Digital Transformation of African Higher Education in an AI Era: Snapshots on Progress

Building on the 2024 High-Level Policy Dialogue in Dakar, Senegal

Contents

Authors of the Report: Prof. Paul Prinsloo， UNESCO-ICHEI Team
Graphic design and layout: DONG Mingyue
Report Coordination: SU Rui, CAO Zian
Report Coordinating Interns: ZHOU Qi, LI Xintian, TANG Jingye
Translation: MA Ruoran, TANG Jingye, XU Shujing
For more information, please contact: office@ichei.org

1. Introduction

1.1 Background to this Report

Higher education serves as a powerful catalyst for development in Africa, playing a central role in the realisation of the African Union's Agenda 2063 and the 2030 Agenda for Sustainable Development. In the rapidly evolving technological landscape, strategically integrating digital and artificial intelligence (AI) technologies into higher education systems represent a crucial step towards achieving quality education for all and nurturing innovation-driven societies. In 2024, the African Union declared the year as the “Year of Education,” which provided a vital opportunity to take stock of the progress made and accelerate efforts to leverage the full potential of technological advancements. It was foreseen that this would optimise governance, management, teaching, and learning in Africa's higher education sector, aligning with the continent's broader development goals.

Against this background, a 2024 High-Level Policy Dialogue in Africa, themed Operationalising Strategies for Quality Higher Education in the AI Era was held in Dakar, Senegal, the International Centre for Higher Education Innovation under the auspices of UNESCO (UNESCO-ICHEI), the Université Gaston Berger (UGB) - International Institute of Online Education (IIOE) National Centre in Senegal, the Université Amadou Mahtar Mbow (UAM) and the Université Numérique Cheikh Hamidou KANE (UN-CHK). The Dialogue convened senior officials from government agencies overseeing higher education, higher education institution (HEI) leadership and teaching personnel, private sector entities, industry professionals and experts, representatives from international and regional organisations, and other partners to explore the transformation of Africa's higher education in the AI era.

The Policy Dialogue drew on the African Union's Continental Artificial Intelligence Strategy and Continental Education Strategy for Africa 2016–

2025, as well as UNESCO's Operational Strategy for Priority Africa 2022-2029. Importantly, the Policy Dialogue was convened under the framework of UNESCO's Priority Africa Flagship Programme "Campus Africa," with the aim of building integrated, inclusive, and quality tertiary education systems and institutions for the development of inclusive and equitable societies on the continent.

The meeting brought together around 150 participants from all subregions of Africa and beyond, including:

- Senior officials from the ministries of education and other relevant government
- entities in charge of higher education
- Higher education workforce, including HEI leadership, teaching personnel, and learning support staff
- Industry professionals and private sector entities
- Experts in promoting AI integration, as well as gender equality, in higher education
- Representatives from UNESCO, the African Union, and other international and regional organisations

During the Policy Dialogue, Mr. Guillaume Husson, Head of Education Sector, UNESCO Multisectoral Regional Office for West Africa, highlighted Africa's youthful population as a significant opportunity, yet pointed out the major challenges the continent faces in the AI era, particularly the constraints on research capabilities.

Several speakers from a range of African higher education institutions added insights regarding the role of higher education in ensuring the digital transformation of the African continent. For example, Mr. Claude Lishou, Director of the Higher Institute for Distance Learning, Université Cheikh Anta

Diop (UCAD), Senegal, emphasised that sustainable AI integration in higher education depends on strengthening ethical regulations for responsible AI use, improving technological infrastructure to ensure equitable access, and building the capacities of stakeholders to fulfill their roles effectively. From the context of Algeria, Mr. Noureddine Bali, Vice-Rector, University of Science and Technology Houari Boumedienne (USTHB), discussed how USTHB implemented the Pedagogical Support Unit (CAP) strategy to enhance the digital skills of teachers and researchers and strengthen the university pedagogical mechanism. He emphasised that AI should empower, not replace, teaching and research. Training on AI tools requires clear guidance but takes time from actual teaching, calling for a standardised approach. He also stressed that the future direction of education should focus more on pedagogy than technology, learning from past experiences.

A snapshot of initiatives of a Southern African university was provided by Mr. Daniel Mashao, Executive Dean, Faculty of Engineering and the Built Environment, University of Johannesburg (UJ), South Africa, who shared the university's commitment to embracing future technologies and anchoring in Africa and the Global South. He highlighted key initiatives such as the introduction of freely available AI modules and UJ's efforts to intensify its outreach with full-time and fully online short learning programmes to help upskill and reskill people for current and future jobs. Such initiative is well in line with UJ’s global excellence and stature (GES) 4.0 strategic objective underpinned by the Forth Industrial Revolution (4IR).

As addressing gender inequalities is central to the digital transformation of the African continent, Mr. Melisew Dejene, Associate Professor in Development Studies and Journalism, Hawassa University, Ethiopia & Member of the UNITWIN Network on Gender, Media and ICTs, shared innovative pathways in Africa to close the gender gap. He emphasised the importance of proactive digital policies, strategies, and legal frameworks to ensure equitable access to AI for both men and women, as well as the critical need for investment in digital infrastructure for higher education. Additionally, he underscored the

significance of empowering African women with AI-related skills to fully harness the benefits of this transformative technology.

Finally, Mr. Abdou Lahate Cissé, Administrative and Technical Coordinator, Francophone African Network of National Quality Assurance Agencies (ANAQ-Sup), Senegal, outlined the organisation's vision to promote the transformation of higher education, research, and innovation through a quality assurance approach. He also discussed strategies for advancing digital technology and AI in higher education, emphasising the role of government and institutional frameworks, the importance of pedagogical institutes in strengthening educator capacities, and integrating AI into doctoral programmes. He further highlighted the need for AI research, networking, and ethical quality assurance guidelines.

1.2 Purpose and structure of this Report

This report, titled "Digital transformation of African higher education in an AI era: Snapshots on progress," uses the 2024 High-Level Policy Dialogue as a point of departure for providing an overview and snapshots of the digital transformation of African higher education in an AI era. The report used data from the different presentations at the 2024 High-Level Policy Dialogue, combined with desktop research to provide snapshots on the digital transformation and integration of AI in higher education in 15 representative countries on the African continent.

This report will be useful for educational and educational technology researchers, educators, public and private educational institutions, NGOs, policy makers, and regulatory bodies.

This report unfolds as follows:

It introduces the notion of digital transformation of African higher education in an age of AI by establishing what is understood as digital transformation in the context of this report, providing a selection of African country case studies

focusing on initiatives to operationalise AI in the context of broader initiatives in service of digital transformation, before analysing some of the trends and gaps and formulating some tentative policy recommendations. In the Appendices of this report, a number of case studies are provided illustrating various aspects of digital transformation in African higher education.

2. Digital transformation of African higher education in an AI era

2.1 Defining digital transformation

Digital transformation is often thought of and presented as the extent to which individuals, communities and institutions are connected to the internet and optimising the benefits of connectivity and technological advances such as Artificial Intelligence (AI).

In the context of Africa, digital transformation not only include advances in connecting individuals, communities and institutions to the internet, and optimising the affordances of advances in technology such as AI, but involves a spectrum ranging from individuals, communities and institutions that function totally analogue and offline, to internet supported with digital processes, documentation and resources, to internet dependent which involves processes and resources that depend on the quality, cost and sustainability of internet connectivity, to entirely online. Focusing, however, only on the technological aspect of digital transformation, loses sight of the broader elements of digital transformation, namely ensuring equity of access to both males and females, and optimising access to and the production of context-appropriate Open Educational Resources (OER).

2.2 Context of digital transformation

Various challenges Africa faces impact on digital transformation such as, but not limited to, underdeveloped digital and electricity infrastructures and provision, a persistent digital divide that spans not only different geographical contexts, but also refer to inequity in access between genders, educational and socio-economic categories, as well as lacking or inadequate policy and regulatory environment. Despite these challenges, there have been vast

improvements, such as a 115% growth in internet users between 2016 and 2021 (World Bank, 2024).

The ***Digital Transformation Strategy for Africa 2020-2030*** (African Union, 2020) states that digital transformation is "a driving force for innovative, inclusive and sustainable growth". It serves a "common and coordinated guide to enable African leaders to reap the benefits of digital transformation, but also to help mitigate the risks that might accompany these developments" (p. 3). The ***Strategy*** aims to harness digital technologies and innovation to transform African societies and economies to promote Africa's integration, generate inclusive economic growth, stimulate job creation, break digital divides, and eradicate poverty. As such, the ***Strategy*** aims to support not only the continent's socio-economic development, but to ensure Africa's ownership of modern digital management tools (p. 4).

The ***Strategy***'s vision is to create "a digitally transformed continent for prosperity and inclusivity." Digital Education is a critical sector foreseen to drive digital transformation (p. 9) supported by the following foundation pillars, namely (1) an enabling environment, policy, and regulation; (2) digital infrastructure; (3) digital skills and human capacity; and (4) digital innovation and entrepreneurship. The ***Strategy*** documents several challenges such as low literacy levels, gender inequality and recommends, inter alia, the review of education curricula, the development of gender-inclusive frameworks and policies as well as the review of education curricula with a focus on Innovation, Science, Technology, Engineering, Art and Maths (iSTEAM) and a combination of digital, 21st century and e-business skills.

As one of the critical sectors identified in the ***Strategy***, digital capability will be a challenge in light of the very low literacy levels (64%) compared to a global average of 84% for people aged 15 and above (p. 22). "Africa's school enrolment at pre-primary, secondary, and tertiary levels is grossly lower by 27% than the global average, while primary school dropout is higher by 21%" and gender inequality is a major concern with females who account for half of the population "have low adult literacy and access to digital technologies,

when compared to their male counterparts" (p. 22). The ***Strategy*** recommends to:

- Review education curricula according to current needs and trends in the digital society, economy, and labour market, with a focus on Innovation, Science, Technology, Engineering, Art, and Maths (iSTEAM) and a combination of digital, 21st-century, and e-business skills, across all areas of learning.

- Promote gender-inclusive education frameworks and policies and boost relevant education opportunities and digital skills development for women and girls in STEAM subjects to narrow the gender digital divide.

- Encourage diversity and inclusion in STEAM education and support the up-skilling of citizens to mitigate job losses (p. 23).

In the specific context of higher education, the ***Strategy*** aims to:

- Support the establishment and scale-up of online higher-level education institutions, with curricula combining STEAM and transversal skills. Support the development of learning communities active within online platforms, to promote peer-to-peer learning and exchange of best practices, as a model including a mix of blended learning to enhance completion rates.

- Scale-up projects and programmes that apply an intersectional approach to promote institutional networking and support quality higher education in Africa, tailoring policies and actions to the needs of regional and national labour market (p. 23).

The success of the Strategy and the above initiatives depends on, inter alia, the building of multi-stakeholder public-private partnerships, and supporting the development of national and regional ICT Centres of Excellence for skills development, the development of smart classes and digitised learning materials (p. 25).

The success of the digital transformation of the African continent is therefore closely linked to the success of the digital transformation of its education, specifically its higher education sector. The Strategy recommends, inter alia, the modernisation of curricula to "exploit ICTs for learning purposes"; localising existing educational content; supporting the proliferation of virtual universities and academic institutions; making use of massive, open online courses; and developing e-learning portals and e-Libraries (p. 40).

The ***Strategy*** highlights several cross-cutting themes such as the role of digital content and applications; the digitalisation of identity, embracing emerging technologies such as AI, blockchain, 3D printing, etc.; issues about cybersecurity, privacy, and personal data protection; and research and development.

2.3 Two inter-institutional examples of digital transformation initiatives in African higher education

2.3.1 Inter-University Council for East Africa

The Inter-University Council for East Africa (IUCEA), established under the IUCEA Act of 2009 of the East African Legislative Assembly (EALA), plays a core role in advancing higher education across the East African Community (EAC). Its mission includes promoting quality assurance, fostering research collaboration, and driving digital transformation to align regional higher education with global trends. Recognising AI's potential, IUCEA has prioritised AI integration as a strategic component of educational reform.

During the Policy Dialogue, Mr. Idris A. Rai, Deputy Executive Secretary, Inter-University Council for East Africa (IUCEA) introduced the Capacity Building initiatives launched this year in collaboration with UNESCO-ICHEI, designed to enhance the digital and AI competencies of the higher education workforce. Looking ahead, IUCEA plans to strengthen its partnership with UNESCO to advance Campus Africa initiatives and deepen its collaboration

with UNESCO-ICHEI in transforming teaching and learning and fostering university-industry partnerships.

In June 2023, IUCEA hosted its 14th Annual Conference, themed "The Future of Higher Education in the Age of Data Science and Artificial Intelligence." The conference convened academia, industry leaders, and policymakers to discuss AI integration strategies, resulting in key resolutions that laid the foundation for regional AI adoption in higher education [78].

Strategic interventions

IUCEA has aligned its AI policy strategies with continental and global frameworks, such as the African Union's Continental Artificial Intelligence Strategy and the United Nations' digital inclusion initiatives. The organisation executes its mandates through various mechanisms, including policy advisory, capacity building, programmes and projects, and partners and stakeholders convening [79].

1. Establishment of a Regional Centre of Excellence (CoE) in AI: IUCEA is spearheading the creation of a federated AI research and innovation hub across EAC partner states. The CoE will conduct AI-focused academic programmes, facilitate interdisciplinary research, and support AI-driven startups.

2. Capacity Building: Under its 2021–2026 Strategic Plan, IUCEA aims to train over 300 academic staff in AI applications for education and research by 2026. Partnerships with organisations like UNESCO-ICHEI provide digital competency training through the International Institute of Online Education (IIOE) platform. The initiative aims to support the transformation of teaching and learning, as well as deepen university-industry collaborations.

3. AI-DARASA Initiative: IUCEA, in collaboration with GIZ, has launched AI-DARASA ("classroom" in Swahili), a regional platform for AI research, education, and skills development. The initiative focuses on micro-credentials,

summer schools, and online AI courses, aiming to train 50,000 individuals by 2028.

4. Policy Formulation and Data Management: IUCEA is developing a comprehensive AI governance framework, emphasising ethical AI use, data privacy, and digital equity. This initiative is being implemented in collaboration with organisations like the Association of African Universities (AAU) and the Population Reference Bureau (PRB).

AI integration into higher education

IUCEA has implemented multiple strategies to enhance AI integration into higher education across the region. Through Capacity Building, IUCEA collaborates with UNESCO-ICHEI and IIOE to equip higher education faculty with AI competencies, ensuring educators can effectively integrate AI into teaching and research. The AI-DARASA Initiative is a groundbreaking project aimed at fostering AI-driven learning in higher education, the goal of which is to offer AI research opportunities and micro-credential programmes, including AI study programmes in eight higher education institutions. Additionally, IUCEA's Policy Formulation and Data Management efforts focus on establishing governance frameworks to regulate AI ethics, data privacy, and responsible AI use in higher education institutions. These comprehensive initiatives position East Africa as a leader in AI-driven higher education transformation, equipping students and educators with the skills needed for the digital age.

Summary

IUCEA's initiatives, including the establishment of a Regional CoE in AI and partnerships like AI-DARASA and that with UNESCO-ICHEI, demonstrate the region's determination to promote higher education transformation. Through collective efforts, East Africa can unlock the transformative potential of AI, shaping a brighter and more inclusive future for its people through higher education.

2.3.2 International Institute for Capacity Building in Africa (IICBA)

The International Institute for Capacity Building in Africa (IICBA) was established in 1999 in Addis Ababa and is a Category I Institute under UNESCO [80]. Its vision is to strengthen teacher policy and development in Africa, and is committed to strengthening the capacity of African Member States in teacher policy and development. The strategic objectives of the organisation are to expand the supply of qualified teachers and to increase their support and motivation [81].

Strategic interventions in empowering teachers

Most of IICBA's work focuses on teachers, and capacity enhancement is one of the IICB's main line of actions during 2023-2025. Through various initiatives, the organisation aims to empower higher education teachers with the skills, resources, and policies needed to address Africa's educational challenges and drive sustainable development.

1. **Support for teacher training institutions:**

IICBA focuses on strengthening teacher training institutions by conducting needs assessments, offering tailored capacity-building programmes, and fostering communities of practice. Initiatives include structured training for mid- to high-level education officials and technical guidance to align pre-service and in-service training with labour market demands [82].

2. **Policy development and implementation:**

The institute provides evidence-based policy guidance to Ministries of Education and higher education institutions. This includes tools for competency-based reforms, quality assurance frameworks, and strategies to address teacher shortages. Annual *Africa Teachers Report* released by IICBA

since 2023 highlights critical issues like STEM education and foundational learning, directly informing higher education policies.

3. **Partnerships and collaborations:**

IICBA works closely with regional bodies (e.g., African Union, ECOWAS), UNESCO institutes (e.g., International Bureau of Education), and global organisations to align capacity-building efforts. Partnerships with institutions like the African Development Bank and UNICEF ensure coordinated support for higher education systems and faculty development [83].

4. **Research and knowledge sharing:**

The institute conducts applied research on teacher policies and publishes findings through reports, discussion papers, and knowledge notes. A new book series and annual symposia aim to amplify African researchers' voices, fostering evidence-based practices in higher education [83].

Digital integration into capacity building for higher education teachers

IICBA has several initiatives that integrate digital devices and AI into capacity building for higher education teachers, mainly including the following key points:

1. **Integration of ICT and digital skills**

IICBA focuses on integrating ICT and digital skills into education. This includes using the TPACK (Technological Pedagogical Content Knowledge) model in teaching and learning; empowering teachers on eLearning content development and assessment; training teachers, TV and radio personnel in providing ODL; and developing digital skills and technology enhanced gender-responsive pedagogy [82].

2. eLearning platforms

Leveraging lessons from the COVID-19 pandemic, IICBA is scaling up online training programmes. IICBA offers capacity development both in person and online via eLearning platforms. This approach ensures that teachers and education professionals can access training and resources remotely, enhancing their digital competencies and ability to use AI in education. The planned eLearning platform, set to launch in 2023, aims to scale up training accessibility for teachers across Africa [83].

Summary

Ensuring that every learner is taught by a qualified teacher remains a massive challenge in Africa for lack of adequate governance structures and supporting resources, but solutions exist. Together with a wide range of partners and digital integration into capacity building, IICBA can contribute to empowering teachers so that all learners can thrive.

3. Current state of AI integration into higher education in selected African countries

The African continent comprises 54 sovereign nations, including thousands of languages, dialects, and cultural communities. Given various constraints, this report cannot provide an exhaustive analysis of digital transformation trajectories—particularly regarding AI integration in higher education—across the entirety of these national contexts.

In this report, we purposefully selected 15 countries in an attempt to provide *snapshots* of digital transformation and the integration of AI into higher education based on, inter alia, their participation in the 2024 High-Level Policy Dialogue hosted in Dakar, Senegal and the availability of information regarding their digital transformation and AI integration in higher education. As such, the 15 snapshots of selected countries provide glimpses of developments in the North, West, East and Southern parts of Africa.

Each country snapshot is structured as follows: a brief overview, specific initiatives in technical and vocational training, implementation measures of universities, training programmes for in-service professionals, as well as overall advancement strategies and challenges for AI integration in higher education.

3.1 Egypt

Created by the International Telecommunication Union (ITU) to track countries' progress toward a series of connectivity targets, the Universal and Meaningful Connectivity (UMC) initiative found that Egypt exhibits an advanced level of broadband, mobile phone, and internet usage among its general population. Affordability, penetration, and gender equity of internet access all met the targets of UMC. However, schools—particularly secondary and upper-secondary schools—suffer from relatively limited access to the Internet. In the International Monetary Fund's (IMF) AI Preparedness Index

assessment, Egypt scores 0.39, ranking it behind Tunisia and Morocco as the third most AI-ready country in the North Africa region.

The Egyptian authorities are committed to continuing to accelerate digital transformation in the country and taking AI as the core driving force. The National Council for AI (NCAI) was established by a decree from Prime Minister Mostafa Madbouly in November 2019. Its primary responsibilities include developing and overseeing the National AI Strategy and coordinating with stakeholders to create a unified approach that reflects the priorities of both the government and key actors in AI adoption. The establishment of the NCAI positioned Egypt as one of the earliest adopters of a National AI Strategy in Africa, with its inception in 2019. The second version, responding to the generative AI revolution at the end of 2022, is set to be released in 2025.

Egypt's first National AI Strategy aims to leverage AI technologies to support the achievement of the country's Sustainable Development Goals (SDGs), facilitate regional cooperation with African and Arabic nations in AI, and establish four critical pillars: AI for Government, AI for Development, Capacity Building, and International Activities [1].

While reiterating the objectives of the first strategy, the second National AI Strategy (2025-2030) sets out metrics for achieving strategic goals related to economic, social, and academic advancements in AI. The strategy anticipates that by 2030, generative AI and related technologies will accelerate academic research, doubling the number of AI publications to 6,000 per year, positioning Egypt as a regional hub for research collaboration. Additionally, the number of AI professionals and experts is expected to reach 30,000 by 2030 [2].

Regarding integrating AI into education at various levels, the Capacity Building pillar from the first strategy and the Talents pillar from the second strategy outline the most relevant plans.

The Capacity Building pillar aims to "prepare the Egyptian population for the age of AI at all levels, from general awareness to school, university, and equivalent education, to professional training for both technical and non-technical disciplines."

Specific measures in technical and vocational training:

- Introducing introductory courses and summer camps on computing foundations for students.

- Enhancing the practicality of AI-related courses and educating students on how to embrace, rather than fear, AI advancements.

- Funds should be raised from the private sector to provide training equipment for AI education.

Specific measures in universities:

- Incorporating AI as a core subject in technical undergraduate majors such as Computer Engineering and Computer Science.

- Strengthening teaching and research capabilities in emerging AI faculties by attracting investments from public and private sectors, promoting international research networks, and actively recruiting Egyptian PhD students and expatriate researchers for visiting positions.

- Bridging the gap between theoretical knowledge and practical skills through postgraduate degree and non-degree programmes, including specialised programmes on specific topics or industries and broad programmes covering AI and data science.

- Partnering with leading foreign academic institutions for longer degree programmes and collaborating with top AI companies in Egypt and abroad for shorter, specialised training programmes.

- Utilising summer holidays to provide students with hands-on experience through boot camps, AI hackathons, and internships.

- Offering specialised AI courses for students from non-technical backgrounds to enhance their understanding of AI applications in their respective fields.

- Providing fully funded professional master's degrees for outstanding graduates in technical disciplines, covering AI modules (as an option among various topics) and workplace soft skills, and offering training and internship opportunities with leading companies in Egypt.

Specific measures for training working professionals:

- Offer basic and customized AI courses for domain experts (i.e., non-technical professionals who provide industry knowledge to AI development teams).

- Developing specialised programmes for executives in startups, government, and the private sector to help them understand and lead AI initiatives.

- The Talents pillar in the second strategy aligns with the strategic objective of "strengthening the quantity and quality of local AI talent and expertise."

General measures:

- Establishing AI R&D labs and AI competitions to encourage student innovation.

- Creating an AI Innovator Centre to provide resources for researchers, developers, and entrepreneurs to collaborate and innovate in AI.

- Developing a comprehensive AI education system within STEM (Science, Technology, Engineering, and Mathematics) curriculum frameworks.

- Introducing AI joint majors that combine AI with fundamental disciplines.

- Implementing an AI talent management and certification programme to validate the skills and expertise of AI professionals at various levels.

- Ensuring compliance with international standards by collaborating with academic institutions, research centres, and private-sector companies in designing training programmes and courses.

Additionally, the major public sectors in Egypt are collaborating to enhance digital infrastructure. As of 2021, there were 11 joint projects between the Ministry of Communications and Information Technology and the Ministry of Education, aimed at establishing digital infrastructure, developing electronic exam systems, and creating innovation hubs and labs in universities. These projects had a combined budget of more than EGP 4.7 billion (USD 298 million). The two ministries also formed an executive committee to monitor and evaluate the status of digital universities and provide necessary technical support.

According to a study by Tshwane University of Technology on AI education in African universities, Egypt ranks highest—alongside two other North African countries—in terms of university maturity in offering AI-focused training programmes. It also ranks highest in the establishment of AI research institutes, alongside two North African and two Southern African countries [3].

A study conducted by the American University in Cairo, based on interviews with 46 faculty members from 10 universities, found that most institutions exhibited high levels of AI readiness. This suggests that integrating AI into university systems and curricula would be highly beneficial [4].

Challenges to AI integration in higher education in Egypt:

- Using the Capacity Assessment Framework methodology, Egypt's AI capacity remains low across all assessed dimensions: governance, data, technology, ecosystem, talent, and infrastructure [1].

- A shortage of experts and skilled engineers capable of developing, implementing, maintaining, and operating AI systems.
- Limited availability of data for research purposes.
- Poor integration of databases with universities, leading to redundancy, inconsistency, and inaccuracies, which hinder the efficiency and accessibility of knowledge extraction.
- Universities and research institutions require more physical infrastructure to support big data processing, AI applications, and remote data processing.
- Insufficient awareness of the importance of intellectual property and its protection [1][2].

Despite its still limited AI capacity, Egypt's AI implementation plan is on track to achieving steady progress through moving from AI Strategy Phase I to Phase II, advancing the integration of artificial intelligence into higher education institutions and expanding its talent reserve.

3.2 Morocco

Overview

In recent years, Morocco has made significant progress in digital development and the modernisation of higher education, particularly with increasing investments in artificial intelligence (AI) and information technology. The IMF's AI Preparedness Index, for instance, gave Morocco a score of 0.43, only behind Tunisia in the North Africa region. Morocco's digital connectivity has also met or closely aligned with a majority of UMC targets, including affordability of the internet and mobile phones, their adoption rates, and gender equity in digital access. In addition, most levels of schools below tertiary level have internet connectivity rates approaching or exceeding 80%, with secondary schools performing strongest. The only weak indicator is the

lack of high-speed broadband services, with 68% of fixed broadband subscriptions having speed equal to or above 10 Mbit/s. Morocco does not have a national artificial intelligence strategy, but data from survey have shown that the country has a favorable ecosystem for developing a holistic vision for AI [5]. Morocco's higher education system is composed of renowned institutions such as Hassan II University, Mohammed V University, and Mohammed VI Polytechnic University (UM6P). The government is actively promoting the transformation of universities towards smart and digital systems to enhance research capabilities and train talent that aligns with future demands.

Core AI policies and project activities in the field of AI in higher education

Morocco's government launched the "e-Maroc" digital strategy as early as 2001 and subsequently advanced AI, big data, and cloud computing technologies in the education sector under the frameworks of "Maroc Numeric 2013" and "Maroc Digital 2020" [6].

National level:

Morocco has established the Digital Development Agency (ADD), which is responsible for implementing Morocco's strategy on digital development and promoting the distribution of digital tools and the development of their use among citizens [8], while the Ministry of Higher Education encourages institutions to establish AI-related programmes. Additionally, the government has actively partnered with international organisations such as the EU, France, and the US to jointly develop AI curricula and research projects. Morocco's increasing focus on AI research is also evident. In 2019, a budget of 50 million dirhams was allocated to the Al-Khawarizmi programme to fund AI research projects. In 2023, the Ministry of Higher Education, Scientific Research, and Innovation (MESRI) announced the creation of the first national research institute dedicated to artificial intelligence [5].

Institutional level:

Several universities in Morocco have established AI research institutes and data science laboratories.

- Mohammed VI Polytechnic University (UM6P) stands out, offering a dedicated AI and Data Science school to train high-level technical talent. UM6P works with various tech companies to jointly develop AI technologies and promote intelligent applications in agriculture, healthcare, energy, and other fields. Furthermore, UM6P offers an executive programme in AI Governance & Practice designed to provide participants with insights into the latest AI developments and their impacts on organisational governance models, with an emphasis on ethical considerations in AI solution design and deployment.

- Mohammed V University of Rabat offers a specialised master's programme in AI aimed at developing students' technical and theoretical knowledge of AI, enhancing their professional skills.

- Euromed University of FES hosts the School of Digital Engineering and Artificial Intelligence (EIDIA), which offers undergraduate and master's courses in AI, big data, robotics, cybersecurity, web and mobile technologies, among others, providing students with cutting-edge engineering training [7].

Morocco is making steady progress in integrating artificial intelligence into higher education through government initiatives, institutional investments, and international collaborations. Universities such as Mohammed VI Polytechnic University and Mohammed V University are expanding AI programmes and research, while partnerships with industries aim to bridge the gap between academia and practical applications. However, the absence of a national AI strategy and specialised regulations presents challenges in ensuring coordinated development and data protection. Efforts to enhance AI education, improve governance frameworks, and strengthen industry-

academia collaboration reflect Morocco’s commitment to fostering a robust AI ecosystem in higher education.

3.3 Algeria

Overview

Algeria, the largest country in Africa, has a well-established higher education system. The government has been actively promoting digital transformation, with artificial intelligence (AI) emerging as a key area of focus in education and research to strengthen national technological capabilities. According to the Oxford Insights Government AI Readiness Index 2024, Algeria ranks 115th globally, reflecting current challenges in AI adoption, infrastructure, and governance [13]. The IMF AI Preparedness Index scored Algeria 0.37, falling behind Morocco, Tunisia, and Egypt in the North Africa region. The ITU's UMC assessment found digital connectivity in the country to be approaching or already satisfying the assessment's targets in areas including affordability, adoption rates, gender parity in internet access, as well as availability of internet at schools. However, the internet availability rate in primary schools is merely 57%, exhibiting a sharp difference compared to that in secondary schools, which all scored at or above 85%. Despite these obstacles, Algeria has taken steps to integrate AI into national strategies and institutions, fostering growth in the sector.

Core AI policies and project activities in the field of AI in higher education

National level:

The Algerian government has implemented several initiatives to integrate AI into higher education as part of its broader digital transformation strategy. The National Artificial Intelligence Strategy (2020-2030), launched in 2019 and revised in 2023, outlines six key pillars: advancing research and innovation, enhancing skills development, investing in infrastructure, promoting the AI

ecosystem, establishing a strong regulatory framework, and focusing on priority sectors [10].

Key national initiatives include:

- The establishment of the National School of Artificial Intelligence, initiated by President Abdelmadjid Tebboune, to provide specialised AI education and training [15].

- The establishment of the National Scientific Council for Artificial Intelligence (AI Council) in 2023, which serves as a scientific advisory body to guide policy development and cross-sectoral AI strategies. It consists of experts from government, industry, and academia, focusing on ethical AI development and strategic investment [11].

- The launch of the largest data and computing centre in the region to support AI research and innovation [9].

Institutional level:

At the institutional level, universities have been actively aligning their curricula with the national AI strategy. Several higher education institutions have:

- Introduced AI-focused research centres and laboratories, facilitating innovation in fields such as machine learning, data science, and robotics. For example, the University of Science and Technology Houari Boumediène in Algiers established the Artificial Intelligence Research Laboratory (LRIA) in 2000 within its Computer Science Department. Led by Prof. DRIAS ZERKAOUI Habiba, the LRIA focuses on cutting-edge areas in AI research, including computational complexity, heuristic methods, neural networks, machine learning, and quantum machine learning. Its applications span various domains such as agriculture, healthcare, climate change, and cybersecurity. [14]

- Strengthened partnerships with industry to provide students with practical

AI training, ensuring alignment between academic programmes and labour market needs.

With 57, 702 students now studying computer science and 74 master programmes in AI currently available across 52 universities, Algeria's capacity to produce AI talent only continues to grow. Meanwhile, notable Algerian researchers are among the top 2% scientists worldwide, while the volume of recognised scientific papers published by scientists from Algeria remains in the top five in Africa and among the top 50 countries globally. [10]

Algeria has demonstrated a strong commitment to integrating AI into higher education through strategic investments, policy frameworks, and institutional developments. At the national level, the government has established a structured AI strategy, built essential infrastructure, and fostered AI research and education. Institutions have expanded AI programmes, research capabilities, and industry partnerships. While challenges such as infrastructure gaps and global competition for AI talent persist, Algeria's continued focus on AI education and innovation positions it as a key player in the African AI landscape.

3.4 Nigeria

The two most significant strategic documents guiding the Nigerian government's initiative to digitalise education are the *National Digital Literacy Framework*, launched by the National Information Technology Development Agency (NITDA) in July 2023 [16], and the *National Artificial Intelligence Strategy*, introduced in August 2024 [17].

The *National Digital Literacy Framework* aims to build a digitally skilled workforce to accelerate Nigeria's economic growth and development. While it does not introduce specific AI-related policies, education is a key area of focus. Its first strategic initiative is to ensure that students at all levels of education are digitally literate before graduation. Specific measures include:

- Training and certifying teachers in digital literacy;
- Providing essential IT infrastructure;
- Developing an integrated data management platform for students and schools.

The National Artificial Intelligence Strategy is designed to serve as a comprehensive roadmap for harnessing technological advancements and socio-economic trends. It aims to enable Nigeria to chart its own course in AI adoption and develop a tailored approach to optimise AI's benefits for society. The Strategy recognises Nigeria's AI landscape as a "solid platform to build upon," highlighting the country's rapidly growing local AI innovation sector, which has gained international recognition from organisations such as the Gates Foundation Grand Challenge and the UNESCO International Research Centre on Artificial Intelligence (IRCAI). Nigeria's AI development is, however, against a backdrop of poor digital connectivity and AI readiness. For instance, the ITU's UMC assessment found limited digital access in the country as adoption rates and fixed broadband affordability are low. This assessment also could not access internet availability in schools due to the absence of available data. In addition, the IMF's AI Prepardness Index scored Nigeria 0.34, falling behind from neighbouring countries like Ghana, Cote D'Ivoire, and Senegal.

Key objectives of the AI Strategy

Building on this foundation, the Strategy seeks to harness AI's potential to enhance productivity, upskill the workforce, and promote inclusive education in Nigeria. To achieve these objectives, the Strategy proposes the following initiatives:

- Establish a strong foundational infrastructure and computing capacity.
- Foster networks of stakeholders across private, public, and higher education sectors to collaborate on AI applications.

- Create the *Nigerian AI Partnership for Commercialisation Excellence (NAPCE)* to facilitate collaboration between researchers, entrepreneurs, and investors, bringing innovative AI solutions to market.

- Conduct a foresight study to assess how AI adoption could exacerbate existing inequalities and identify vulnerable groups with limited technological access or digital skills.

- Encourage AI adoption in public services—such as healthcare, education, and transportation—to improve service delivery and foster public-private partnerships.

- Develop and implement AI-driven training and education systems to identify, nurture, and develop diverse AI talent, including in related fields such as cybersecurity.

- Launch a comprehensive AI skills development programme, including curriculum reform, teacher training, and reskilling initiatives.

- Establish an *AI Research and Development Fund (AIR&D Fund)* to support cutting-edge AI research in Nigeria and attract global talent.

- Build a high-speed, reliable network for research institutions and educational facilities to enable seamless collaboration and data sharing within the AI community.

Challenges in integrating AI into higher education

Despite these ambitious plans, significant challenges remain in integrating AI into Nigeria's higher education system:

- **Lack of regulatory consensus:** Nigerian higher education regulatory bodies have yet to establish unified ethical frameworks and regulatory policies for generative AI in universities [18].

- **Data-related issues:** Challenges persist in data collection, quality, availability, and accessibility.

- **Financial constraints:** AI development is hindered by insufficient government funding, inadequate university investment in AI research facilities and programmes, and a lack of venture capital for start-ups.

- **Economic instability:** High inflation, currency depreciation, and rising energy costs create financial uncertainty and discourage long-term investments in AI.

- **Shortage of AI talent:** Only 3% of Nigerian IT professionals specialise in AI and robotics, and the country faces a "brain drain" as skilled professionals seek opportunities abroad.

- **Limited access to high-performance computing:** The high cost of computing resources presents a barrier to AI research and development.

While the Strategy lays strong foundations for AI adoption across multiple sectors, it contains relatively few measures specifically targeting higher education institutions. Instead, its focus is broader—aiming to enhance overall socio-economic well-being while building AI capacity at national and institutional levels.

3.5 Senegal

Overview

Located in West Africa, Senegal is experiencing a profound digital infrastructure transformation through strategic plans such as *Sénégal Numérique 2025* strategy. In the field of higher education, the country has established several key institutions offering specialized programs in artificial intelligence (AI), including the African Institute for Mathematical Sciences Senegal (AIMS) and the Dakar Institute of Technology [19].

The digital transformation is occurring against the backdrop of medium-to-low internet adoption rates in the country. For example, the UMC assessment conducted by the ITU revealed that 60% of households and individuals aged 15 and above have internet access, while phone ownership is higher at 79%, likely due to the greater affordability of mobile broadband compared to fixed broadband. The availability of high-speed fixed broadband is also low, at just 15%. In addition, 73% of upper secondary schools have internet connectivity. Interestingly, the AI Preparedness Index rated Senegal at 0.4, ranking just behind Ghana in the West-Central Africa region.

Core AI policies and project activities in the field of AI in higher education

National level:

Senegal's Ministry of Communication, Telecommunications and the Digital Economy (MCTEN) plays a leading role in AI policy development. In September 2023, MCTEN launched the *National Strategy for the Development of Artificial Intelligence* (SNDIA), which builds on existing policies like the Digital Strategy 2025 and the *National Cybersecurity Strategy*. The SNDIA emphasises an ethical approach to AI, though specific legal frameworks and regulations are yet to be fully developed [20].

The government is also investing in digital infrastructure, including data centres, 5G networks, and supercomputing capabilities, to support AI adoption across various sectors, including education. However, despite these efforts, there is currently no national policy on AI-related data sharing or open public data, which could impact AI research and development.

As part of its broader digital transformation, Senegal's government has prioritised addressing rural-urban and gender disparities in AI accessibility. Under the *Senegal Digital 2025 strategy* [21], measures are being taken to improve internet connectivity, electrification, and mobile penetration, which will support AI-driven educational initiatives.

Institutional level:

At the institutional level, several universities and research centres in Senegal have developed AI-focused programmes and research initiatives:

- **African Institute of Mathematical Sciences Senegal (AIMS):** The African Master's in Machine Intelligence (AMMI) is a fully funded one-year graduate programme that provides advanced training in machine learning and AI applications. The programme aims to cultivate skilled AI researchers capable of addressing both regional and global challenges.

- **Dakar Institute of Technology:** Offers a Master's Degree in AI designed for students and professionals who seek expertise in AI techniques and applications.

- **Université Cheikh Anta Diop (UCAD):** UCAD, in collaboration with the International Development Research Centre (IDRC), leads AI research projects, such as using AI for COVID-19 epidemiological modeling. This initiative explores the adaptability and social acceptability of AI-driven health interventions within Senegal's socio-anthropological context.

- **African Centre for Technology Studies (ACTS):** The AI4D Africa Scholarship Programme, supported by international partners like Canada's IRDC and the Swedish International Development Cooperation Agency, aims to foster AI and machine learning expertise in African public universities [19].

Despite these efforts, challenges remain, such as limited research and development (R&D) funding and data accessibility issues. In 2015, Senegal's gross R&D investment was only 0.58% of GDP, indicating the need for more investment to sustain AI research and education [20].

Senegal is progressively integrating artificial intelligence into higher education through national policies and institutional initiatives. Programmes at institutions like AIMS and the Dakar Institute of Technology contribute to AI workforce development, while research efforts explore applications in fields

such as public health. The *National Strategy for AI Development* aligns with broader digital transformation plans, though regulatory frameworks are still evolving. Challenges such as gender disparities, rural-urban digital divides, and limited research funding persist, but ongoing efforts in infrastructure expansion, talent development, and cybersecurity enhancement reflect the country's commitment to advancing AI in higher education.

3.6 Côte d'Ivoire

Overview

Côte d'Ivoire is accelerating its digital transformation, actively shaping its role as an important participant in the field of artificial intelligence (AI) in Africa. The IMF's AI Preparedness Index scored Côte d'Ivoire 0.37, the third highest number in the region, falling behind Ghana and Senegal. According to ITU's UMC assessment, Cote D'Ivoire, 40% of individuals aged above 15 have access to the internet, and 87% of upper secondary schools are connected. Satisfactory progress has also been achieved in population's access to high-speed broadband and affordability of mobile broadband. With a growing emphasis on technology and innovation, the country is integrating AI into its national and higher education policies to bolster economic growth, enhance governance, and address local needs. The higher education sector is adapting to the dynamic demands of the global labor market by expanding digital skills training systems, including AI.

Core AI policies and project activities in the field of AI in higher education

National level:

At the national level, Côte d'Ivoire is focusing on developing a comprehensive AI and data governance strategy. In 2024, the government launched the process to establish the *National AI and Data Management Strategy* [24], which aligns with African Union guidelines. This strategy aims to integrate AI

ethically and inclusively, with a focus on local realities and the development of human resources. The government is encouraging the digitalisation of services and promoting AI through the Digital Acceleration Project (PADCI) [25], co-financed by the government and the World Bank, aimed at modernising public administration and fostering the digital ecosystem. To support this, the country has been enhancing its legal and regulatory framework, such as the Startup Development and Support Programme (PADS) [22], which encourages the growth of digital startups, providing tax breaks, financial support, and infrastructure improvements.

Institutional level:

At the institutional level, universities in Côte d'Ivoire have begun offering AI-related programmes, particularly in fields like computer science, engineering, and data security.

- Boigny University's Master's in Computer Science programme equips students with expertise in algorithms, data structures, programming languages, software engineering, and computer hardware, enabling them to apply problem-solving skills to real-world challenges.

- Nangui Abrogoua University offers a Master's in Computer Engineering, which includes courses on AI, distributed systems, and software development, giving students a comprehensive understanding of IT systems and AI applications.

- At the School of Engineering and Technology (ENSIT), students in the Master's programme engage in a specialised curriculum focusing on AI, automation, cybersecurity, and connected objects. ENSIT's engineering cycle, which includes AI, automation, and network security, offers practical training to equip students with the skills needed to contribute to the country's technological transformation [23].

However, despite these developments, there is currently no dedicated research institute for AI in the country, and the overall AI strategy remains under development. This suggests a need for stronger institutional collaboration and investment to foster a research culture in AI within higher education institutions.

Côte d'Ivoire is making significant strides in integrating AI into its higher education system, with a focus on both enhancing digital skills and fostering ethical AI applications. The national strategy, supported by initiatives like PADCI, aims to create a solid foundation for digital transformation. Universities are expanding their AI curricula, though challenges remain in establishing a robust research infrastructure. With ongoing efforts to improve the regulatory framework and support for innovation, the country is on track to enhance its role in the AI-driven digital economy.

3.7 Ghana

Overview

Ghana is progressively promoting the integration of AI into its higher education system, with universities offering AI-focused programmes to build local expertise and address the skills gap. The country boasts a growing tech ecosystem, including innovation hubs like the Accra Digital Centre AI Lab and initiatives such as the Artificial Intelligence Association of Ghana, which foster collaboration and AI development. The IMF's AI Preparedness Index revealed Ghana to be leading in AI readiness with a score of 0.43 in the West-Central Africa region. According to ITU's UMC assessment, Ghana has also made good progress in improving internet affordability and increasing internet penetration among the population aged 15 and above. However, challenges persist, such as limited internet coverage, with rural areas having only 41% 4G penetration compared to 88% in urban areas, and the lack of 5G infrastructure [26]. Secondary schools face poor connectivity, with only 47% of upper secondary schools having the internet. Additionally, the lack of access

to venture capital and traditional bank loans hinders the growth of AI projects and startups, limiting practical AI applications within the education sector.

Core AI policies and project activities in the field of AI in higher education

National level:

The National Artificial Intelligence Strategy (2023-2033), developed by Ghana's Ministry of Communications and Digitalisation, aims to build AI capacity across all sectors. The strategy outlines several key pillars, with Pillar 1: Expand AI Education & Training playing a crucial role in higher education. This pillar focuses on increasing the number of AI and machine learning graduates, promoting STEM education, and fostering practical technical skills in data science and engineering [26]. Key initiatives include:

- **Higher Education AI Incubators and Accelerators:** The Ghana Tech Lab (GTL) Free Incubator Programme enrolled 28 AI startup ideas, providing training, mentorship, and seed funding of GHS 15,000 per project [27]. Additionally, the Africa AI Accelerator Program supports AI entrepreneurship in Ghana [26].

- **STEM and ICT Programmes:** Ghana emphasises Science, Technology, Engineering, and Mathematics (STEM) education, with programmes such as the National Robotics Competition, engaging senior high school and primary students in AI-related activities. Girls-In-ICT & Youth in ICT are also initiatives to build digital skills among underrepresented groups, especially young women.

- **E-Government Infrastructure Platform Project and E-Transform Project:** Despite progress, Ghana faces challenges such as limited access to venture capital, gaps in digital infrastructure, and low awareness of AI's potential in industries. The E-Government Infrastructure Platform Project and E-Transform Project aim to strengthen connectivity and data governance,

supporting AI adoption in education and beyond [28]. With continued investment in AI education and infrastructure, Ghana seeks to become a leader in AI development in Africa.

Institutional level:

Various Universities in Ghana offer programmes in Computer Science at Undergraduate and Postgraduate Level. These include the following Universities: University of Ghana, University of Cape Coast, Kwame Nkrumah University of Science and Technology, Ashesi University. For example:

- **Academic City University College** offers a Bachelor of Science (BSc) in Artificial Intelligence (AI), designed to equip graduates with knowledge in emerging advances in computational and decision-making sciences. The programme focuses on enabling students to understand and apply technologies that allow computers and machines to function intelligently, particularly in the accurate prediction of events and outcomes. This curriculum aims to prepare students for the evolving AI landscape by providing them with the skills needed to contribute to the field's advancements [29].

Ghana is making strategic efforts to integrate AI into its higher education system, aiming to develop a skilled workforce and support the country's digital transformation. The *National Artificial Intelligence Strategy (2023-2033)* prioritises AI education and training, with universities such as Academic City University College offering AI-focused programmes. Various government-led initiatives, including the Girls-in-ICT and Youth in ICT programmes, seek to promote digital skills development, particularly among underrepresented groups. Additionally, innovation hubs and incubators like the Ghana Tech Lab support AI-driven entrepreneurship. However, challenges such as limited digital infrastructure in rural areas, a lack of large-scale local AI projects, and restricted access to financing continue to hinder AI education and research. Despite these obstacles, Ghana's commitment to AI capacity-building reflects its ambition to position itself as a leader in AI adoption within Africa.

3.8 Ethiopia

In June 2020, the Ethiopian government launched its national digital transformation strategy, *Digital Ethiopia 2025*, to leverage digital opportunities and propel Ethiopia towards a knowledge-based and innovative economy. ICT is one of the five key sectors identified in the Homegrown Economic Reform Agenda [30].

There is significant room for improvement in Ethiopia's digital connectivity and AI readiness. According to ITU's UMC assessment, only 16% of individuals aged above 15 are internet users, and only 22% of secondary schools have internet availability. Likewise, the AI readiness score for Ethiopia is also one of the lowest in the East Africa region at a score of 0.25 measured by the IMF's AI Preparedness Index.

In *Digital Ethiopia 2025*, regulators recognised the significance of AI and its integration into key sectors of the Ethiopian economy. The strategy set out to establish an Artificial Intelligence and Robotics Center of Excellence under Addis Ababa Science and Technology University, which was inaugurated in September 2020. The Ethiopian Biotechnology Institute (EBTI), the Technology and Innovation Institute (TechIN), the Ministry of Innovation and Technology (MInT), the Ministry of Science and Higher Education, and the newly established Artificial Intelligence Research and Development Center focus on research, talent development, skills and education, ethics and inclusion, as well as standards and regulations. The recently approved Artificial Intelligence Research and Development Center will support future technologies, developing AI services, products, and solutions based on localised research and development adapted to the Ethiopian context. Addis Ababa University (AAU) has also introduced a postgraduate programme in AI [31].

As part of this strategy, the Ethiopian government has introduced initiatives to address digital literacy gaps and aims to help 70% of Ethiopians become digitally literate by 2025. The primary and secondary education system is set

to be reformed with a focus on basic literacy and digital skills, through initiatives such as promoting technology-supported learning and integrating digital literacy into curricula. Universities are also encouraged to expand digital skills programmes and training.

Following the national digital transformation strategy, the Ethiopian Council of Ministers endorsed the country's first *National Artificial Intelligence Strategy* during its 37th regular meeting in June 2024. The Strategy aims to provide strategic direction for increasing AI adoption in social and economic development while fostering a competitive domestic AI industry that aligns with national security priorities [32].

In the education sector, the government has recognised the need to enhance AI literacy in early education, as current efforts have primarily focused on universities. Private and international NGO-led initiatives in early childhood education face significant resource constraints and have proven ineffective. The difficulty in meeting early childhood education and basic literacy targets, particularly in rural areas, underscores the need to promote STEM education. This serves the dual purpose of preparing the population for homegrown innovation while addressing misconceptions that STEM disciplines are inaccessible, male-dominated, or lack exciting career opportunities [33].

Proposed Policy Solutions for Education

At Levels Below Tertiary Education:

- Acknowledge the need to address basic education as a means of providing more universal benefits to the population.

- Complement paper-based learning activities with appropriate digital tools to track students' basic reading, writing, and numerical skills, providing targeted interventions at the individual level when needed.

- Incentivise families to set early learning milestones for their children.

- Develop a common core curriculum across basic learning subjects with interactive functionalities, such as shared computing resources, trackable study progress, on-demand additional resources, and tailored feedback.

- Create vocationally relevant resources to establish STEM extension modules, preparing students for a shifting economy.

- Reduce skills gaps and job market asymmetry by developing a centralised job-matching system, allowing job seekers to maintain profiles linked to their accounts and requiring employers with more than 10 employees to post vacancies in the system. AI could be leveraged to provide tailored advice to job seekers and recruiters.

At University Level:

- Ensure all universities offering a computer science curriculum also provide a Data Science and Artificial Intelligence programme, offering both foundational and advanced training in data science and machine learning.

- Require all computer science undergraduate and graduate students to complete capstone hands-on projects.

- Mandate that every Ethiopian university offering a Machine Learning, Artificial Intelligence, Data Science, or similar degree programme participate in establishing jointly funded, faculty-led applied research laboratories, focusing on strategic AI development in Ethiopia.

- Establish an *Education Technologies AI Laboratory* within universities to explore AI applications with the potential to enhance education quality at all levels.

- Collect granular education data to enable data-driven decision-making at the university level.

- Introduce special incentives—such as tax credits, cash grants, and other

funding mechanisms—for businesses that offer accessible programming and data science programmes, particularly for those in rural and underprivileged areas.

Complementary Social Infrastructure and Equality Goals

To enhance education conditions, the Strategy also identifies key social infrastructure and equality priorities:

- Encouraging female participation in education and the workforce, while prioritising equity in employment opportunities, pay, and basic rights protections.

- Digitalising government operations and implementing a tracking system for recipients of cash or other transfers, ensuring budget allocations serve their intended purpose and improving the evaluation of investments in education and other strategic objectives.

3.9 Kenya

Kenya's national AI landscape is defined by a dynamic and rapidly evolving digital ecosystem, paving the way for AI integration across various sectors. According to the AI Preparedness Index published by the IMF in April 2024, Kenya ranks third in Africa (0.45), trailing only South Africa and Tunisia. However, significant challenges remain in unlocking AI's full potential. For instance, data from the ITU shows that in 2023, only 35% of individuals aged 15 and above in Kenya had access to the internet—a figure that highlights the need for further digital inclusion efforts.

The existing legal and regulatory framework, highlighted by the *Data Protection Act of 2019*, provides a solid foundation for ethical data use—a cornerstone of human-centred AI development. Additionally, key policy documents such as the *National ICT Policy 2019*, *Digital Master Plan 2022-2032*, and the *Digital Economy Blueprint 2019* support AI readiness by

outlining potential AI use cases, risks, key stakeholders, and necessary enablers such as digital skills and infrastructure [34].

In March 2025, the *Ministry of ICT and Digital Economy* unveiled the draft *National AI Strategy 2025-2030*, which aims to harness the transformative power of AI for socio-economic development [35].

AI in Higher Education Policy

Kenya has developed several strategies and regulations to accelerate the digitalisation of education at all levels. These include the *National Education Sector Strategic Plan (NESSP) 2018-2022*, *Basic Education Act of 2013*, *Sessional Paper No. 1 of 2019*, *Technical and Vocational Education and Training (TVET) framework*, and the *Universities Act of 2012 [34]*.

More specifically, the *Kenya Digital Master Plan 2022-2032* outlines Kenya's AI roadmap, emphasising the development of curricula and the integration of emerging technologies into academic institutions and ICT centres of excellence [36].

The key policies targeting AI integration into higher education include:

- **Investment in AI-ready infrastructure:** Expansion of digital infrastructure, high-performance computing clusters, and other components of a comprehensive AI ecosystem.

- **Digital skills curriculum development:** Designing and adapting curricula to train professionals, the workforce, and the general population to improve productivity and enhance digital inclusion.

- **Graduate internship expansion:** Expansion of the ICT Graduate Internship programme and the inclusion of a Diploma Internship with sponsored international exchange opportunities.

- **Public-private collaboration:** Creating an enabling environment for

partnerships between private sector actors, NGOs, and public organisations (e.g. Aix Africa, Moringa School, Kidd-O Skillkit, and Jenga School) to enhance professional skills through management and technical training.

- **AI research centres of excellence:** Establishing research centres and innovation clusters across different regions to foster AI development and application.

- **Emerging technology education:** Developing curricula and delivering courses on AI and data science within academic institutions. For instance, universities such as the *University of Nairobi* and *Jomo Kenyatta University of Agriculture and Technology (JKUAT)* already offer AI and Data Science courses with a strong technical focus.

Challenges in AI Integration into Higher Education

Despite progress in integrating AI and ICT into Kenya's higher education system, several challenges persist:

- **Digital divide:** Disparities in access to digital technologies continue to hinder equitable AI adoption. The cost of acquiring AI skills—whether through advanced degrees (e.g. PhDs) or access to computing power and data resources—remains high.

- **AI infrastructure constraints:** Kenya still faces significant limitations in AI infrastructure development.

- **Funding shortages:** Startups and universities struggle with limited access to venture capital and development financing to scale AI projects.

- **Skills gap:** A mismatch between demand for ICT skills and supply underscores the urgent need for more robust training and reskilling programmes—something that higher education institutions currently lack the capacity to fully address.

- **AI governance challenges:** Kenya's low ranking in the *Global Index on Responsible AI* indicates room for improvement, particularly regarding the establishment and maintenance of a comprehensive governance framework to protect human rights and promote socio-economic equality within the AI ecosystem.

3.10 Uganda

Overview

Uganda is a developing country with a growing higher education sector that plays a crucial role in fostering technological and economic advancements. The country has been integrating Science, Technology, Engineering, and Innovation (STEI) into its national development strategies to drive economic transformation. Despite the increasing adoption of artificial intelligence in various sectors, Uganda lacks a dedicated legal and institutional framework governing AI development and deployment [37]. This challenge is further reflected in Uganda's AI Preparedness Index, which stood at 0.35 according to the IMF's data in April 2024. Additionally, data from the ITU shows that in 2023, only 15.3% of individuals aged 15 and above in Uganda had access to the internet—a significantly lower figure compared to many other African nations—highlighting the need for improved digital infrastructure and accessibility.

Core AI Policies and Project Activities in the Field of AI in Higher Education

National Level:

At the national level, Uganda has incorporated AI-related discussions into broader policy frameworks rather than enacting AI-specific regulations. Key national policies that touch upon AI include *Uganda Vision 2040*, which highlights STEI as a driver of economic growth, though it does not explicitly mention AI [38]. The *National Strategy on the Fourth Industrial Revolution*

(NS4IR) recognises data as a critical asset and recommends accelerating the implementation of Uganda's data exchange framework [39]. Additionally, the third *National Development Plan* (NDP III) 2020/21-2024/25 identifies digital transformation and AI as essential for Uganda's progress and underscores the need for AI and machine learning specialists [40].

As part of its broader digital transformation efforts, Uganda is also in the process of developing a National Data Strategy to strengthen its data ecosystem and maximise the economic value of data [39]. The aim of developing the national strategy is to address key challenges such as limited data sharing, fragmented datasets, low data utilisation culture, and the lack of common standards and trust in the data ecosystem.

Institutional Level:

At the institutional level, Ugandan universities are actively incorporating AI into education and research. ISBAT University offers the country's first Bachelor of Science in Artificial Intelligence & Machine Learning (BSc. AI & ML)[41], while Cavendish University Uganda (CUU) provides a Bachelor of Science in Data Science and Artificial Intelligence (BSDAI), equipping students with interdisciplinary skills in AI, data science, and applied machine learning [42]. These programmes reflect a growing emphasis on AI education to meet the country's technological and economic development goals.

Makerere University leads in AI research, with projects such as AirQo, which deploys low-cost air monitoring systems, and AI-driven tools for agricultural disease tracking and medical diagnostics. In collaboration with the Ugandan government, it has also inaugurated the AI Health Lab to enhance healthcare delivery using AI-powered diagnostics for malaria, tuberculosis, and cervical cancer [43]. Additionally, Mbarara Referral Teaching Hospital utilises AI-enabled monitoring devices to improve maternal healthcare outcomes [44]. These initiatives highlight Uganda's expanding AI ecosystem in higher education, healthcare, and public service.

Uganda has made notable progress in integrating AI into higher education, particularly at the institutional level, where universities have developed AI-focused academic programmes and research initiatives. However, at the national level, AI policies remain embedded within broader technological development frameworks, lacking AI-specific regulatory structures. The absence of a dedicated AI governance framework presents challenges in coordinating AI development across sectors, including higher education. Nonetheless, Uganda's strategic focus on digital transformation and its ongoing investments in AI research and education demonstrate a growing commitment to leveraging AI for national development.

3.11 Congo-Brazzaville (The Republic of the Congo)

The Republic of the Congo has a relatively low level of digital transformation maturity. The country's AI Preparedness Index, as reported by the IMF in April 2024, stands at just 0.28—a relatively low level compared to other African nations. On the other hand, data from the ITU shows that in 2023, 38.4% of individuals aged 15 and above used the internet. While this figure still falls short of optimal digital inclusion, it is relatively high compared to similar countries, reflecting some progress in expanding digital access. Despite the absence of specific AI regulations in the Republic of the Congo (Congo-Brazzaville), the government has made notable strides in accelerating the digitalisation of its education system. The country is exploring AI's potential to transform education in collaboration with international organisations.

Policy Framework and Digitalisation Efforts

A key policy document shaping the future of education in the Republic of the Congo is the *Pacte de Partenariat pour le Secteur de l'Éducation et de la Formation 2024-2029*, which aligns with the *National Development Plan (2022-2026)* and the *Education Sector Strategy (2021-2030)* [45]. This initiative, backed by funding from the *Global Partnership for Education (GPE)* and other international donors, is implemented in partnership with UNESCO.

Its ultimate goal is to achieve universal access to quality basic education while contributing to the country's broader socio-economic development.

Integration of ICT into Higher Education

ICT is recognised as a key enabler of modern education in the Republic of the Congo. The *Pacte de Partenariat* outlines several objectives for ICT integration in higher education:

- **Expanding digital learning platforms and e-learning tools** to enhance accessibility in higher education institutions.
- **Encouraging the use of digital resources** for both students and faculty to improve learning outcomes.
- **Training university faculty in ICT-based teaching methods** to strengthen the quality of higher education.
- **Supporting digital tools in curriculum development and instruction** to modernise pedagogy.
- **Developing an integrated education management system (SIGE)** to track student data, faculty information, and institutional performance.
- **Increasing the availability of digital infrastructure** such as computers and online libraries in public universities.

AI Research and Higher Education Initiatives

One of the most significant advancements in AI is the establishment of the *first AI research centre in the African region* in Congo-Brazzaville. This centre is a partnership between the *United Nations Economic Commission for Africa (UNECA)* and the *Government of the Republic of the Congo*. Located at *Denis Sassou Nguesso University in Kintélé*, north of Brazzaville, the centre aims to:

- Provide essential technology and training in AI and robotics for researchers, youth, and interested citizens.

- Contribute to the development of AI-related innovations and emerging technologies in the region.

- Offer a **Master of Science in AI and Data Science** in collaboration with *Denis Sassou Nguesso University*, fostering AI expertise in higher education [46].

Challenges in ICT Integration into Higher Education

Despite these achievements, several challenges hinder the further integration of ICT into higher education:

- **Reliance on external funding:** Projects such as SIGE depend on donors like UNESCO and the World Bank, highlighting the lack of dedicated national budget allocations for maintaining digital infrastructure and statistical data systems.

- **Limited technical capacity:** Education officials at central and regional levels lack sufficient training to manage and implement digital systems effectively.

- **Weak coordination among government bodies:** There is a lack of synergy between ministries and statistical agencies (e.g., *INS* and education sector planning units), creating inefficiencies in data management.

- **Incomplete decentralisation of SIGE:** The education data management system is not fully decentralised, limiting its effectiveness for local-level educational planning.

- **Infrastructure gaps:** Many schools, particularly in rural areas, lack **proper ICT infrastructure, internet access, and digital devices**, limiting digital and ICT adoption in education.

3.12 Congo-Kinshasa (The Democratic Republic of the Congo)

The Democratic Republic of the Congo (DRC) currently has a low level of digital transformation, let alone specific AI regulations or efforts to leverage AI in higher education. Data from the ITU shows that in 2023, only 30.5% of individuals aged 15 and above in the DRC used the internet, indicating an even lower level of digitalisation compared to its neighbour, the Republic of the Congo (Congo-Brazzaville). This is further reflected in the country's AI Preparedness Index, which stood at just 0.25 according to the IMF's data in April 2024. This is largely due to the country's deep-rooted social inequalities, which are further exacerbated by ongoing socio-economic and political crises such as war, gender-based violence, food insecurity, and poverty [47].

Given the severe challenges facing the education system, the country's initiatives in emerging technologies primarily focus on **digitalisation** rather than direct AI integration. The key policy frameworks guiding digital transformation in higher education are:

- ***Stratégie sectorielle de l'éducation et de la formation 2016-2025***, adopted in 2015 by four ministries overseeing education.

- ***Plan National du Numérique - Horizon 2025***, introduced in 2019 by *Agence pour le Développement du Numérique (ADN)*, the DRC's dedicated digitalisation agency.

Stratégie sectorielle de l'éducation et de la formation 2016-2025

This strategy underscores digitalisation as a key mechanism for enhancing teaching, learning, research, and governance in higher education. Its core objectives include:

- **Integrating ICT into education through virtual libraries, online**

learning platforms, and academic management systems.

- **Encouraging open and distance learning (FOAD)** to expand education access, especially for girls and disadvantaged communities.

- **Investing in digital infrastructure** by developing a **National Virtual Library**, university IT centres, and interconnecting higher education institutions (*Établissements d'Enseignement Supérieur, EES*).

- **Expanding internet access for education institutions** at all levels, with a target of full internet connectivity by 2025 [48].

Plan National du Numérique - Horizon 2025

This national digitalisation plan highlights **AI and digital technology** as critical enablers of good governance, economic growth, and social progress. Key initiatives for higher education include:

- **Establishing National Research and Education Networks (NREN)** to interconnect universities, research institutions, and national archives.

- **Creating university-based research centres** focused on digital transformation and emerging technologies.

- **Offering professional qualifications and certifications** tailored to the needs of the digital economy.

- **Launching dedicated digital learning programmes** for students, professionals, and the general public.

- **Supporting digital startups and innovation hubs** to foster collaboration between universities, the private sector, and government institutions for developing digital education solutions [49].

Challenges in AI and ICT Integration into Higher Education

Despite these initiatives, several **critical challenges** hinder AI adoption and digital transformation in higher education:

- **Severe digital infrastructure deficits:** Many higher education institutions **lack reliable internet access, IT centres, and digital libraries**, particularly in rural areas.

- **Limited AI awareness and expertise: There is a shortage of AI professionals and educators trained in digital and emerging technologies.**

- **Fragmented policy implementation:** The lack of a **unified AI or digital education strategy** leads to inconsistent implementation across different ministries and institutions.

- **Dependence on international donors:** Many digitalisation projects, including infrastructure development, rely heavily on **external funding** rather than sustained national investment.

- **Economic and social instability:** Ongoing **conflict, poverty, and gender disparities** create additional barriers to digital learning and education access.

3.13 South Africa

South Africa, as a middle-income country, has a well-established higher education system comprising both public and private institutions. In alignment with its Vision 2030 [50] and broader Fourth Industrial Revolution (4IR) strategy, the country has actively integrated artificial intelligence (AI) into its higher education sector. Various national policies and institutional initiatives support AI research, education, and skill development, ensuring that the country remains competitive in the global digital economy.

The South African government has identified AI as a crucial driver of innovation and economic growth, a position reinforced by its leading status in AI preparedness across the African continent. According to the IMF's AI Preparedness Index published in April 2024, South Africa ranks first in Africa with a score of 0.5. Additionally, according to ITU data, 75.7% of individuals aged 15 and above in South Africa had internet access in 2023, placing the country at an advanced level of digital connectivity. The National AI Policy Framework further underscores AI's strategic importance, highlighting key pillars such as Talent and Capacity Development, Digital Infrastructure, Research and Innovation, and Ethical AI and Data Governance [51].

Core AI Policies and Project Activities in the Field of AI in Higher Education

National Level:

The South African government has introduced multiple policies to foster AI integration into higher education. The Department of Science and Innovation (DSI) plays a key role in AI-related research and education through its decadal plan [52], which prioritises AI, robotics, and cybernetics. The National Research Foundation (NRF) supports AI research through the South African Research Chairs Initiative, with specific chairs dedicated to AI [53]. Additionally, the DSI collaborates with the Department of Basic Education to introduce 4IR-related skills, such as coding and robotics, into school curricula to create a pipeline for AI talent development.

Public-private partnerships also contribute significantly to AI education. The government collaborates with international and local industry players, such as IBM South Africa, to develop AI research labs and capacity-building initiatives. Furthermore, funding mechanisms such as the R&D tax incentive and grants from the Department of Trade, Industry and Competition help bolster AI research and innovation [54].

In alignment with the *Presidential Commission on the Fourth Industrial Revolution (PC4IR) Recommendations*, South Africa has been expanding its network of AI hubs. Since 2022, hubs have been launched at the University of Johannesburg (UJ), Tshwane University of Technology (TUT), and the Central University of Technology [55]. Each hub is linked to economic sectors, driving AI adoption in fields such as manufacturing, finance, healthcare, agriculture, and telecommunications. TUT, for instance, focuses on AI applications in farming, food production, and generative AI for education.

Institutional Level:

Several higher education institutions in South Africa have established AI-focused research centres and academic programmes. The Centre for Artificial Intelligence Research (CAIR), a collaborative network across eight universities, conducts research in cybersecurity, machine learning, and AI ethics. The Artificial Intelligence Institute of South Africa, founded in 2022, operates across four universities in Tshwane, Johannesburg, Free State, and Western Cape, promoting interdisciplinary AI research and applications.

Universities have also expanded their AI-related curricula significantly. The number of tertiary AI courses increased from two in 2017 to 54 in 2023 [56]. The University of Cape Town offers an MSc/MPhil in Artificial Intelligence, a two-year full-time programme designed to provide in-depth AI expertise. Similarly, Stellenbosch University provides an MSc in Machine Learning & AI, equipping students with both fundamental and advanced AI techniques. The University of the Witwatersrand offers multiple AI-focused programmes, including an MSc in AI and an MSc in Robotics, which emphasise areas such as machine learning, computer vision, and intelligent systems [57].

South Africa has demonstrated a strong commitment to integrating AI into higher education through well-structured national policies and institutional initiatives. Government agencies, universities, and private sector stakeholders collaborate to enhance AI research, education, and workforce readiness. While the country faces challenges such as digital infrastructure gaps and a

shortage of skilled AI professionals, ongoing investments in AI-related education and research indicate a strategic approach to fostering innovation and competitiveness in the 4IR era.

3.14 Zambia

Zambia's higher education system is mainly centred around public universities, offering diverse degree programmes and fostering international collaborations. In recent years, the government has been progressively integrating digital transformation and Artificial Intelligence into different sectors to enhance innovation, economic growth, and workforce preparedness. However, the country's overall digital readiness remains relatively low. According to the IMF's AI Preparedness Index published in April 2024, Zambia scored 0.37, indicating a modest level of AI preparedness. Additionally, ITU data shows that in 2023, only 33% of individuals aged 15 and above had internet access, reflecting the country's limited digital infrastructure. Despite these challenges, AI adoption at the university level is gradually increasing, driven by institutional initiatives and national policies aimed at fostering technological advancement.

AI Integration and Higher Education Policies in Zambia

Zambia has made significant strides in digitalisation and Artificial Intelligence integration through the implementation of landmark policies. Back in 2009, The Zambia Information and Communications Technology Authority (ZICTA) was established under the ***Information and Communication Technologies Act No.15 of 2009*** to regulate the Information and Communication Technology (ICT) sector, laying the foundation for digital governance [58]. The ***SMART Zambia Electronic Government Master Plan 2018–2030,*** launched in 2019, aimed to digitise government operations to enhance public service delivery [59]. In 2020, the ***Data Protection Act 3*** was enacted to ensure data privacy and security, a critical aspect of AI implementation [60]. More recently, the ***National ICT Policy 2023*** and its ***Implementation Plan*** were introduced

to coordinate and strategise digital transformation efforts across various sectors [61][62]. Additionally, the ***National Digital Transformation Strategy 2023–2027*** was developed to provide a comprehensive roadmap for integrating digital technologies, including AI, into the national development agenda [63].

Focusing on AI integration into higher education and capacity building, Zambia introduced the ***National Technical Education, Vocational and Entrepreneurship Training (TEVET) Policy*** in 2022. This policy aims to enhance access, quality, and relevance of technical education by promoting innovation, research, and the adoption of Information and Communication Technologies (ICTs) [64]. Key objectives include increasing participation in technical education, improving the productivity of the labour force in both formal and informal sectors, and promoting entrepreneurship to boost economic participation. In 2024, the ***Artificial Intelligence Strategy*** was launched, providing a detailed roadmap for AI adoption across various sectors, including education [65]. This strategy focuses on enhancing public service delivery, fostering innovation, and equipping students with AI-driven skills to prepare them for the evolving job market. These policies collectively aim to strengthen Zambia's AI capabilities and integrate AI into the higher education system, aligning with global technological advancements.

Institutional-Level AI Adoption

Several Zambian universities have begun implementing AI and digital transformation initiatives. Texila American University Zambia (TAUZ) has launched a Bachelor of Science in Artificial Intelligence, providing students with expertise in machine learning, neural networks, and data analytics. The university also collaborates with the Information and Communications Technology Association of Zambia (ICTAZ), enabling students to engage with industry professionals and AI experts [66].

In addition, TAUZ has introduced cutting-edge IT degree programmes, with support from key stakeholders such as ZICTA, Airtel Zambia, and Zamtel

Limited. These programmes focus on digital skills, AI applications, and industry-relevant training, reflecting Zambia's broader push for AI integration into higher education [67].

At the University of Zambia (UNZA), digital transformation efforts include the establishment of the Institutional Repository (UNZA-IR) to digitise research and academic materials. This initiative enhances AI-driven knowledge management and accessibility, aligning with global trends in higher education digitalisation [68].

Zambia has achieved notable progress in digital transformation by introducing key policies since 2009, building a solid foundation for AI integration in various sectors including education. Then, the Artificial Intelligence Strategy in 2024 which was a milestone that foster the rapid adoption of AI into higher education through expanded digital access, research funding, and public-private partnerships. Moving forward, stronger industry collaboration and government investment will be crucial in positioning Zambia as a leader in AI-driven education in Africa.

3.15 Zimbabwe

Zimbabwe's overall digital readiness is relatively low. ITU data shows that in 2023, only 38.4% of individuals aged 15 and above used the internet, indicating broader digital accessibility challenges. Moreover, according to the IMF's AI Preparedness Index published in April 2024, the country scored 0.3, reflecting limited AI preparedness. However, there is a promising foundation for future AI adoption—70.7% of upper-secondary schools are connected to the internet. This suggests that a significant portion of students have already been exposed to digital tools before entering higher education, potentially facilitating AI integration efforts in the long run.

In terms of the higher education sector, Zimbabwe has a growing number of institutions committed to fostering technological innovation and digital transformation. Universities such as the University of Zimbabwe and the

National University of Science and Technology play a crucial role in advancing education and research, including efforts to integrate artificial intelligence into their curricula. However, the adoption of AI in higher education remains in its early stages, hindered by infrastructural limitations, educator preparedness, and policy gaps.

AI Integration and Higher Education Policies in Zimbabwe

Zimbabwe has progressively developed policies to support both higher education and AI. The ***Administrative Justice Act of 2004*** focused on access to information and accountability, setting the stage for transparency in governance[69]. The ***Electronic Transactions and eCommerce Bill of 2013*** addressed digital privacy and security concerns, crucial for any AI-based education system[70]. More recently, Zimbabwe has intensified its AI-related policies. The ***Windhoek Statement on Artificial Intelligence in Southern Africa (2022)*** demonstrated the country's commitment to regional cooperation in AI governance[71]. In 2023, the ***Deep Learning IndabaX Zimbabwe*** was held to promote AI research and innovation[72]. By 2024, the government launched the ***National Artificial Intelligence (AI) Policy***, focusing on AI coordination and strategy, alongside the ***AI Readiness Assessment Methodology (RAM) Implementation*** to evaluate the impact of AI initiatives in education and other sectors[73][74]. These efforts highlight Zimbabwe's intention to create an enabling environment for AI integration in higher education.

Despite these policy advancements, Zimbabwe's AI education landscape faces significant challenges, as highlighted in the study *Integrating Artificial Intelligence in Zimbabwe's Education Curriculum: A Call for Global Collaboration*. The study points to limited curriculum integration, where AI-related concepts are scarcely embedded in national education policies across primary, secondary, and tertiary levels[75]. Educator unpreparedness further complicates AI adoption, as many lecturers and teachers lack the training to effectively teach AI-related topics[75]. Additionally, infrastructure gaps—such as inadequate computer labs, unreliable internet, and frequent power

outages—restrict students' access to AI learning tools, particularly in rural areas[75]. The study also emphasises broader concerns such as resource constraints, ethical risks, and access equity, which create disparities in AI education across different demographic groups[75]. Addressing these issues requires comprehensive policy interventions and international collaboration to build a sustainable AI education framework.

Institutional-Level AI Adoption

At the institutional level, Zimbabwean universities have begun implementing AI-related policies, although progress remains uneven. Some universities have introduced AI courses and innovation events, often in collaboration with international partners. For example, the University of Zimbabwe hosted a week-long Artificial Intelligence and Innovation event. A highlight was the visit of Sophia, a renowned AI robot created by Hanson Robotics. Her visit aimed to inspire Zimbabwean youth to pursue careers in AI and STEM fields[76]. The Harare Institute of Technology established a new Centre for Artificial Intelligence in order to harness technological potential in Zimbabwe. The goal of the Centre is to bridge educational gaps and prepare students to excel in a quickly evolving job market[77].

Challenges and Future Prospects

These institutional efforts are bolstered by national-level AI initiatives, but universities still face financial and technological constraints. A key challenge is ensuring that policies translate into practical applications, such as hands-on AI training and industry partnerships, to prepare graduates for the AI-driven job market. Without a coordinated strategy between government policies and institutional implementation, the integration of AI in Zimbabwe's higher education will remain fragmented.

By aligning national AI strategies with university-level initiatives, Zimbabwe can foster a more cohesive AI education ecosystem. Strengthening infrastructure, providing educator training, and ensuring equitable access will

be crucial in advancing AI literacy and innovation across the country's higher education institutions.

4. Analysis and discussion

This Report provides ample evidence of not only the various challenges the digital transformation on the African continent as a whole face, such as concerns about literacy and skills levels, gender inequality, and lack of infrastructure (sustainable access to fresh water and electricity), and more specifically a lack of digital infrastructure, but also of the various initiatives to support digital transformation ranging from, inter alia, the African Union, UNESCO-ICHEI, national governments, inter-institutional alliances (such as the Inter-University Council for East Africa, IUCEA and the International Institute for Capacity Building in Africa, IICBA) to public/private networks and higher education institutions. What is also very clear is that the optimisation of the ethical and responsible use of AI is entangled in the broader digital transformation of institutions, countries, and the continent as a whole.

It is furthermore abundantly clear that the digital transformation of Africa is seen and operationalised as "a driving force for innovative, inclusive and sustainable growth" but also considering the risks that digital transformation may hold for individuals, communities, institutions and the continent (*Digital Transformation Strategy for Africa 2020-2030* (African Union, 2020, p. 3).

Despite the different challenges faced by the digital transformation of the African continent, the brief overviews of the state of AI integration into 15 African countries provide rich snapshots of not only in the progress of operationalising the affordances of AI, but also a consideration of the ethical and legal implications in each of these 15 contexts.

While it is almost impossible to summarise the different national imperatives and initiatives, the following tentative themes emerge from the 15 snapshots. In the presentation of these themes, some examples of countries are provided as illustrations, but this does not mean that the theme is limited to the examples only.

1. Some African countries lack national AI strategies for example, Morocco. This does not, however, imply that there is nothing happening with regard to realising the potential of AI and integrating it into higher education.

2. Many of the 15 countries covered in these 'snapshots' have established specific structures to lead and track the digital transformation and progress in AI - e.g. the National Council for AI (NCAI) and International Telecommunication Union (ITU) in Egypt; the Digital Development Agency (ADD) in Morocco; the National Scientific Council for Artificial Intelligence and National School of Artificial Intelligence (Algeria); the *National Digital Literacy Framework* and the *Nigerian AI Partnership for Commercialisation Excellence (NAPCE)* (Nigeria); the Accra Digital Centre AI Lab and initiatives such as the Artificial Intelligence Association of Ghana (Ghana); the Artificial Intelligence and Robotics Centre of Excellence (Ethiopia); and the Centre for Artificial Intelligence Research (CAIR)(South Africa).

3. There is also evidence of collaboration with tech companies and industry to jointly develop AI technologies and promote intelligent applications (e.g. Morocco and Algeria).

4. While addressing the rural-urban and gender disparities in AI accessibility is specifically mentioned in the case of Senegal, disparities in access and skills levels between rural and urban areas are germane to many African countries.

5. The 15 snapshots provide ample evidence of the digital transformation and AI integration in higher education contexts, the Ethiopian snapshot provides a case that digital transformation and AI readiness starts at primary and secondary school levels.

6. The integration of AI in curricula and increasing AI readiness and skills levels are linked to the expansion of digital education, expanding digital learning platforms, tools and e-resources (e.g. The Republic of the Congo).

7. It is clear that there are several initiatives to adapt curricula, offer specialised programmes and provide student support and development to the potential of AI in and for education and future places of work (e.g. Egypt, Morocco, Côte d'Ivoire; Ethiopia, Kenya; Uganda; Zambia).

8. Many of the snapshots provide evidence of various and varying levels of readiness - on national, institutional and individual (staff and students).

9. Digital transformation and the integration of AI depends on the provision of support and development for teaching staff with a specific focus on students and staff from non-technical backgrounds (e.g. Egypt)

10. Many of the countries presented in above provide evidence of establishing alliances with public/private sectors and NGOs to attract investments to increase capacity and skills levels at institutions (e.g. Egypt; Ethiopia; Kenya, South Africa)

11. There is also ample evidence of inter-institutional (continental and international) collaboration and expertise exchange (e.g., Egypt, Senegal). For example, in Senegal there is the AI4D Africa Scholarship Programme supported by international partners like Canada's IRDC and the Swedish International Development Cooperation Agency.

12. Interestingly, in the case of Egypt there is specific mention of the provision of support and training for working professionals.

13. Many countries in the snapshots presented above established AI R&D labs and research centres (e.g. Egypt, Algeria; Ghana; Kenya, the Democratic Republic of the Congo (DRC).

14. The snapshot from Egypt provides an example of the need for compliance with international standards (Egypt).

15. The snapshot of the digital transformation and AI integration in the context of Côte d'Ivoire shows a commitment to ensure that digital transformation and AI integration is done ethically and inclusively.

The 15 country snapshots also provide an interesting view of shared experiences in addressing the challenges faced in the digital transformation and integration of AI into education. Some of the shared challenges include, but are not limited to:

1. The impact of poor digital connectivity (e.g., Nigeria, Ghana, Kenya, Uganda, Zimbabwe), economic instability, and lack of resources (e.g., Nigeria; Democratic Republic of the Congo, DRC).

2. While the snapshots provide examples of a rich array of strategies, frameworks, and policies, there is also evidence of the role and impact of fragmented policy implementation (e.g., Democratic Republic of the Congo, DRC) and weak coordination among government bodies (e.g., The Republic of the Congo)

3. The snapshot from Ethiopia suggests low AI readiness (Ethiopia). At the same time, many of the 15 countries share Nigeria's experience, reporting on the urgent need for capacity and expertise and a lack of regulatory consensus or, in the case of Kenya, challenges related to AI governance.

4. Many of these countries also share the concerns from Ghana regarding the lack of infrastructure and funding and a reliance on external funding (e.g. the Republic of the Congo)

5. Though only the snapshot from Egypt specifically reported on insufficient awareness of intellectual property and its protection, this is most probably shared by most if not all the countries on the African continent.

As acknowledged, the above themes and challenges provide glimpses of the shared realities of the 15 selected countries. As such, these themes and challenges provide an invitation for a conversation about digital transformation

and the integration of AI in education on the African continent - nothing more than an invitation, but also nothing less.

5. Recommendations

Formulating a number of recommendations based on the evidence and brief analysis presented in this report may seem too early. Despite these concerns, the following recommendations aim to inform further research into the digital transformation, including integrating AI into higher education on the African continent.

While all 54 countries on the African continent are faced with the affordances and challenges of digital transformation and the integration of AI into higher education, the 15 country snapshots illustrate the varying and various ways in which digital transformation and the integration of AI unfold in each of the 15 contexts. From this, it is clear that the contextual richness and variety on the African continent make it impossible to prescribe recommendations that will suit the contextual specificities of every African country. The following five recommendations are, therefore, broad and tentative recommendations:

1. The digital transformation and integration of AI into higher education should be understood and approached in terms of the intergenerational legacies of colonialism and the freedom struggles that many African countries fought against colonial powers. The years of unjust colonialism and the years following independence left deep intergenerational scars on the African continent. Most, if not all, of the countries in this report see digital transformation and the integration of AI into higher education and into society as ways to address the vast intergenerational inequalities and injustices in the lack of service of societal transformation, inclusivity, and social justice.

Recommendation 1: The digital transformation and the integration of AI into higher education in each of the African countries need, therefore, to be approached with sensitivity to these histories and continued inequalities. There is no one-size-fits-all solution.

2. The digital transformation and the integration of AI into higher education require a combined effort of governments, international and

national collaboration and alliances, intra- and inter-institutional networks and sharing of expertise and resources, as well as cooperation with a range of public and private as well as industry partners. Governments and departments of education should provide enabling frameworks and support for institutions to form these networks and partnerships with appropriate safeguards and protection to prevent a digital recolonisation of Africa. The safeguards and informed decision-making aim to serve institutions in the way truly needed and limit the risk of giving up rights once again, being disenfranchised, and having their human and natural resources looted in exchange for financing digital infrastructure and skills development.

Recommendation 2: African governments and institutions should do their utmost to not only protect African interests, data, as well as natural and human resources when negotating with national and international partners, whether public or priave, but also to ensure that the terms and conditions under which these partnerships and collaborations are established to put Africa and her institutions and peoples' interests first.

3. Human history provides ample evidence that advances in technology are no panacea for all of society's ills and travails. History also provides ample evidence of how technology can serve justice, inclusivity and peace or be in service of war, the abuse of human rights, and the disregard for human and planetary wellbeing.

Recommendation 3: In embracing digital transformation and the integration of AI into higher education, African governments and institutions should heed the history of the evolution of technology, and international good practices, and put legislation and oversight mechanisms in place to ensure that the digital transformation and the integration of AI into higher education serve humanity on the African continent and be used to protect the interests and livelihoods of all, and not only a few.

4. The digital transformation and the integration of AI into higher education also create enormous opportunities for countries to collaborate and

share resources. Many challenges and opportunities are shared, and countries on the African continent, under the leadership of, inter alia, the African Union and the various regional bodies, should create regulatory and legislative frameworks that allow and support collaboration and the exchange of expertise and skills. The 15 country snapshots provide evidence of knowledge and, to some extent, resources, that can be shared among African states. In the race to embrace innovation and operationalise the affordances of digital transformation and the integration of AI into higher education in the African continent cannot afford a competitive environment that results in the African continent losing its unique approach to understanding humanity as being-together coheasively, underscoring the principle of mutual care and reciprocity (e.g. Ubuntu).

Recommendation 4: Humanity originated on the African continent and, as such, Africa should set an example for the rest of the world on how the affordances of the digital transformation and the integration of AI into higher education can be shared among peoples, communities, and countries. There cannot be a 'winner-takes-it-all' approach. African countries and peoples are profoundly connected, and their histories are entangled. Inter-country collaboration is not an option; it is a duty.

5. The digital transformation and the integration of AI into higher education hold, on the one hand, a huge potential to erase the inequalities and mend the gaps of inequalities between genders and urban/rural divides, but also the danger to exacerbate the second-level digital divide and inequity. In the digital transformation and the integration of AI into higher education, the most marginalised and disenfranchised should not be forgotten. The digital transformation and the integration of AI into higher education advance at such a pace that the regulatory and legislative environments in the respective African countries almost always lag behind developments, leaving national assets and the privacy of their citizens and data protection rights unprotected but the often-unscrupulous strategies by a range of EdTech actors and sectors. There is ample evidence that the EdTech sector does not self-

regulate, and there is an urgent need for an agile legal and regulatory response to technological advances. Due to the lack of digital infrastructure and expertise, as well as the immense intergenerational needs of many African communities, not to miss out on the affordances of the digital transformation and the integration of AI into higher education, African countries and their populations are more vulnerable to exploitation and abuse.

Recommendation 5: Organisations such as the African Union and the various regional bodies and structures, as well as regulatory and legislative frameworks in each of the African countries should ensure that the digital transformation and the integration of AI into higher education do not exacerbate the digital divide.

6. Conclusion

In the light of the various, often intergenerational challenges faced by African countries, the combination of education and technology is portrayed as a powerful catalyst for development in Africa, playing a central role in the realisation of the African Union's Agenda 2063 and the 2030 Agenda for Sustainable Development. Integrating digital and artificial intelligence technologies into higher education systems represent for the African continent and, for many contexts across the globe a crucial step towards achieving quality education for all and nurturing innovation-driven societies.

This report takes as its **point of departure** a High-Level Policy Dialogue in Africa held in Dakar (Senegal) towards the end of 2024, themed "Operationalising Strategies for Quality Higher Education in the AI Era". The purpose of the meeting was to map and explore the transformation of Africa's higher education in the AI era.

Section 2 of this Report mapped a specific understanding of digital transformation as not only including advances in connecting individuals, communities and institutions to the internet, and optimising the affordances of advances in technology such as AI, but involving a spectrum ranging from individuals, communities and institutions that function totally analogue and offline, to internet supported with digital processes, documentation and resources, to internet dependent which involves processes and resources that depend on the quality, cost and sustainability of internet connectivity, to fully online. In this Report, digital transformation is taken to be much more than just technology and the optimisation of the affordances of technology in life and education. If digital transformation does not seriously address the digital divide and the disparities in access between genders, communities, and rural/urban divides, then such a digital transformation will not be transformational. Digital transformation furthermore means more than ensuring equity of access to genders and rural/urban communities but also optimising access to and the production of context-appropriate Open

Educational Resources (OER) that can be available in digital but offline formats.

The 15 country snapshots provided interesting glimpses of some aspects of the digital transformation in these countries with specific attention to the integration of AI into higher education. These snapshots were analysed, and the emerging themes provide the basis for formulating five recommendations for consideration.

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7. Appendix - Case studies and presentations

The following case studies and presentations have been selected from presentations at the 2024 High-Level Policy Dialogue in Africa that took place in December 2024 in Dakar, Senegal. The case studies were selected as examples of progress of the digital transformation and the integration of AI into African higher education. The case studies presents glimpses of digital transformation in action. As far as possible, the original text of the presentations were used, and where the presentation was in French, Google Translate was used to translate the French to English. In the adaptation of these 9 presentations to be included as part of this Report, much of the text does not present a narrative. Where possible, a narrative structure was inserted to ensure an easier reading experience.

7.1 Shaping the Future of Education with Responsible AI: Cross-Organisational Co-creation of Open Educational Resources

By Prof. Dr Amélé Adamavi-Aho Ekué

Open educational resources for professional development of higher education professionals must be considered from a **strategic and systemic perspective**:

- Open educational resources (OER) assist in mitigating the still-existing **disparities in access to quality resources for professional development.**

- Open educational resourcesER are part of a broader **eco-system of educational resources** serving institutional development and higher levels of alignment between the educational purposes and professional standards: quality educational resources for professional development that are openly

accessible impact the quality, the diversity and praxis-orientation of education

- Open education resourcesOER for professional development are available through a variety of **platforms and networks** dedicated to advance the quality of the educational delivery

- Providing access to open educational resources constitutes **a whole-institutional responsibility cutting across the higher education sector and the professional groups in institutions** (teaching professionals, administrative professionals, quality assurance officials, institutional leaders)

Two examples of Open Access Resources for Ethics Education from the Globethics Library and Publications include

- AI Ethics and Higher Education. Good practice and guidance for educators, learners, and institutions

- AI Governance Ethics. Artificial Intelligence with Shared Values and Rules

Principles that gudieguide the co-construction and sharing for an expanded pool of Open Educational Resources (OER), in the case of Globethics include:OER:

- **Cross-organisational, international and cross-disciplinary collaboration**

- **Across sectors**: Collaboration between stakeholders of different sectors (educational and diverse industries) assists in developing resources at par with developments (emerging technologies)

- **Across disciplines**: Consideration of different disciplinary perspectives and methodologies for the creation and delivery of resources (e.g. humanities and sciences)

- **Across institutions**: HEIs**,** INGOS, UN agencies, multilateral

organisations and educational associations, at regional and international levels, to foster multi-directional exchange on content, formats, methodologies and intended outcomes of OER

- **Ethics as lens and in the 'co-driver seat' for the co-creation of OER**

- Higher education remains an important location for **equipping future leaders**; an educational task that requires ethical discernment and decision-making capacities.

- Ethics beyond compliance characterises a quality-oriented co-development of OER and should become a standard for international and multi-stakeholder collaboration.

- Technological advancement and ethical awareness need to go hand in hand

- **Knowledge creation, sharing, and circulation for diversity and inclusion in higher education.**

The concept comprises two courses of **6 units each** for higher education professionals and for higher education leaders on the relevance of ethics for the development, application, and evaluation of AI in the higher education sector. The guiding rationale in the development of these courses was to introduce the subject matter from **a transversal institutional perspective**, balancing the risks and opportunities against the background of values and principles applicable and arising in higher education domains.

The course outline contains the following foci:

1. What is ethics? What is AI?
2. Ethics and opportunities of AI in higher education
3. Engaged ethical challenges and dilemmas of AI in higher education
4. Ethics of AI as societal responsibility

5. Ethics, guidelines, and governance of AI
6. Future directions and emerging themes around ethics and AI

AI-driven innovations necessitate changes in curricula and pedagogy and can be illustrated in the following three application areas:

AI in governance	AI in journalism	AI in community engagement
• Universities can engage students in analysing how AI can improve public services, e.g., students might assess the deployment of automated systems for detecting tax fraud, evaluating both the efficiency and ethical implications of such tools. • Students can propose AI solutions for policy challenges, ensuring these are fair, transparent, and aligned with societal values	• Higher education can train journalists to responsibly leverage AI technologies. For instance, students could use AI tools to identify and analyse deepfakes, ensuring the integrity of media reporting. • AI can also assist in large datasets for investigative journalism, uncovering hidden patterns or trends that might otherwise remain unnoticed.	• Universities have a unique role in engaging with local communities, collaborating with community stakeholders to develop AI applications tailored for local needs。 • Educational outreach projects can empower communities with knowledge about AI, fostering trust and understanding of its capabilities and limitations.

Table 1: Application areas for AI in education

The following four aspects are examples of how AI is transforming higher education:

- AI in admissions: analysing applications but raising fairness concerns
- Adaptive learning: tailoring education to individual needs
- Ethical considerations: AI-assisted assessments and academic integrity
- Administrative improvements: class scheduling, student tracking

This case study concluded with the proposition that higher education can lead to the ethical integration of AI through leadership, critical engagement, and innovative solutions.

7.2 Innovative tools in higher education in Algeria: The experience of the USTHB

By Prof. Noureddine BALI, Vice-Rector in charge of Graduate Studies, Continuing Education and Diplomas, University of Science and Technolog Houari Boumediene (USTHB)

There are 115 institutions of higher education in Algeria, 54 universities, university centres, 39 National Higher Schools and 13 Higher Normal Schools. The University of Science and Technology Houari Boumediene (USTHB) is one of the 54 universities in Algeria. Located in the municipality of Bab Ezzouar, 20 kilometers east of Algiers, and designed by the renowned Brazilian architect Oscar Niemeyer on a 150-hectare site, it opened its doors on April 25, 1974. Currently, USTHB adopts the LMD system (License, Master, and Doctorate) for its academic programmes.

USTHB features include:

- A university campus that includes: 4 restaurants, a post office, 19 science

clubs, a bookstore and a space for artistic and cultural activities.

- A central library in addition to faculty-specific libraries.
- A technical platform for physicochemical analysis.
- An intensive language learning centre (CEIL).
- A preventive medicine centre.
- A computer resources centre (CRI)

During the 2024-2025 academic year, USTHB has enrolled **48387** Undergraduate and graduate students, **3000** Doctoral candidates, **2180** Teachers of various ranks, **2060** Technical and administrative staff, offering **43** Undergraduate programmes, **109** Graduate programmes and **33** Doctoral programmes. Pedagogy at USTHB utilises an institutional Learning Management System (Moodle), uses Massive Online Open Courses (MOOCs), and integrates **AI** in the training of instructors in Algeria, particularly for newly recruited teachers. Pedagogical Support Units (**PSUs or commonly known as CAP**) in Algeria are regulated by Ministerial Decree 932 of July 28, 2016.

Since 2016, USTHB has implemented a training strategy focused on:

- **Developing the 12 skills outlined in Decree 932 of July 28, 2016**, aiming to ensure high-quality teaching that meets international curriculum standards. Training offerings must adapt to current environmental changes and anticipate future needs.
- **Technological innovation in education** empowers teacher-researchers to develop educational technology skills, thereby enhancing their pedagogical practices.
- The pandemic of Covid-19 has significantly increased the visibility of

hybrid learning (combining in-person and online instruction), while **artificial intelligence**, notably with the advent of ChatGPT and subsequent AI advancements, has made significant strides.

This pedagogical and technological development aims to develop skills in educational technologies (both in distance and face-to-face learning), allowing for:

- The **improvement of teaching practices** among teacher-researchers.
- The **introduction to** the various **mechanisms of** university **pedagogy**.

Through a harmonious set of conferences and workshops, each with specific objectives, participants will develop the following set of skills:

- Master the **methodology for producing educational materials**,
- Structure a **course pedagogically**,
- Understand different **pedagogical methods**,
- Adopt **various** forms of **assessment**,
- Establish **quality** criteria for **evaluation**.

The teacher-researcher will also be able to :

- Identify the steps in **creating an online training** module.
- Organise **collaborative tasks by methods: Pyramid-TPS-Jigsaw etc**,
- Design a **pedagogical scenario**,
- Master the **Moodle platform**,
- Produce **educational videos**,

- Integrate **ICT** into the **evaluation process**,

- Leverage **AI** in all aspects of training.

In 2023, Algeria recruited 8,000 new teacher-researchers, with **262** joining USTHB. This is a first. **787** teachers have been trained, and by 2025, the aim is to train **900** new recruits at USTHB. The USTHB also has its own management platforms and software, developed in-house, such as the **university website**, the **ENT** (digital workspace), the **virtual campus** (Moodle), **email**, a **library management platform**, **budget and accounting management software,** and **scoring** and **grades software**. For example, the **ENT** includes all the university's academic management systems, such as **management** of lecture theatres, **classrooms**, work laboratories, **timetables**, field or study specialty **wish lists**, requests for **academic leave**, **displays**, etc.

Starting in 2023, the USTHB initiated a new training programme focused on the utilisation of artificial intelligence in research and teaching.

- Experts explain to learners from various disciplines what artificial intelligence is.

- They provide learners with several interesting AI.

Some of the AI tools suggested by these experts include, but are not limited to:

- Using AI to create state-of-the-art summaries of articles through intelligent and focused research with Scispace, Consensus, or Semantic Scholar.

- Using AI for note-taking in Obsidian.

- Using AI for paraphrasing Quillbot.

- Using AI to enhance writing quality: Synapse.

- Using AI for data visualisation with ECharts.
- Using AI for checking the lexicon and grammar with PaperPal.
- Using AI to calculate plagiarism percentage with Grammarly (plagiarism checker)
- Using AI to create a bibliography with Litmaps and VOSviewer.

The Algerian Ministry of Higher Education and Scientific Research (MESRS) has put a great deal of effort into digitising the management of its sector, particularly in the development of digital skills and the inclusion of AI. The creation of PROGRES, a multi-platform software package, is a sure sign of technological progress in university management. These platforms cover :

- Orientation of new baccalaureate holders,
- Registration of students in all LMD and engineering courses,
- Academic management of the university,
- Student life- accommodation, catering and transport,
- Recruitment management,
- Staff management (teachers, technical staff and workers),
- Budget and accounting management,
- Management of contracts and services, etc.

PROGRES has its own artificial intelligence.

This case study concluded with a discussion of some of the consequences of AI on the quality of education such as lower-cost education; time savings, reduced resource utilisation, thanks to simulation programs and staying up-to-

date with the latest advancements in science and technology, thanks to the open-source community. In using AI there is a need, however, to consider the following ethical issues such as consequences for students, disguised plagiarism, reduced effort, etc., and the question asked by educators: Are we creating a future generation that is intellectually disabled and dependent on AI?

When discussing the use of AI in higher education, this case study proposed the consideration of the following:

- The **use of AI** as a tool **to assist in teaching and research**, rather than a substitute for teachers or students.

- The training on the use of **AI tools requires** a **didactic guide** so that we can **speak the same language**.

- The **training of students on the use of AI** tools takes time away from actual teaching, hence the need to **standardise** this **time**.

- Future **didactic guides** illustrating the use of AI should be more **focused on pedagogy than technology** (to learn from past experiences).

- It is necessary to **rationalise the use of AI by students**, such as banning paraphrasing tools (Quilbot), in order to **encourage** student **autonomy.**

The case study concuded by suggesting that we must absolutely be sure of what we are doing now because the future of students is at stake. Also, the amount of information given to students is reduced every time the education system changes. Students are furthermore often overwhelmed (they follow a course, work, or do nothing at all).

7.3 Micro-Certification: Teacher Professional Development Projects at the IIOE Nigeria National Centre

By Muhammed Bashir Mu'azu, Ph.D, Professor, Department of Computer Engineering, Ahmadu Bello University(Ahmadu Bello University, Zaria, Nigeria)

The Ahmadu Bello University (ABU) is the first IIOE partner HEI that has completed the whole phase of localised implementation, and this case study reports on three project, namely: the Domestication of Micro-Courses (B1: Design & Produce Micro-Course), the Design & Development of IIOE-Based Micro-Courses, and the Sensitisation on LLMs & Introducing "1+X" Micro-Courses.

The Domestication of Micro-Courses (B1: Design & Produce Micro-Course)which entailed the following:

- A micro-course (certification) is a short, bite-sized, and activity-based course
- Essentially **compact** (about 6-15 minutes of a few modules) but **comprehensive** enough with a focus on a topic or skill
- Designed to reduce learner fatigue (learning at one's own pace and/or convenience)

The **IIOE Micro-Certification Project for Higher Education Workforce Digital Competency Building IIOE Micro-Certification Project for HEI Educators** has its objective to support HEIs to reskill and upskill their workforce by offering **flexible** and **customised** solutions for the higher education workforce to upskill and reskill. By playing an active role in this project, ABU sets transferable definitions of digital competencies and

evaluation criteria, forms a content repository that gathers courses, case studies, and guidance that allow exchange and peer learning, and encourages recognition of digital competency building as an important part of professional development.

In the second project, ABU (with Quality Assurance support from the UNESCO-ICHEI/IIOE) designed and developed 2 Micro-Certification courses (from the HE Teaching Personnel Digital Competency Reference Framework). Two examples included (1) Conduct collaborative instructional research with online and offline integration; and (2) Design and produce presentation

The third project "Sensitisation on LLMs & Introducing “1+X” Micro-Courses" focuses on maximising educational and professional efficiency with Large Language Models (LLMs)

The ABU also hosted a National Dialogue on AI in higher education during 2024 with the following government departments and regulatory bodies in attendance:

- Federal Ministry of Education **(FMoE)**
- Federal Ministry of Communications, Innovation & Digital Economy **(FMoCIDE)**
- Nigerian Communications Commission **(NCC)**
- Nigeria Information Technology Development Agency **(NITDA)**
- National Universities Commission **(NUC)**
- National Board for Technical Education **(NBTE)**
- National Commission for Colleges of Education **(NCCE)**

Academia/higher education was represented by several universities, polytehnics, colleges of education and the Artificial Intelligence Ethics

Research Network (AIERN). Industry was represented by UNESCO-ICHEI/IIOE; Galaxy Backbone Ltd **(GBB)**; Huawei Technologies; Oando Energy Resources and the National Centre for AI & Robotics **(NCAIR)**. This dialogue is designed to follow up on building a **Consensus Framework towards a Policy/ Guidelines Roadmap for Nigeria Higher Education in the Age of Artificial Intelligence.**

7.4 Case study Université Gaston Berger

By: Michel Bakar DIOP， PhD in agronomic Sciences and biological engineering, Director of the Institute for Open and Distance learning (IFOAD)

The Gaston Berger University joined the IIOE network in 2020 amid the education crisis linked to the Covid-19 health crisis. This strengthened the means of responding to the challenges of ensuring the continuity of teaching and learning through digital technology, enabled by cooperation.

The design and development of the National IIOE Senegal Centre Project is involved. On a national level, the "Digital Senegal 2016-2025: Strategy of SN2025; the 2021-2025 strategic plan of Gaston Berger University, the Distance Learning Program Evaluation Framework (ANAQ SUP 2017), and the Distance Learning Institutions Evaluation Framework (ANAQ SUP 2017). On an international level, the design of the Centre project took cognisance of the IIOE Quality Assurance Framework 2.0, and the overview of the responsibilities of IIOE Centres.

The Senegal Project established a national network of higher education institutions, and during 2024, two universities were involved, namely Gaston Berger University and the Cheikh Hamidu KANE Digital University (UN-CHK). Two higher institutes of professional education were also involved, namely ISEP de Matam and ISEP de Richard-Toll, one regional health training centre - the CRFS Saint-Louis, as well as two private higher education

establishments, the African Center for Computer and Technical Training (CAFIT) and the Kocc Barma University of Saint-Louis.

The localisation of IIOE programmes at national level: Micro-certification entailed the IIOE Teacher Micro-certification Project Program Actors (2023) which included a framework comprising of 21 skills - Eight (8) Basic Skills (A1-A8), Six (6) Intermediate Skills (B1-B6), Five (5) High Skills (C1-C5); and two (2) Professional development skills for teachers integrating research with digital tools (T1-T2).

The case study also reported on the establishment of a cross-functional technical team for training management upstream and downstream of teaching and learning in the IIOE platform to:

- Monitor and evaluate Micro-certification in digital pedagogy

- Exploitation of a smart classroom for the improvement of digital infrastructure, governance, and management of digital education

It also involved the creation of a local team of nine (9) expert trainers in the co-construction of courses with those from the IIOE (College of Teacher Education, East China Normal University) to guarantee the quality of teaching and learning in digital pedagogy in French through the IIOE LMS platform. The number of teachers registered for the 2024-2025 cohort was 129 out of an initial target of 200 individuals. Teacher supervision for the use of the IIOE platform began on December 3, 2024, with a view to empowering them in the use of educational resources. Implementation of educational resources for the development of self-learning has been scheduled from December 10 to January 25, 2025. The duration of the teaching-learning of the basic micro-certification in digital pedagogogy was estimated 6 months from January 30, 2025 and following pilot micro-certification, the enrollment plan was foreseen to be extended from 2025 to other EES across Senegal.

7.5 Gender and AI in African Higher Education: Challenges and Good Practices

By: Melisew Dejene Lemma (PhD, Associate Prof in Development Studies & Journalism) | Hawassa University, Ethiopia

This presentation introduced the problem statement regarding gender and AI in African higher education as follows: Reference was made to a Gender Digital Divide i.e. **the gap between men and women in terms of access to, use of, and benefits from information and communication technologies (ICTs)**, which is a concern in African Higher Education. The global level data reveals that the world is on a promising path to close the gender gap in as 70 per cent of men are using the Internet, compared with 65 per cent of women in 2023 (ITU, 2023). Africa also has a lot more to go with the gender digital divide, as well as the digital divide being huge.

Challenges to increasing female educators' participation in African HE include but are not limited to the following:

- Access Challenges – According to ITU (2023) “roughly four in ten men and three in ten women use the Internet.”

- “The gender digital divide creates a data gap that is reflected in the gender bias in AI.” (UN Women, 2024).

- Economic Challenges - in low-income countries, only 20 % of are digitally connected (see ITU, 2023)

- Lack of affordability continues to be a key barrier to Internet access in low-income economies.

- Compared to prices in high-income economies, the mobile-broadband basket is 5.5 times less affordable in lower-middle-income economies [representing most African Economies] and more than 20 times less

affordable in low-income economies.

This presentation also highlighted the following challenges to increasing female educators' participation: “Who creates AI and what biases are built into AI data (or not), can perpetuate, widen, or reduce gender equality gaps” (UN Women, 2024)

- The piper setting the tune- who is guiding the decisions for AI Systems to operate, make decisions, and more?

- “AI systems are biased because they are human creations.” (Smith & Rustagi, 2021). Women lag behind men in digital and AI skills (Celine Caira, Lucia Russo, Luis Aranda, 2023).

- “Only 22 percent of professionals in AI and data science fields are women—and they are more likely to occupy jobs associated with less status.” (World Economic Forum, 2018 cited in Young, E., Wajcman, J., and Sprejer, L. 2021).

- 44% AI systems studied exhibited gender bias (Smith & Rustagi, 2021).

- Even most advanced African countries like Tunisia, South Africa, Egypt, and Kenya are at early stages of AI development when weighed against the AI readiness index. “Africa is below the halfway mark at 26.91 (afrilabs.com).

Good practices and innovative pathways in Africa to close the gender gap include, but are not limited to

- Positive developments to maximise – Supporting AI startups in Africa

- 30% of AI startups in Africa specialise in Machine Learning, followed by Deep Learning (17%), Natural Language Processing (15%), Computer Vision (12%), Generative AI (10%), Reinforcement Learning (9%), and Robotics (7%) (afrilabs.com).

- Proactive digital Policy, strategies and legal environment to promote equitable utilisation of AI in African HE (Lemma, Ngutuku, Obioha, & Siebert, 2022).

- Investment in Digital Infrastructure.

- AI as a sophisticated technology needs a range of infrastructure and digital capabilities.

- Africa needs to invest in Digital Literacy, Hardware and Soft ware development.

- African women need to get the skills premium for exploiting and harnessing the benefits of AI.

7.6 Promoting women in higher education: Challenges and innovations to integrate female teachers in digital transformation and AI

By: Dr Maryam Khadim, MBACKE (Association of Women for the Promotion of Science and Technology in Senegal)

In this presentation, Dr Maryam Khadim referred to some figures with regard to women in higher education (MESRI, 2022):

- Students in public higher education were supervised by 2,403 permanent teachers, 83.94% were male (2017) and 16.06% were women.

- Of all students in science and technology, female students accounted for 34%； 15% assistants are female, 23% of the assistant professors and 21% full professors are female.

Less than 25% of teaching and research staff are female.

Dr Maryam Khadim also referred to the following characteristics of the profile of AI experts in Senegal:

- Out of the 14 AI experts from 10 different structures, 14.3% are women. They are relatively young (50% are between 26-35 years old, and 21.4% are between 36 and 45 years old. They have relatively short seniority in AI research, typically (42.9%) between 3-5 years, and 35.7% practiced for less than 2 years. 85.7% are from the IT disciplinary, 71.4% are specialising in AI.

Overall, Less than 25% of the AI workforce are female.

The following challenges need to be overcome:

1. Socio-cultural challenges: Family and work responsibilities may limit the time available to train or contribute to digital projects; the low number of women in higher education in the fields of AI and digital transformation limits role models for female teachers.

2. Structural and strategic challenges: Efforts related to digital transformation or the integration of AI are sometimes undervalued in professional evaluation criteria; few institutions have explicit strategies in place to encourage women's engagement in digital transformation.

3. Interdisciplinary challenges: Poor integration between AI and other disciplines can limit opportunities for co-creation.

Dr Maryam Khadim concluded with reference to the following best practices:

- **Preparing the next generation:** Cairo University offers very advanced training from Bachelor's level where all the theories of AI, beyond the latest trends are proposed, thus allowing learners to have a perfect mastery of the theoretical concepts of AI.

- **Capacity building:** The University of Cape Town also offers a certificate programme in AI that covers fundamental concepts of AI, such as machine

learning algorithms and speech recognition.

- **Public-private partnership:** In Algeria the government has created a National Center for AI Research and has organised training for students and professionals. Companies such as DZ-AI, and AI research company based in Algiers, have been founded to build local capacity.

- **Stakeholder engagement:** GalsenAi is a community initiated by young Senegalese people passionate about data sciences and IoT.

7.7 Promoting South-South and Triangular Cooperation (SSTC) to Improve Higher Education Results

By: Professor Mamadou Babacar NDIAYE | Vice President, Network for Higher Education Excellence in West Africa (REESAO), Rector of Iba Der Thiam University in Thies (UIDT)VP Réseau pour l'Excellence de l'Enseignement Supérieur en Afrique de l'Ouest (REESAO) Recteur de l'Université Iba Der Thiam de Thiès (UIDT)

In his presentation, Professor Mamadou Babacar NDIAYE referred to several effective strategies, good practices and mechanisms for South-South and Triangular Cooperation (SSTC) pertaining to collaborative academic and research partnerships. For example, Southern universities can establish partnerships with each other, creating research networks and mobility programmes for students and researchers. These partnerships are often based on common interests and allow for an exchange of knowledge tailored to the specific needs of the partner countries. There is also the potential of joint research projects that can address specific regional issues (e.g., sustainable agriculture, public health) and develop tailored solutions. Southern countries can also organise workshops, seminars and conferences to exchange good practices in higher education and university management.

This can include training on improving the quality of teaching, academic management and the use of innovative technologies

With regard to Innovative financing mechanisms Professor Mamadou Babacar NDIAYE referred to funds for SSTC can come from bilateral or multilateral sources, with the involvement of the Northern countries in the triangular framework. For example, international institutions or NGOs can support projects by providing funding or technical expertise.

Mobilities of students and researchers can be supported by scholarship and mobility programmes that enable students and researchers from countries from the South to study or conduct research in other countries of the South, thus creating strong links and inter-university networks. Double-degree or co-supervision programmes are also effective in strengthening academic capacities and promoting the exchange of know-how between partner institutions.

Professor Mamadou Babacar NDIAYE also referred to the use of digital technologies to facilitate virtual collaboration, allowing students and teachers to work together remotely. This reduces geographical barriers, and the costs associated with physical travel.

The following are challenges encountered in promoting SSTC:

- Inequalities in institutional resources and capacity: Differences in financial resources, infrastructure and qualified personnel between countries in the South may limit the capacity of some institutions to participate fully in the SSTC. These inequalities can create imbalances in partnerships and affect the sustainability of joint projects.

- Coordination and management of partnerships: SSTC project management often involves multiple stakeholders, including governments, academic institutions and international organisations. Coordination between these actors can be complex, especially when there are differences in

priorites and expectations.

- Sustainability of initiatives: Many SSTC initiatives lack sustainability due to reliance on external funding or difficulty in maintaining partnerships beyond the initial phase. Sustainability requires long-term funding strategies and appropriate management.

- Language and cultural barriers: Linguistic and cultural barriers can pose a challenge between countries in the South, affecting communication and the effectiveness of joint projects.

- Lack of coherent policies: In some countries, the absence of clear public policies on international collaboration or SSTC may limit the engagement of academic institutions. A strong political and institutional framework is crucial to support these initiatives.

In summary, although the SSTC is an important level for improving higher education outcomes, it requires coordinated management, strong political commitment and solutions adapted to local contexts to overcome the challenges inherent in its implementation.

Inspiring examples of SSTC success stories catalysing AI

A. Partnership between South Africa and Senegal for digital innovation in education

Background: South Africa and Senegal have established partnerships within the framework of educational innovation programmes supported by international organisations, such as UNESCO and bilateral cooperation agencies e.g. cooperation between South Africa and France.

Digital transformation: These partnerships have enabled both countries to introduce advanced educational technologies, such as e-learning platforms and the use of AI to personalise student learning. South Africa, with its AI

expertise, has collaborated with Senegal to develop automated assessment systems and learning management platforms that integrate AI.

Impact: Students in Senegal benefited from access to online educational resources, while AI tools were used to track their progress and adapt lessons. The partnership also helped build the capacity of Senegalese teachers to integrate technology into their teaching practices.

B. Cooperation between Brazil, India and Portugal (triangular) for AI and digital education

Background: A triangular partnership between Brazil, India and Portugal was established under the "AI in education" supported by multilateral institutions such as the World Bank and the EU.

Digital transformation: India, a leader in digital innovation, has contributed its expertise in the field of AI, while Brazil has contributed to the application of these technologies in educational contexts. Portugal, through its advanced digital education projects, has played a key role in teacher training and the integration of digital solutions.

Impact: This project has enabled the creation of a hybrid learning platform in three countries, where AI is used to create tailored content and deliver personalised learning paths. It has also strengthened the capacities of local educational institutions to adopt advanced digital technologies.

C. The "Africab AI for education" initiative (South-South cooperation between Kenya, Nigeria, South Africa and Rwanda)

Background: The "Africa AI for education" brings together several African countries including Kenya, Nigeria, South Africa and Rwanda, to integrate AI into education systems and higher education

Digital transformation: The programme focuses on using AI to improve access to quality education in Africa. The technologies developed include

machine learning systems for creating online courses, virtual tutoring platforms, as well as data analysis tools to personalise curricula and and the monitoring of student performance.

Impact: These countries have successfully created a collaborative environment where AI solutions are tailored to the specific needs of the African continent, while building local capacity for AI teachers and to develop research into AI. For example, Kenya has used these technologies to develop and deliver courses for students in rural areas, while South Africa has built capacity for AI research applied to education.

D. The "China-Africa Joint Research Center" (South-South cooperation)

Background: The "China-Africa Joint Research Center", supported by the Tianjin University (China) and African partners focuses on the integration of digital technologies and AI in African universities.

Digital transformation: The partnership has enabled the implementation of AI solutions for the development of distance learning programmes, particularly in technical fields such as engineering, computer science and medicine. The project also included training teachers in the use of AI in teaching and institutional management.

Impact: The initiative has had a direct impact on the quality of higher education in Africa, enabling a significant improvement in access to courses and educaitonal resources through AI-powered digital platforms. This has helped increase student success rates through personalised learning materials.

E. The regional partnership "ASEAN-South Korea Digital Education Cooperation"

Background: The partnership between the Association of Southeast Asian Nations (ASEAN) countries and South Korea has integrated advanced digital solutions, including AI, to improve higher education in the region.

Digital transformation: South Korea has shared its expertise in digital transformation, particularly in integrating AI into learning processes and analysing student performance. ASEAN countries, in return, have adapted these solutions to local contexts, developing hybrid education programmes that combine traditional teaching with personalised digital learning.

Impact: The partnership has helped to reduce gaps in access to quality education, particularly in rural areas of ASEAN countries, and strengthened distance learning capabilities through AI. Educational institutions in the region have adopted AI-based systems to deliver personalised education at scale.

Conclusion

These examples illustrate how South-South and triangular cooperation can be a powerful catalyst for the digital transformation of higher education. By leveraging complementarities between countries in the South, and in some cases with contributions from the North, these partnerships have helped integrate AI solutions into higher education, improve accessibility and personalise learning for students. However, to ensure their sustainability, it is essential to invest in strong governance structures and support the continuous training of teachers and students.

7.8 South-South and Triangular Cooperation (SSTC). A significant catalyst for digital transformation and AI integration in higher education

By: Mr. Brian Halubanza, Dean of the School of Engineering and Technology, Mulungushi University, Zambia

In his presentation, Mr Brian Halubanza provided examples of South-South Cooperation (SSC) referring to collaboration between developing countries to share knowledge, skills, and resources and Triangular Cooperation (TrC)

referring to partnerships where developed countries or organisations support SSC initiatives.

South-South and Triangular Cooperation (SSTC) enhances digital transformation and AI integration and fosters innovation, capacity building, and knowledge exchange. Mr Brian Halubanza referred to the following focus areas namely digital tools for teaching and learning, AI-driven adaptive learning systems and collaborative research and capacity building.

Effective strategies and mechanisms for SSTC include the following:

Regional Hubs and Networks

- Establish SSTC Centers of Excellence to coordinate and localise efforts. Examples: Huawei ICT Academies in Africa.

Multilateral Platforms

- Platforms like UNESCO-ICHEI's IIOE for shared learning resources and collaboration.

Capacity Building Programmes

- Train faculty and administrators in AI and ICT tools through partnerships. Example: Malaysia-Africa AI Fellowship programmes.

Public-Private Partnerships (PPPs)

- Collaborations with companies like Huawei for ICT integration.

Policy Alignment through Forums

- Host dialogues to align institutional policies with global trends in AI and education.

There are, however, several challenges in promoting SSTC such as:

1. **Funding**

- Limited resources for sustained collaboration and technology adoption.

2. **Digital Divide**

- Uneven access to ICT infrastructure and AI tools.

3. **Policy Misalignment**

- Diverse priorities and regulatory environments across regions.

4. **Cultural and Linguistic Barriers**

- Adapting AI and digital tools for local contexts.

5. **Monitoring and Evaluation**

- Lack of standardised metrics to assess impact.

In his presentation, Mr Brian Halubanza provided some examples of inspiring cases of SSTC in higher education and he referred to UNESCO-ICHEI that has been actively collaborating with higher education institutions (HEIs) across Africa to promote digital transformation and innovation. This collaboration aims to enhance digital transformation and integrate artificial intelligence (AI) into the university's educational framework. Key aspects of the partnership include capacity building, infrastructure enhancement and resource sharing.

Some examples of SSTC in higher education include:

- **Mulungushi University** is poised to enhance **the quality and accessibility of education**, preparing its students and faculty to excel in an increasingly digital world.

- **e-VidyaBharati and e-ArogyaBharati Network Project**: India’s

partnerships with African universities through its e-VidyaBharati and e-ArogyaBharati Network Project (e-VBAB) have demonstrated the transformative potential of SSTC.

- **Pan-African e-Network Project**: India-Africa collaboration enabling virtual classrooms and knowledge sharing in African universities. These virtual universities provide African students with access to Indian education resources, including AI-integrated platforms for interactive learning.

- **Huawei ICT Academies**: Established in Kenya, South Africa, and Zambia (e.g., Mulungushi University), providing industry certifications and digital skills training.

Mr Brian Halubanza concluded his presentation with some recommendations for Advancing SSTC in Higher Education

1. **Enhance Regional Coordination:** Establish SSTC hubs to facilitate localised efforts and resource sharing.

2. **Expand Public-Private Collaborations:** Engage technology firms for innovation and infrastructure development.

3. **Prioritise Capacity Building:** Focus on upskilling educators and administrators in AI and ICT.

4. **Increase Funding and Resources:** Advocate for investments in SSTC-driven digital transformation.

5. **Cultural Contextualisation:** Develop AI tools and digital resources tailored to local languages and needs.