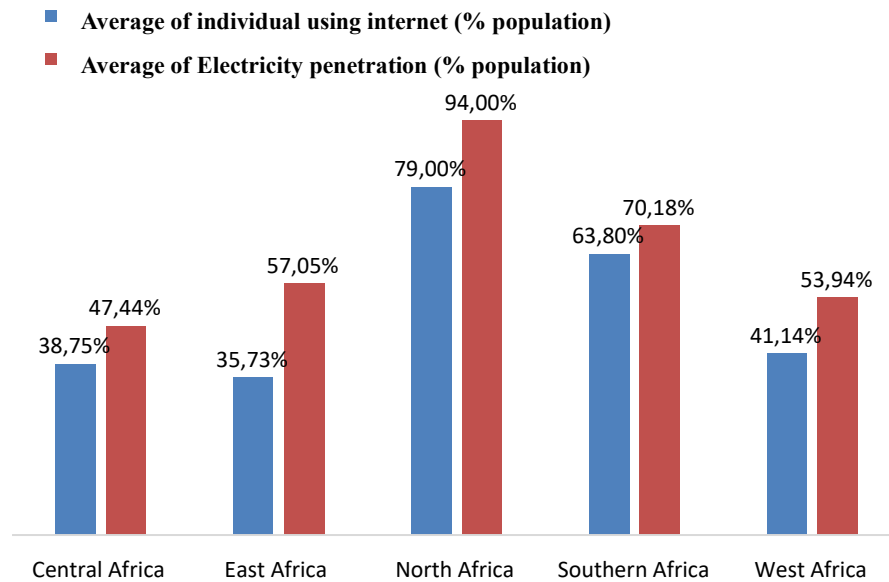
Sources: Author’s calculation based on UNESCO, World Bank

Fig. 2 : proportion of secondary school with access to computers for pedagogical purposes

Digital skills have become one of the core pillars of education in the 21st century. Today, literacy extends far beyond the ability to read and write—it increasingly encompasses basic digital competencies that enable individuals to participate effectively in modern economies. However, data show that access to digital learning infrastructure remains severely limited in many African countries. Across the continent, only 58.5% of secondary schools on average have access to computers for pedagogical purposes, with strong disparities across subregions. North Africa (88%) leads, reflecting consistent investment in digital education and infrastructure. East Africa (69%) also performs relatively well, thanks to active digital learning initiatives in countries such as Rwanda (76%), Mauritius (100%), and Seychelles (100%). In contrast, West Africa (41%) and Central Africa (43%) fall far behind, with countries such as Burkina Faso (7%), Chad (16%), and Sierra Leone (9%) showing alarmingly low levels of digital access. Even in Southern Africa (56%), the picture is uneven—Botswana (95%) and Namibia (76%) contrast sharply with South Africa (15%), revealing internal inequalities. Limited access to technology in schools represents a critical barrier to digital

literacy development. A school system without computers restricts students from acquiring essential digital competencies, deepening existing inequalities between learners. As Artificial Intelligence (AI) and emerging technologies become increasingly integrated into education and the labor market, students without early exposure to digital tools risk being left behind.

In the context of this study—focused on leveraging AI and EdTech platforms for digital skills and workforce readiness in Africa—these disparities highlight a major structural challenge. Without equitable access to ICT resources at the secondary level, initiatives aimed at promoting AI literacy, coding, and digital innovation will have limited reach and impact.



Sources: Author’s calculation based on UNESCO, World Bank

Fig. 3: percentage of population using internet and electricity

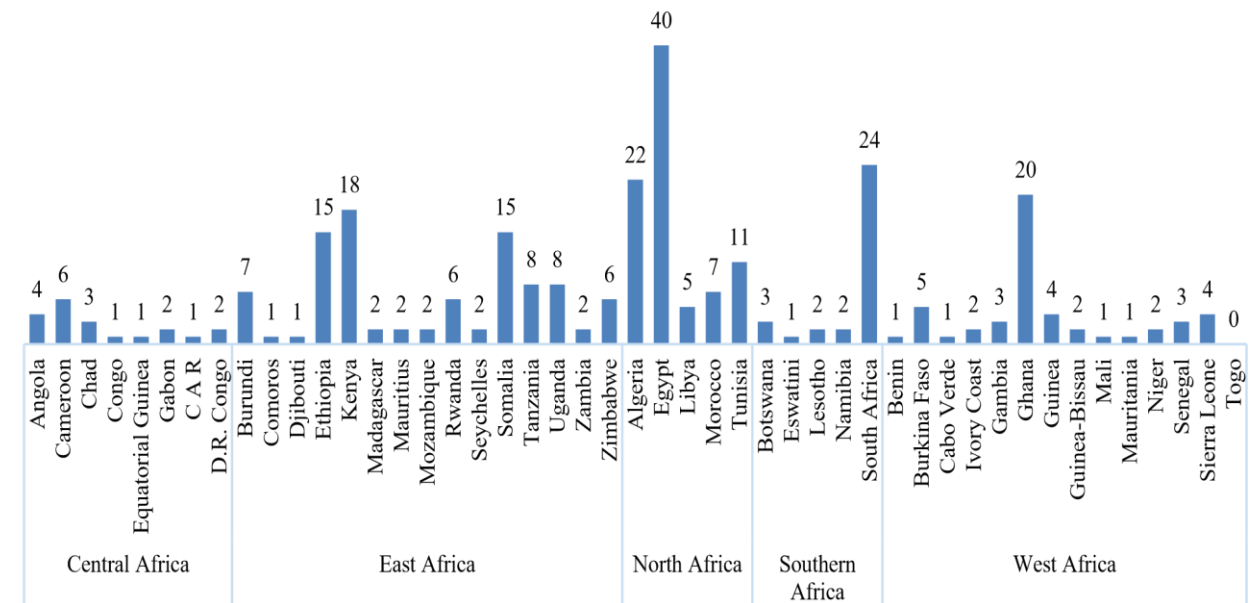
Developing digital skills requires an enabling environment with a on robust infrastructure. Two critical factors—access to electricity and internet connectivity—form the foundation upon which digital learning, innovation, and AI integration can thrive.

As Fig. 2 shows, the average electricity penetration rate is 55.03%, but regional disparities are striking. Central Africa (47.44%) remains below the continental average, reflecting persistent energy access challenges that constrain both households and educational institutions. Similar limitations are observed in East Africa (53.99%) and West Africa (53.94%), where approximately half of the population lacks access to reliable electricity. In contrast, North Africa (70%) and Southern Africa (70.18%) have achieved higher levels of electrification, providing a stronger foundation for digital transformation and technology adoption. Electricity is not merely a development indicator—it is a key factor endowment for innovation, ensuring learning continuity and enabling the effective use of digital tools. Without stable power, schools and training centers can effectively integrate computers, digital platforms, or AI-based educational systems , now one of the most strategic resources in the digital era. The average internet penetration rate in Africa is 45.45%, meaning that more than half of the population remains offline. The situation is particularly concerning Central Africa (38.75%), East Africa (35.73%), and West Africa (41.14%), where limited connectivity restricts access to digital learning platforms, online training, and AI education resources. Moreover, these figures represent access alone—when considering connection stability, affordability, and quality, the effective rate of usable internet access is likely much lower. Once again, North Africa (79%) and Southern Africa (63.8%) stand out, reflecting greater digital infrastructure investment and higher readiness for technology adoption. These two regions are therefore better positioned to integrate AI and digital innovation in education and workforce training, while the rest of the continent risks falling further behind.

This disparity in electricity and internet access highlights a fundamental challenge: the digital divide in Africa is increasingly rooted in infrastructural inequality. Ensuring universal access to these

foundational services is therefore a prerequisite for digital skills development, inclusive innovation, and equitable participation in the global knowledge economy.

Number of higher learning institution teaching AI/ML

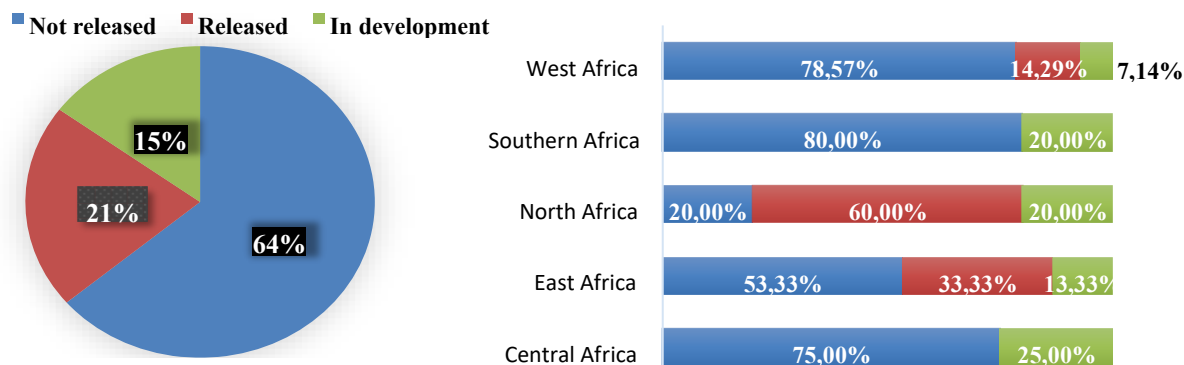


Sources: Author's calculation based on UNESCO, World Bank.

Fig. 4: number of higher learning institutions teaching AI/ML per country

To fully benefit from technological innovation and contribute meaningfully to the global knowledge economy, countries must establish robust training frameworks capable of developing 21st-century skills. In this context, the integration of Artificial Intelligence (AI) and Machine Learning (ML) into higher education curricula is a critical step toward building a skilled and futureready workforce. The number of higher learning institutions offering AI or ML programs is a useful indicator of a region's capacity to generate digital talent and foster innovation ecosystems. The landscape, across Africa remains uneven. Of the 281 institutions identified, North Africa leads with 85 institutions, driven largely by Egypt (40) and Algeria (22)—countries that have made substantial investments in higher education and research infrastructure. East Africa follows closely with 95 institutions, reflecting strong progress in countries such as Kenya (18), Ethiopia (15), and Somalia (15). These nations are increasingly positioning themselves as regional hubs of digital innovation and AI education. In contrast, West Africa (49) and Central Africa (20) lag, with limited institutional capacity to deliver AI or ML education. While Ghana (20) emerges as a clear leader in West Africa, many neighboring countries, including Togo and Benin, have only a handful—or no—institutions offering such programs. Southern Africa (32), led by South Africa (24), demonstrates strong potential but faces internal disparities, as smaller countries in this subregion have minimal offerings.

This uneven distribution underscores a major structural challenge for human capital development in Africa. The concentration of AI-related training opportunities in a few countries creates a geographical and cognitive divide that limits the continent's overall capacity to harness AI for development. Moreover, regions with weaker educational infrastructure risk becoming passive consumers rather than active contributors to global technological innovations.



Sources: Author's calculation based on UNESCO, World Bank
 Fig. 5: Effectiveness National Strategy

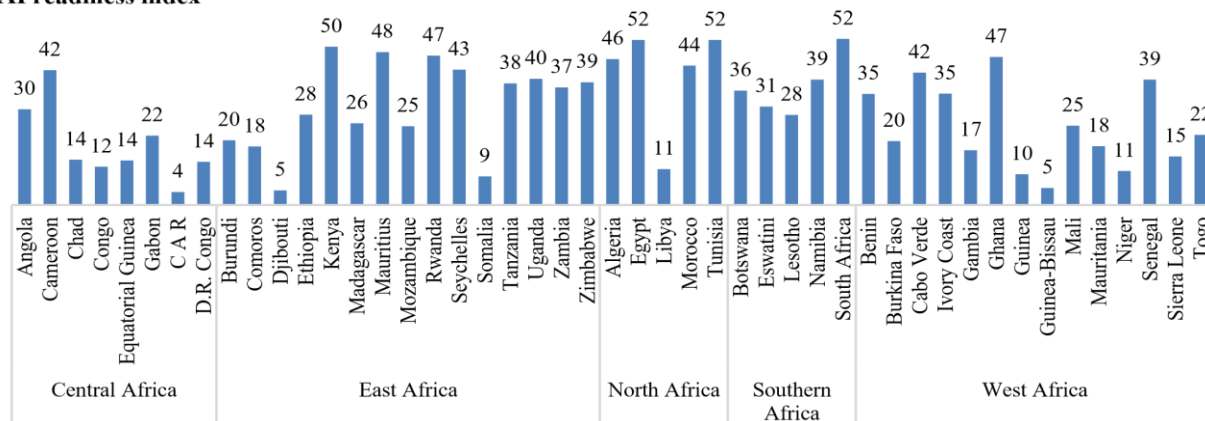
The effective adoption and governance of Artificial Intelligence (AI) across sectors require a comprehensive national strategy—a policy framework that defines priorities, ethical standards, infrastructure needs, and capacity-building pathways. Such strategies serve as a roadmap for integrating AI into education, health, agriculture, and public administration, while ensuring that innovation aligns with national development goals.

In Africa, however, the development of National AI Strategies (NAIS) remains limited and uneven. Among the countries surveyed, only one in five (approximately 20%) has officially released a national AI strategy. About 15% of countries are currently in the process of developing one, while a significant 64% have not yet initiated any formal strategy. This reveals that most African nations are still at the preparatory or exploratory stage of AI policy formulation, potentially slowing the continent's collective readiness for the digital era.

Regional differences are particularly striking. North Africa leads the way, with 60% of its countries having already released a national AI strategy and another 20% in development—an indication of strong political will and institutional commitment, as seen in countries like Egypt and Morocco. In contrast, West Africa (78.6%) and Southern Africa (80%) have the highest shares of countries without any strategy in place, reflecting weak policy frameworks and limited institutional coordination. East Africa shows moderate progress, with 33.3% of its countries having released a strategy and 13.3% in development, highlighting the region's growing interest in digital governance.

The absence of well-defined AI strategies in most African countries poses a serious challenge to human capital development and workforce readiness, both of which are key components of this study. Without a national framework to guide the integration of AI into education systems, training programs, and the labor market, many countries risk widening the digital divide and missing the economic opportunities associated with the AI revolution.

AI readiness index



Sources: Author's calculation based on UNESCO, World Bank
 Fig. 6 : AI Talent Readiness Index

The AI Readiness Index provides a comprehensive measure of a country's capacity to adopt, implement, and benefit from artificial intelligence technologies. It evaluates key dimensions such as digital infrastructure, human capital, innovation ecosystems, and government strategy. Across Africa, the average readiness score stands at 29, underscoring the continent's limited preparedness to fully harness the potential of AI for economic and social transformation.

Figure 6 reveals strong regional disparities. North Africa (41) ranks highest, driven by relatively advanced economies such as Egypt (52) and Tunisia (52), which have invested in digital infrastructure and AI policy frameworks. Southern Africa (37) follows closely, thanks largely to South Africa (52)—a regional leader in AI research, education, and innovation. East Africa (31) shows moderate progress, led by Kenya (50), Rwanda (47), and Mauritius (48), countries that have strategically integrated digital transformation into national development agendas.

By contrast, West Africa (24) and Central Africa (19) trail behind, reflecting persistent challenges in infrastructure, digital education, and governance. Many countries in these subregions—such as Chad (14), Central African Republic (4), and Guinea-Bissau (5)—lack the technological and institutional capacity to support AI adoption. These structural weaknesses risk widening the digital divide, leaving millions excluded from the opportunities offered by the global AI economy.

3. Discussion

The analysis highlights a clear divide between North Africa, Southern Africa, and the rest of the continent in technological readiness, digital infrastructure, and educational attainment. North and Southern Africa are better positioned to adopt and integrate artificial intelligence within education and professional training systems. Conversely, many sub-Saharan countries face persistent challenges including limited internet access, inadequate school infrastructure, and insufficient education funding. This structural imbalance threatens to exacerbate inequalities in AI-driven education and widen the digital divide across Africa.

This divide is further reflected in the status of national AI strategies. Only about 20% of African countries have released a national AI strategy, 15% are developing one, and 64% have yet to initiate such efforts. This policy gap limits coordinated AI implementation, particularly in education and skills development. Countries with established strategies—such as Egypt, Morocco, and South Africa—also rank highest on the AI Readiness Index, underscoring the importance of strategic vision for effective AI integration. Without clear national frameworks, many countries risk fragmented, unsustainable AI initiatives.

Artificial intelligence holds transformative potential for education by democratizing access to high-quality learning. Advanced AI models exhibit reasoning capabilities comparable to graduate-level expertise, enabling them to supplement teaching, provide personalized feedback, and simulate expert guidance. In regions with limited access to qualified teachers, AI can serve as a catalyst for educational equity by offering on-demand tutoring and tailored learning pathways. A significant obstacle is the lack of continuous teacher training, especially in West and Central Africa, where professional development opportunities are scarce. This capacity gap impedes the effective integration of AI into pedagogy and risks deepening regional disparities. Prioritizing teacher upskilling and embedding AI literacy and ethics into curricula are essential to harness AI's benefits responsibly and inclusively.

AI can also enhance learning quality and personalization. AI-driven systems adapt content to individual learners' pace and abilities, which is particularly valuable in overcrowded classrooms with limited teaching resources. By supporting differentiated learning, AI has the potential to reduce educational disparities and improve outcomes.

Empirical evidence indicates that AI-assisted learning environments can accelerate training while maintaining learner performance. For Africa, where resources and skills are limited, such acceleration could significantly boost workforce readiness and support sustainable economic transformation.

Why is it urgent to adopt AI — especially in education?

The urgency to adopt AI in education stems from the risk that unmanaged AI use may erode core competencies. Traditional assessments relying on homework and repeated answers lose reliability as students increasingly use AI tools to complete assignments without genuine understanding. This undermines diagnostic assessment and weakens learning trajectories. Consequently, education systems must incorporate AI-aware pedagogies, update assessment methods, and train teachers to ensure AI acts as a learning accelerator rather than a source of illusory achievement.

AI also risks deepening existing inequalities if access and capacity issues are not addressed. Productivity gains from AI disproportionately favor those with access and skills, potentially widening income and competence gaps. In education, digitally connected schools and students will advance faster, while underserved populations risk falling further behind. To prevent this, an equitable AI agenda is imperative—guaranteeing affordable connectivity and devices, investing in teacher development, updating curricula for digital and AI literacy, and implementing inclusive policies prioritizing disadvantaged learners. Only by coupling AI adoption with equity measures can it become a genuine tool for inclusive human capital development.

What Solutions Can Be Proposed?

Given Africa’s current infrastructural limitations—where internet coverage averages only about 45% and access to electricity stands around 55%—more than half of the continent’s population remains excluded from the potential productivity gains brought by artificial intelligence. Bridging this gap requires a two-tiered strategy combining long-term structural reforms and short-term inclusive innovations.

In the long term, African governments and their development partners must accelerate electrification projects and expand affordable broadband connectivity. Without these fundamental infrastructures, any attempt to deploy AI for educational or economic transformation will remain uneven and geographically concentrated. Yet, as AI technology advances rapidly, waiting for universal infrastructure coverage is not an option. Short-term interventions can and must complement these efforts to ensure that African populations are not left behind in the digital revolution.

A key short-term priority is to reform education and training curricula to integrate artificial intelligence (AI) use, ethics, and critical digital literacy. Updating curricula is essential not only to prepare students for the future of work but also to ensure that teachers and trainers can use AI responsibly and effectively in the classroom. Countries such as Rwanda and Kenya have already made notable progress in this direction. For instance, Rwanda’s Ministry of Education, in collaboration with UNESCO and the Mastercard Foundation, has begun incorporating AI and data science modules into secondary and tertiary programs, aiming to build a “future-ready” workforce (UNESCO, 2023). Similarly, Kenya’s Competency-Based Curriculum (CBC) framework promotes the use of emerging technologies and has introduced coding, AI literacy, and digital 404ersonalized learning (DPL) in schools since 2022 (Daltry et al., 2025).

These national reforms can be further strengthened through alignment with the UNESCO AI Competency Framework for Teachers (2024), which identifies five interrelated domains of teacher capacity development: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional growth. Embedding these competencies into teacher training and professional development programs would ensure that educators acquire, deepen, and eventually create innovative and ethical uses of AI in learning environments. Such integration would also foster human oversight, inclusion, and respect for linguistic and cultural diversity in digital education.

Another innovative solution involves expanding access to AI tools through low-cost mobile platforms. Given Africa’s mobile penetration rate exceeding 85% and the availability of SMS/USSD services even in remote areas, governments could collaborate with telecom operators to deploy simplified AI systems hosted on local servers and accessible via free or low-cost textbased interfaces. Through this approach, users could interact with AI assistants for educational, agricultural, or business support without requiring smartphones or broadband connectivity. Kenya’s SMS-based digital advisory services,

developed in partnership with Safaricom, provide a valuable model for how AI-powered solutions can reach underserved communities (Hernandez et al., 2024).

At the continental level, these recommendations directly support the African Union’s Digital Transformation Strategy for Africa (2020–2030), which emphasizes digital skills development, education digitization, and equitable access to emerging technologies such as AI, robotics, and the Internet of Things. Aligning national education reforms and mobile AI initiatives with this strategy would ensure coherence between local innovation and continental objectives for digital inclusion and sustainable development. By linking educational innovation to these policy frameworks, African countries can build a digitally literate population equipped with ethical, technical, and critical skills essential for the 21st century.

Conclusion

The transition from basic to digital literacy is a fundamental structural transformation shaping how African societies learn, work, and innovate. Key pillars of this transformation include curriculum reform, inclusive AI access, and infrastructure expansion. By embedding AI and digital competencies into education, African countries can move beyond traditional literacy to develop digital fluency, critical thinking, and problem-solving skills. This shift will strengthen human capital formation and enhance workforce readiness in an AI-driven global economy. Effective implementation of these strategies can reduce regional disparities, close educational inequalities, and empower Africa’s young population to compete in the 21st-century knowledge economy.

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