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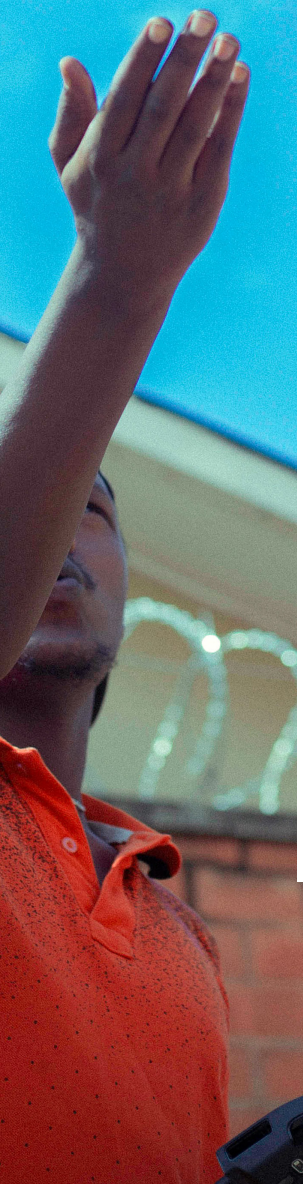
ALU AFRICAN LEADERSHIP UNIVERSITY

Artificial Intelligence in Sub-Saharan Africa

Overall Report



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Executive Summary: AI Could Revolutionise Many Sectors in Sub-Saharan Africa

As the storm clouds finally cleared, Esther stood at the edge of her shattered farm, her heart sinking into the muddy earth beneath her feet. The fields, once vibrant with the promise of harvest, lay in ruins—crops uprooted, trees snapped, and the soil washed away by the merciless deluge. Her hands trembled as she thought of her children, huddled inside their modest hut, where the rain had leaked through the roof and hope seemed to drain away with every drop. They deserved more than this, she thought—more than a life where their poorly resourced school was a 5km slog away, and where even basic healthcare was a distant, unreachable dream. She wiped away a tear, knowing that, despite her resilience, the odds were heavily stacked against her family, and many others like them.

This scenario is the unfortunate reality for thousands of families across the Sub-Saharan Africa region. On almost every metric of significance across the sectors of Education, Healthcare, Agriculture and SME enablement, the region lags behind global leaders:

South Africa is the highest ranked country on the **Healthcare Access and Quality Index**, but it only comes in at

#50

1,500kg/ha

The average yield per hectare for cereal crops across the region

VS

3,900kg/ha

The world average (leading countries manage **10,000kg/ha**)

Only 28%

of students complete upper secondary education, meaning that the majority do not achieve school-leaving qualifications

52

The number of days to register a new company across Sub-Saharan Africa

VS

5-10

The number of days to register a new company in more developed countries

However, our research indicates that there are significant levels of development taking place across these sectors, using the latest advances in **Artificial Intelligence ("AI")**. The tremendous advantages that this technology offers might just enable the region to overcome the many **challenges** that have historically held it back, and **leapfrog** it to levels of accessibility, service and productivity that have previously only been the preserve of the most developed countries in the world.

1.1 Key Findings

Our **findings** show there are many pockets of AI innovation across these sectors in SSA that just require scale and more mass adoption to **revolutionise** conditions in these countries.

- **Crop2Cash** in Nigeria has customised its own Large Language Models and managed to train them in seven local languages to respond to smallholder farmers who phone in on a standard toll-free number and ask questions about weather, diseases, planting timing, fertiliser regimes and irrigation advice.
- **M-Schule** in Kenya uses AI to assess each learner's competency, tailors the lesson specifically for that learner and then delivers it via SMS to kids located anywhere in the country.
- **Dimagi**, operating in Zambia amongst other countries, offers AI trained telemedicine to patients living remotely. Natural Language Programming enables patients to communicate via WhatsApp with healthcare workers situated elsewhere.
- **Lelapa AI** in South Africa has developed its VulaVula platform which enables small businesses to improve their customer engagement by using translation services between English and three other major South African languages.

1.2 Challenges

Of course, it won't just be plain sailing. There are many **obstacles** standing in the way of rolling out these innovations and reaping the expected benefits.

In many parts of this region, access to **localised data** is limited, and data collection is inconsistent. **Infrastructure constraints**, such as poor internet connectivity and lack of electricity, further hinder the implementation of AI solutions. The **high cost** of importing technology, coupled with expensive access to the digital platforms required for AI, makes it difficult for many of these operators to achieve sufficient scale to make a difference.

In addition, there is a lack of **digital literacy** in many Sub-Saharan African countries, with low smartphone penetration and poor cellular coverage in rural areas. AI development itself faces obstacles, as there are few **region-specific models** to address the unique characteristics and languages of each country.

Environmental factors, such as climate unpredictability, and regulatory barriers also present hurdles. Few countries in the region have clear digital policies, and there is limited funding for local AI initiatives. **Cultural resistance** to technology adoption and difficulty translating AI insights into practical actions further complicates the situation.

1.3 Recommendations

To overcome these challenges, we have made several recommendations:

Create supportive AI regulations

Governments and policymakers must step in to create **supportive AI regulations** and coordinate funding to address infrastructure deficits.

Manage the risks of AI

While data privacy laws are in place in many countries, more needs to be done to focus specifically on the risks of AI.

Co-ordinate efforts to scale innovation

Coordinated efforts across the region are essential to **scale** the innovative solutions already in place and ensure that more citizens can benefit from these incredible advances.

Encourage bold leadership

Bold and far-thinking **leadership** will be required across each country to guide and stimulate this development.

With some deliberate effort and political will, it isn't difficult to imagine a powerhouse region where:

- AI-powered **precision farming** techniques are helping smallholder farmers everywhere dramatically increase their yields and efficiency. Where AI algorithms are analysing satellite imagery, sensor data, and weather forecasts and providing farmers with real-time, hyper-local recommendations on optimal planting times, fertiliser application, irrigation scheduling, and pest management.
- AI has amplified the impact of every **healthcare worker**, enabling them to do more with less. Where AI-powered tools are helping clinicians serve multiple patients effectively, interpreting medical images and identifying diseases swiftly. Where this technology has democratised expertise, bringing high-quality diagnostics to even the most remote clinics.
- Each country runs an **educational system** where every learner receives the exact support they need, precisely when they need it, ensuring that no one falls behind, and everyone reaches their full potential.
- **SMEs** are able to streamline operations, automate processes, reduce costs, improve customer engagement, and access new markets, all without huge capital or technical know-how required.

2.

The Evolution of AI in Sub-Saharan Africa

IBM launched its first research lab in Nairobi in

2013

2,400+

AI-focused companies were operational across Africa by 2023

The evolution of Artificial Intelligence (AI) in Sub-Saharan Africa has been shaped by a combination of local innovation, global technological trends, and the unique socio-economic challenges faced by the region. This historical overview highlights key milestones in the development and adoption of AI across various sectors, including agriculture, healthcare, education, and small and medium enterprises (SMEs).

2.1 Early Foundations

The roots of AI in Sub-Saharan Africa can be traced back to the early 2000s when academic institutions began to establish research programs focused on computational sciences.

Notable initiatives included:

1. Establishment of AI Research Labs

Institutions like the **African Institute for Mathematical Sciences (AIMS)**, founded in 2003, began developing programs in machine learning and data science. This laid a foundation for future AI research and education across the continent.

2. International Collaborations

Partnerships with global tech companies have facilitated knowledge transfer and capacity building. For instance, **IBM** launched its first research lab in Nairobi in 2013, marking a significant investment in local AI capabilities.

2.2 Growth of AI Ecosystems

The past decade has witnessed a significant uptick in AI activity across Sub-Saharan Africa, characterised by:

1. Emergence of startups

By 2023, over 2,400 AI-focused companies were operational across the continent. Countries like South Africa, Nigeria, and Kenya have emerged as tech hubs, fostering a vibrant startup ecosystem that has developed innovative AI solutions tailored to local needs.

2. Government initiatives

Several African governments have recognised the potential of AI to drive economic growth. For example, South Africa formed the **Presidential Commission on the Fourth Industrial Revolution** to develop policies that support AI adoption. Similarly, Kenya has established a task force to harness AI effectively.

2.3 Sector-Specific Developments

AI's adoption has been particularly pronounced in our key sectors:

Agriculture

The agricultural sector has seen significant advancements through AI applications aimed at improving food security and optimising farming practices. Startups like **Apollo Agriculture** and **IAPrecision** leverage AI for precision agriculture, providing farmers with data-driven insights to enhance productivity.

Healthcare

In healthcare, AI technologies have been deployed to improve diagnostics and patient care. Companies such as **Envisionit Deep AI** utilise machine learning for medical imaging, while initiatives like **MomConnect** provide maternal health support through AI-driven communication platforms.

Education

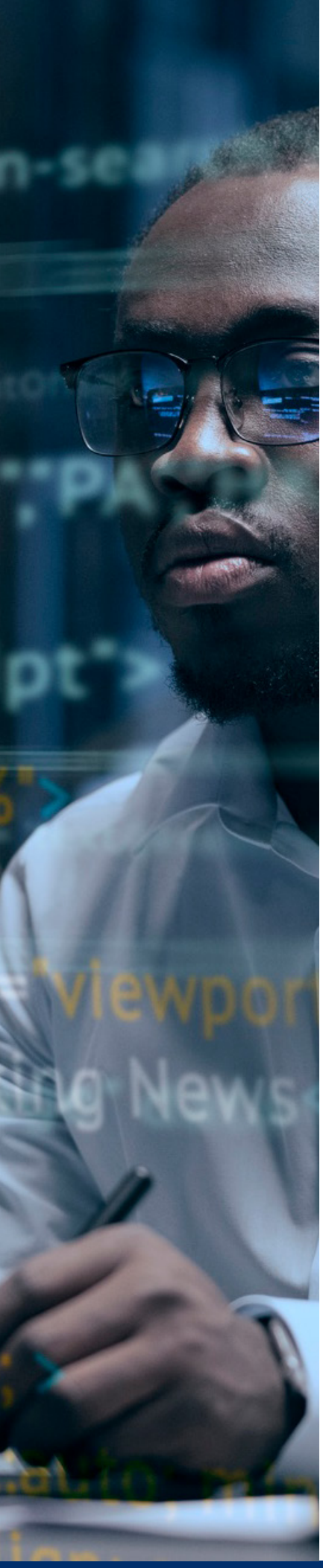
The education sector has benefited from AI through personalised learning solutions and administrative efficiency improvements. Institutions are increasingly adopting AI tools to enhance educational outcomes and address challenges such as high dropout rates.

SMEs

Small and medium enterprises are leveraging AI for operational efficiency and market insights. The use of chatbots and predictive analytics is helping SMEs optimise customer engagement and streamline operations.

3.

A Look at the Current AI Ecosystem in Sub-Saharan Africa



The SSA artificial intelligence ecosystem has evolved rapidly in recent years, driven by a combination of local innovation, international partnerships, and strategic policy frameworks.

> While still nascent compared to global counterparts, the continent's AI landscape demonstrates growing maturity, with emerging hubs of research, entrepreneurial activity, and governance experimentation.

3.1 Key Players in the African AI Ecosystem

1. Private Sector Innovators

Africa's AI private sector spans startups and established tech firms addressing continent-specific challenges. Financial technology dominates AI applications, with mobile payment platforms like **M-Pesa** (Kenya), **Flutterwave** (Nigeria), and **EcoCash** (Zimbabwe) leveraging machine learning for fraud detection and customer analytics. Other notable enterprises include **Sama** (Kenya), a training data provider for machine learning models.

2. Governmental and Intergovernmental Actors

National governments and regional bodies play pivotal roles in shaping AI adoption. Ghana, Nigeria, and Kenya have formulated national AI strategies to guide public-sector integration and workforce development. At the continental level, the **African Union (AU)** adopted its **Continental AI Strategy** in July 2024, emphasising ethical governance, capability-building, and sectoral prioritisation (e.g., agriculture, healthcare). The strategy mandates member states to establish regulatory frameworks and invest in talent retention, reflecting a coordinated push to avoid technological dependency.

3. International Collaborators

Foreign tech firms and research institutions increasingly partner with African entities. The **Wits MIND Institute** (South Africa), launched in 2024 with **IBM** collaboration, focuses on foundational AI research in machine and biological intelligence. These partnerships often aim to balance commercial objectives with capacity-building, though concerns about data sovereignty and intellectual property persist.

4. Research Institutions and Academic Initiatives

- **Interdisciplinary Research Hubs**
  The Wits MIND Institute represents Africa's ambition to lead in cutting-edge AI research. Its interdisciplinary approach integrates

AI investment in Africa in Q2, 2024:

$4m

VS

Global AI investment in Q2, 2024:

$23.2bn

63%

of African AI startups are in seed or pre-seed phases

neuroscience, robotics, and ethics, with projects ranging from drug discovery to astronomy. In Ghana, the **African Centre for Research in Artificial Intelligence (CAIR)** trains experts and develops localised AI applications, particularly in language processing and agricultural optimisation. These institutions often collaborate with universities such as **Strathmore University** (Kenya) and **Cairo University** (Egypt), which have launched dedicated AI programs.

- **Funding for Academic Research**
  While underfunded compared to global standards, African AI research benefits from targeted grants. **The Data Science Africa (DSA) Research Award**, supported by the **International Development Research Centre (IDRC)**, disburses $2,500–$5,000 to junior researchers for projects adhering to FAIR data principles. **The Deep Learning Indaba**, a pan-African initiative, supplements this by hosting workshops and funding open-source AI tools. However, the scale remains limited; most institutions rely on international partnerships or corporate sponsorships to sustain labs.

5. Funding Sources and Investment Trends

- **Domestic and International Investment**
  Africa's AI startups face a stark funding gap. In Q2 2024, the continent attracted just $4 million across five deals—less than 1% of the $23.2 billion global AI investment. Early-stage ventures dominate the landscape, with 63% of African AI startups in seed or pre-seed phases. Notable exceptions include **Zipline** (drone logistics), which raised $250 million in 2023. Governments have begun allocating budgets for AI infrastructure; Rwanda, for instance, prioritises drone corridors and smart cities.

- **Challenges in Financing**
  Structural barriers hinder growth. Limited cloud infrastructure and fragmented data ecosystems raise operational costs for AI developers. Regulatory uncertainty also deters investors: only Mauritius, Rwanda, Benin, and Senegal have finalised national AI strategies as of 2024. The AU's Continental Strategy seeks to address this by urging harmonised data governance laws and innovative financing mechanisms, including public-private partnerships.

6. International Aid and Philanthropy

Development agencies fill critical gaps. The IDRC funds initiatives like **AI4D Africa**, which supports ethical AI projects in healthcare and education. The **Bill & Melinda Gates Foundation** has invested in agricultural AI tools for smallholder farmers, while the **Chan Zuckerberg Initiative** backs language model development for underrepresented African dialects. These efforts, however, risk creating donor-driven agendas that may not align with local priorities.

The next decade will prove decisive in determining whether Africa shapes AI as a tool for inclusive development, or remains peripheral to its global evolution.

4.

Exploring the Opportunity Landscape

4.1 Definition of Artificial Intelligence

Before going any further it is important to define what we mean by Artificial Intelligence ("AI"). Artificial Intelligence (AI) encompasses a wide spectrum of technologies and methodologies that enable machines to perform tasks traditionally associated with human intelligence. This range includes various subfields such as machine learning, predictive analytics, and generative AI, each serving distinct functions and applications in both creative and analytical domains.

- **Machine Learning and Predictive Analytics** are foundational components of AI that focus on data-driven decision-making. Machine learning involves algorithms that allow systems to learn from data inputs, identify patterns, and improve their performance over time without explicit programming. This subset of AI is crucial for predictive analytics, which utilises historical data to forecast future outcomes.

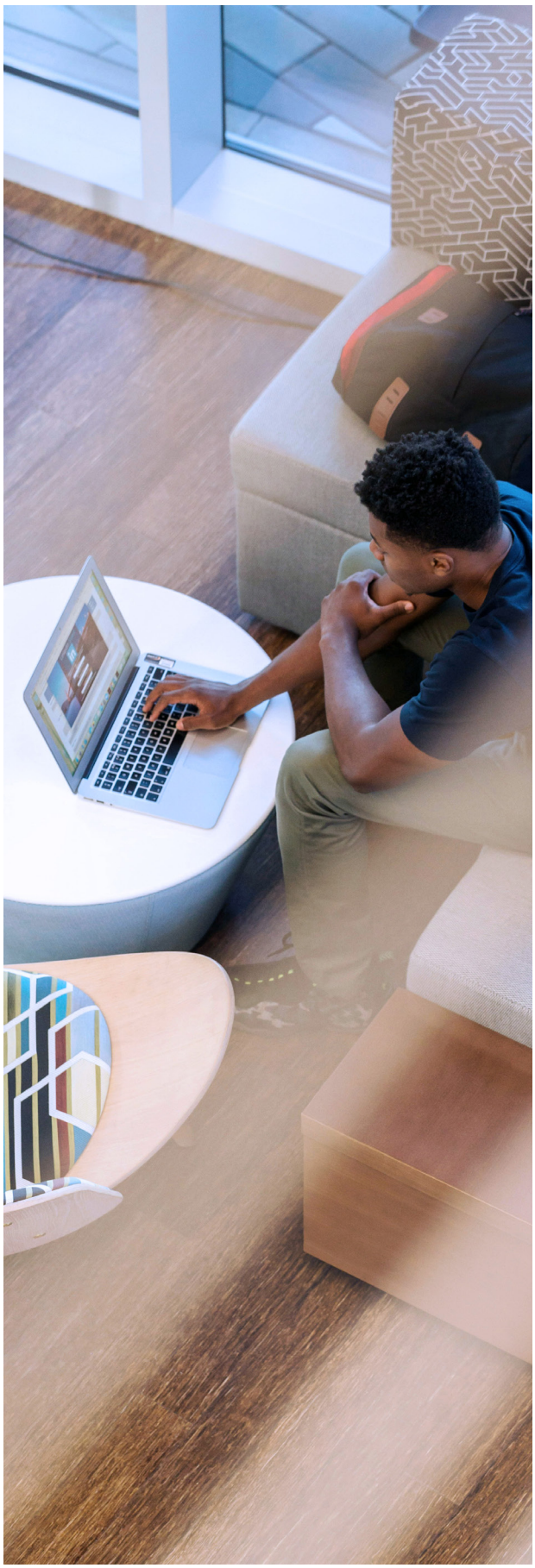
> By analysing trends and behaviours, predictive analytics can inform business strategies across industries such as finance, healthcare, and marketing.

  For instance, it can predict customer behaviour or optimise supply chain logistics by leveraging statistical models and machine learning techniques like regression and classification.

- **Generative AI**, on the other hand, represents a more creative aspect of artificial intelligence. It is designed to generate new content—be it text, images, music, or even software code—based on learned patterns from existing data. Utilising advanced techniques such as Generative Adversarial Networks (GANs) and deep learning models, generative AI can create unique outputs that did not previously exist. This capability has transformative potential in various fields, including art, entertainment, and product design. For example, generative AI can produce realistic images from textual descriptions or compose original music by analysing existing compositions. The integration of generative AI with predictive analytics further enhances its utility by allowing businesses to simulate potential scenarios and outcomes based on creative inputs.

- **Large Language Models (LLMs)** play a pivotal role in the realm of Generative AI, particularly in the generation of human-like text. These models, such as OpenAI's GPT series, are trained on vast datasets that allow them to understand and produce language with remarkable coherence and contextual relevance. LLMs utilise advanced architectures, primarily based on transformers, which enable them to process and generate text efficiently by considering the relationships between words and phrases across extensive contexts. This capability allows LLMs to perform a variety of language-related tasks, including content creation, summarisation, translation, and even interactive dialogue in applications like chatbots and virtual assistants.

  Creating and training Large Language Models (LLMs) in Sub-Saharan Africa presents several **unique challenges**, primarily due to the region's linguistic diversity and the limited availability of resources. With estimates suggesting that there are between 1,000 and 2,000 languages spoken across the continent, many of which lack a standardised written form or substantial digital presence, the data necessary for training effective LLMs is often scarce. This



situation is exacerbated by the predominance of a few dominant languages in digital spaces, leading to concerns that smaller languages may be marginalised or completely overlooked in AI development efforts.

Moreover, the **technical and financial resources** required to develop LLMs are often out of reach for many local organisations.

> The complexity and costs associated with training these models can deter investment in languages that do not have large user bases or commercial viability.

As a result, there is a risk that the digital divide will widen further, leaving millions without access to AI technologies that could enhance their daily lives and economic opportunities. Initiatives like Lelapa AI's InkubaLM model aim to address these gaps by focusing on low-resource languages and leveraging open-source datasets, but widespread collaboration and support are essential for creating sustainable solutions that represent the continent's rich linguistic tapestry.

The numer of languages spoken across the African continent:

1,000-2,000

4.2 Exploring across the Value Chains

Across every step in each sector's value chain, challenges abound. Businesses around the region have found ways to solve these challenges using different aspects of AI.

Agriculture

Agriculture in sub-Saharan Africa faces a range of interconnected challenges across the entire value chain, from inputs to end markets, which significantly impact productivity, food security, and economic development. These challenges can be broadly categorised under input access, production, processing, storage, distribution, and market access.

1. Inputs

- **Limited Access to Seeds and Fertilisers**
  Smallholder farmers often lack access to improved seeds and fertilisers due to underdeveloped distribution systems. Fertiliser use is extremely low, averaging 8-15 kg of nutrients per hectare compared to the global average of 100 kg/ha. High prices and poor availability contribute to this limited use, while weak infrastructure and high transaction costs make inputs expensive.
- **Inadequate Irrigation and Water Management**
  Only 4% of cultivated land is irrigated, compared to 37% in South Asia, making agriculture highly dependent on unpredictable rainfall. This dependency exacerbates vulnerability to climate variability, as the region lacks sufficient investment in water storage and distribution.
- **Limited Access to Credit and Finance**
  Access to credit is restricted due to high risks associated with agriculture and the absence of tailored financial products. Smallholder farmers struggle to secure financing for essential inputs like seeds and fertilisers, which limits their ability to enhance productivity.
- **Weak Agricultural Research and Extension Systems**
  Agricultural research and extension services are underfunded, resulting in limited development and dissemination of technologies suited to diverse farming conditions. This gap hinders farmers' adoption of new practices that could improve yields and resilience.

2. Production

- **Environmental Challenges: Climate Change and Land Degradation**
  Agriculture in sub-Saharan Africa is predominantly rainfed, making it highly sensitive to climatic changes such as erratic rainfall and higher temperatures. Additionally, land degradation from deforestation and unsustainable practices threatens agricultural productivity, potentially causing significant loss of arable land by 2050.
- **Social Challenges: Support for Smallholder Farmers**
  Smallholder farmers lack access to training and support needed to adopt new technologies, reducing their ability to improve productivity and resilience against climate impacts. Governance issues, including political instability and inconsistent policies, further complicate agricultural development.

Average fertilizer use in sub-Saharan Africa:

8-15kg/ha

VS

Average fertilizer use globally:

100kg/ha

Irrigated farmland in sub-Saharan Africa:

4%

VS

Irrigated farmland in South Asia:

37%

3. Processing and Packaging

- **High Costs and Limited Access to Quality Packaging Materials**
  Packaging is often expensive and of low quality, limiting farmers' ability to preserve their produce. A lack of investment in packaging systems and a shortage of expertise further constrains the agro-processing sector, making products less competitive.
- **Challenges with Cold Storage and Transport**
  Inadequate cold storage facilities and poor transport infrastructure lead to significant spoilage. Without proper refrigeration, even well-packaged goods can perish, exacerbating post-harvest losses.

4. Storage and Distribution

- **Infrastructural Deficiencies**
  Poor road networks and storage facilities contribute to high transportation costs and post-harvest losses, with some estimates suggesting up to 40% of food produced is lost before reaching consumers. Low levels of mechanisation and dependence on traditional practices also limit efficiency in managing harvested crops.
- **Economic Barriers**
  Limited capital for investing in modern storage solutions and high costs for technologies like refrigerated transport deter farmers from adopting more efficient practices, perpetuating a cycle of inefficiency.

Post-harvest losses for farmers in sub-Saharan Africa can reach up to

40%

5. End Markets

- **Limited Market Access and Price Volatility**
  Farmers struggle to reach profitable markets due to inadequate infrastructure and price instability, which discourages investment in agriculture. The dominance of middlemen in supply chains also means farmers receive a smaller share of profits.
- **Dependence on Traditional Crops and Gender Disparities**
  Heavy reliance on staple crops reduces farmers' opportunities to access higher-value markets, while gender disparities restrict women's participation in agricultural value chains, limiting overall productivity.
- **Global Competition and Climate Challenges**
  Sub-Saharan African farmers often compete with subsidised imports, making it difficult to achieve profitability. Climate change adds another layer of complexity, with erratic weather patterns leading to inconsistent harvests and price increases.

Addressing these challenges requires comprehensive strategies that include improving infrastructure, expanding credit access, enhancing agricultural education, and investing in climate-resilient practices. Developing robust policies and fostering public-private partnerships can help unlock the region's agricultural potential.

Healthcare

The healthcare sector in Africa presents numerous opportunities as it increasingly adopts Artificial Intelligence (AI) to address critical challenges and enhance healthcare delivery. AI can optimise various components of the healthcare value chain, such as production, distribution, patient care, financing, and accessibility. Here's an overview of AI's potential across these components.

1. Producers: Enhancing Innovation

- **Pharmaceutical and Biotechnology Manufacturers**
  AI can significantly reduce the cost and time needed to bring new drugs to market

by identifying drug candidates, optimising production processes, and accelerating clinical trials. In Africa, where affordable medications are scarce, these advancements can improve access to life-saving treatments.

- **Medical Device Manufacturers**
  AI-powered diagnostic tools and wearable health monitors enhance healthcare accessibility, particularly in areas with few healthcare professionals. These devices provide real-time health insights, empowering patients to monitor their health remotely and helping bridge gaps in underserved communities.
- **Information Technology Firms**
  Companies focusing on AI solutions such as telemedicine platforms, electronic health records (EHRs), and diagnostic tools contribute to better healthcare outcomes. These technologies support timely care, allow data analysis for improved disease monitoring, and help allocate resources effectively.

2. Product Intermediaries: Optimising Supply Chains

- **Wholesalers and Group Purchasing Organizations (GPOs)**
  AI-driven predictive analytics help forecast medical supply needs, minimise waste, and ensure timely distribution. This is crucial in regions where inefficient supply chains lead to frequent shortages of essential medical products.
- **Direct-to-Consumer (DTC) Distributors**
  Automated replenishment of medications based on predictive algorithms ensures patients, especially in rural areas with limited access to pharmacies, receive timely medication delivery. This approach supports continuous patient care and reduces health risks.

3. Providers: Improving Patient Care

- **Hospitals and Healthcare Professionals**
  AI enhances healthcare by supporting diagnostic accuracy, decision-making, and automating workflows. It enables hospitals to detect patterns in patient data for quicker diagnoses and personalised treatments. Additionally, AI supports telemedicine by facilitating remote consultations, providing care to patients in underserved areas.
- **Integrated Delivery Networks (IDNs)**
  IDNs combine various healthcare providers and insurers, using AI to enhance patient outcomes and reduce costs through predictive analytics, automated billing, and patient monitoring. These tools streamline processes, enabling more efficient and coordinated care.
- **Pharmacies**
  AI-driven inventory management systems help pharmacies maintain critical medication supplies, reducing stockouts. Predictive analytics also assist in identifying potential medication interactions, thereby enhancing patient safety.

4. Fiscal Intermediaries: Innovating Healthcare Financing

- **Insurers and Pharmacy Benefit Managers (PBMs)**
  AI analyses healthcare claims data to predict patient risks, allowing insurers to create effective insurance plans and manage costs. AI helps detect fraudulent claims and identifies high-risk patients needing preventive care. For PBMs, AI optimises prescription benefits, ensuring cost-effective treatments without compromising quality.
- **Health Maintenance Organizations (HMOs)**
  AI tools help HMOs manage patient care by predicting individuals at risk of developing chronic conditions, enabling early intervention. This is crucial in Africa, where healthcare systems often struggle with non-communicable diseases like diabetes.

5. Purchasers: Empowering Consumers and Governments

- **Government**
  Governments can use AI to analyse health data, track disease outbreaks, and allocate resources effectively, ensuring healthcare services reach remote and underserved populations. AI also aids in designing data-driven public health interventions to improve national health programs.

- **NGOs and Donors**
  AI-driven insights help NGOs optimise medical supply distribution, monitor program effectiveness, and predict health trends, ensuring efficient use of resources. Real-time health outcome tracking enables NGOs to adjust programs swiftly for maximum impact.
- **Employers and Individuals**
  Employers can leverage AI to design health insurance plans tailored to employee needs, improving wellness and productivity. For individuals, AI-powered tools, such as telemedicine and diagnostic applications, provide access to healthcare services that were previously out of reach.

6. The AI-Driven Future of Healthcare in Africa

The potential of AI spans the entire healthcare value chain, offering solutions to improve diagnostics, streamline supply chains, and enable personalised care. Collaboration among stakeholders, investment in AI technologies, and building infrastructure will help bridge existing gaps in healthcare delivery, making quality care more accessible and affordable across Africa. With strategic efforts, AI can drive a healthcare revolution on the continent.

Education

The edtech sector in Africa has seen growth, particularly spurred by the COVID-19 pandemic, as startups aimed to address educational access challenges through technology. However, the integration of artificial intelligence (AI) in these ventures remains limited. According to Disrupt Africa, over 300 edtech startups operate across the continent, with 23 raising a combined USD 34.6 million in 2023—a 40% increase from the previous year. Despite this growth, edtech funding only accounts for 1.4% of total startup investments in Africa, indicating that it still lags behind sectors like fintech. For instance, Nigeria, once a leader in edtech funding, saw a notable decline, raising just USD 399.9 million in 2023, dropping behind Kenya, Egypt, and South Africa.

The numer of edtech startups that operate across Africa:

300+

The percentage of startup investments in Africa that are attributed to edtech funding:

1.4%

While some startups are beginning to explore AI, their approaches vary significantly. In Kenya, **Kytabu** has adopted a teacher-centred strategy, emphasising the importance of supporting educators rather than solely focusing on student tools. In contrast, South Africa's **Vambo AI** faces funding challenges as governments remain cautious about AI's role in education. Nigeria's **Schoolinka** views AI as a solution to poor teaching quality, aiming to improve student engagement and teacher effectiveness.

1. Applications of AI and Machine Learning (ML) in Education

Globally and in Africa, AI and ML are gradually reshaping education by enhancing learning experiences and providing personalised support. Machine learning, a key driver of AI advancements, allows for learning analytics—collecting, measuring, and using data about students to inform teaching strategies. For example, Kenya's **M-shule** uses an AI system to assess students' competencies and deliver appropriate lessons.

However, the adoption of advanced AI in education faces challenges such as high costs, integration difficulties, and data management issues. African institutions also struggle with overcrowded classrooms, limited resources, and diverse language needs, which AI could potentially help address.

2. Personalised Learning and Adaptive Systems

AI's potential to deliver personalised education is one of its most impactful applications. Adaptive learning systems tailor content based on individual students' progress, allowing for real-time adjustments. Tools like **Khan Academy's Khanmigo** and Kenya's **M-Shule** personalise lessons to accommodate students' learning paces. This approach is particularly beneficial in Africa, where large class sizes and resource constraints are common.

3. Intelligent Tutoring and AI-Driven Assessments

Intelligent Tutoring Systems (ITS) use AI to simulate one-on-one tutoring, providing real-time feedback and adapting to students' needs. Examples include **Brainly** and **Rori** in Ghana, which support students with subjects like maths through interactive tutoring. AI can also automate grading, easing teachers' workloads by providing quicker feedback through computer vision and natural language processing (NLP). This allows educators to focus more on teaching rather than administrative tasks.

4. AI in Multilingual Education

Natural Language Processing (NLP) can address language barriers in Africa's multilingual educational landscape by providing real-time translations and content in native languages. Tools like South Africa's **Foondamate** support students in multiple languages, making education more accessible. The continent's linguistic diversity, with over 2,138 languages, presents both a challenge and an opportunity for AI-powered language solutions to revolutionise education.

5. Addressing Inequities and Supporting Special Needs

AI has the potential to reduce educational inequities by offering personalised support, especially in multilingual settings or for students with disabilities. For instance, **Google Labs** in Accra has developed tools that transcribe speech for those with non-standard speech patterns, while **Cram101** uses algorithms to summarise and simplify textbooks.

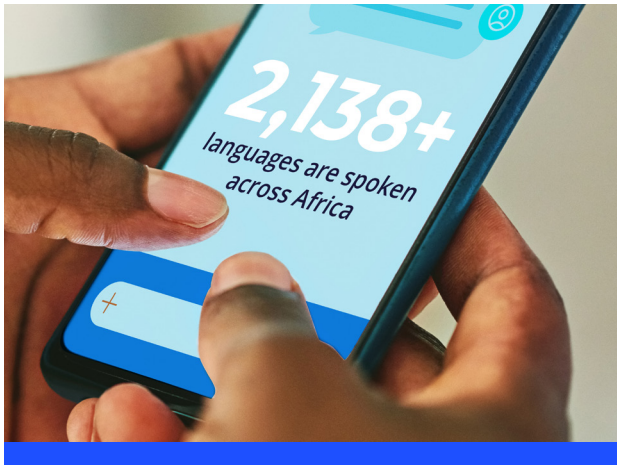
6. Ethical, Cultural, and Infrastructure Considerations

As AI adoption grows, ethical concerns around data privacy, over-reliance on AI, and its impact on critical thinking need to be addressed. In Africa, AI solutions must be culturally relevant and aligned with local educational needs, considering the limited infrastructure in many regions. Collaboration among educators, developers, and policymakers is crucial for creating effective AI tools.

7. AI Research and Training Initiatives Across Africa

Research initiatives are helping advance AI's role in education by building local expertise. Notable projects include Tanzania's **AI4D Africa lab**, Burkina Faso's **CITADEL**, and Ghana's **Responsible AI Lab**, which focus on AI research, ethical development, and addressing the continent's unique educational needs.

A significant challenge lies in the availability of representative datasets. Many AI models are based on Western contexts, overlooking African realities. Localised research and data collection are necessary to ensure AI technologies are effective and relevant across diverse African educational environments.



In Sub-Saharan Africa:

44m

SMEs account for

80%

of jobs
and contribute

50%

of the GDP

Businesses in the US that fail within the first five years:

48%

VS

Businesses in South Africa that fail within the first five years:

80%

SME Enablement

Sub-Saharan Africa's 44 million SMEs play a critical role in the region's economy, representing 80% of jobs and about 50% of GDP. However, they face challenges that threaten their sustainability and growth, such as economic instability, infrastructure inefficiencies, and high business failure rates. Research indicates that approximately 25% of U.S. businesses fail within the first year and nearly 50% within five years, while South African SMEs exhibit even higher failure rates of 70%-80% within five years. To address these challenges and foster growth, AI offers transformative solutions by automating tasks, optimising operations, and improving market intelligence access.

1. AI for SME Growth

AI technology can enhance the business ecosystem by reducing failure rates driven by high costs, inefficiencies, and limited financial access. A 2019 study revealed that 63% of companies adopting AI saw revenue growth, and 44% experienced cost reductions. Across sectors, AI has enabled both large corporations and SMEs to streamline operations, innovate, and grow.

SMEs can leverage AI tools like **General Purpose Technologies** for automation, **Natural Language Processing (NLP)** for customer engagement, and **Machine Learning** for business analytics. AI also helps overcome logistical issues in supply chains, reducing operational costs and creating more innovative products. In a survey of African SMEs, 70% reported using AI, citing benefits such as cost savings, efficiency, and risk reduction, while only 5% expressed concerns about AI-induced job losses.

2. AI Applications Across SME Activities

PRIMARY ACTIVITIES

- **Inbound Logistics**
  AI improves logistics by predicting supply needs and automating inventory management. For example, Nigeria's **TradeDepot** uses AI for predictive analytics to optimise inventory, pricing, and supply chain visibility, reducing out-of-stock scenarios. AI can also automate sourcing based on real-time data, allowing SMEs to focus on core business activities.

- **Outbound Logistics**
  AI optimises delivery schedules, routing decisions, and inventory tracking, which lowers transportation costs and improves customer satisfaction. In the pharmaceutical sector, **Zendawa** in Kenya uses AI for efficient last-mile delivery, reducing delays and logistical bottlenecks.

- **Operations**
  AI automates production tasks, identifies operational bottlenecks, and improves precision. Edge AI allows data processing on devices

without continuous internet, which benefits SMEs in areas with limited connectivity. For instance, Kenya's **Fastagger** enables offline machine learning (ML) model deployment for real-time data processing.

- **Data-Driven Decision Making**
  AI enables SMEs to process large datasets and make informed decisions regarding market trends, pricing, and resource allocation. In Kenya, **Zendawa** uses AI to manage inventory and credit scoring, enhancing financial accessibility for pharmacies.
- **Customer Engagement**
  AI-powered tools like NLP improve customer interactions by analysing behaviour and providing personalised recommendations. Platforms like Lelapa AI's **Vulavula** in South Africa offer multilingual services, enhancing customer engagement across diverse languages.

SUPPORT ACTIVITIES

- **Financial Management**
  AI automates financial tasks, such as invoicing and cash flow forecasting, offering SMEs affordable AI solutions through AI as a Service (AIaaS). This model allows small businesses to experiment with AI tools without significant upfront costs.
- **Access to Capital**
  AI helps SMEs access financing by analysing alternative data for credit scoring. Platforms like **Zeeh Africa** use AI to create credit profiles based on non-traditional data, expanding capital access for cash-dependent SMEs.
- **Human Resource Management**
  AI streamlines recruitment and employee training. AI-powered tools can automate resume screening and skill assessments, improving hiring quality. For example, South Africa's **Africa HR Tech** automates recruitment processes for better talent management.
- **Procurement and Vendor Management**
  AI automates procurement by forecasting demand and optimising sourcing. This approach reduces costs and streamlines supply chains, helping SMEs access better deals and improve vendor relationships.
- **Research and Development (R&D)**
  AI supports product development by analysing market data to identify trends and guide innovation. **MPharma** in Ghana uses AI for demand forecasting and inventory management, improving medicine access and reducing costs.

3. Understanding SME Failure Through a Value Chain Lens

High SME failure rates in Africa often stem from challenges in market access, finance, and talent acquisition. By applying **Porter's value chain framework**, the following key drivers have been identified:

- **Access to Markets**
  Poor infrastructure and high transportation costs limit SMEs' ability to reach markets. Cross-border payment issues and limited online presence further restrict market expansion. AI can help optimise logistics and enhance digital marketing strategies.
- **Access to Finance**
  SMEs face difficulties securing funding due to high interest rates and inadequate documentation. AI-driven credit scoring models can improve financing access by evaluating alternative data sources, reducing reliance on traditional credit histories.
- **Access to Talent**
  The shortage of skilled workers, especially in technology and customer service, hinders SME growth. AI-based recruitment tools and personalised training platforms can help SMEs attract and retain talent, addressing skills gaps.

5.

Global Innovations in AI Across the Sectors

Globally, AI development is taking place at a tremendous rate. However, not all of these are suitable for the African context. And the region does not always lag the developments elsewhere in the world. In smallholder agriculture, for example, many of the innovations described in this report are world leading!

Relevant global AI innovations include:

Agriculture

1. Precision Agriculture

OVERVIEW:

Precision agriculture employs AI to analyse data from various sources, such as satellites and drones, to monitor crop health and soil conditions.

KEY INNOVATIONS:

- **Real-Time Monitoring**
  Sensors collect data on soil moisture, temperature, and nutrient levels, allowing farmers to make informed decisions about irrigation and fertilisation.
- **Automated Irrigation Systems**
  AI algorithms optimise water usage by determining the precise amount of water needed, based on real-time data, promoting sustainability and reducing waste.

2. Autonomous Machinery

OVERVIEW:

The use of AI-powered autonomous machinery is revolutionising farming operations by automating tasks such as planting, harvesting, and weeding.

KEY INNOVATIONS:

- **Weeding Robots**
  Companies like FarmWise have developed robots that utilise computer vision to identify and remove weeds without harming crops, significantly reducing the need for chemical herbicides.
- **Drone Technology**
  Drones equipped with AI analyse crop health from above, providing insights into pest infestations and nutrient deficiencies.

3. Predictive Analytics

OVERVIEW:

AI systems analyse historical data to predict future agricultural trends, helping farmers anticipate challenges such as pest outbreaks or adverse weather conditions.

KEY INNOVATIONS:

- **Crop Threat Detection**
  Start-ups like Taranis employ high-resolution imagery combined with AI to detect potential threats to crops early, allowing for timely interventions.
- **Yield Prediction Models**
  AI tools can forecast crop yields based on various factors, enabling better planning and resource allocation.

4. Smart Greenhouses

OVERVIEW:

AI is used in smart greenhouses to optimise growing conditions by automatically adjusting environmental factors such as light, humidity, and temperature.

KEY INNOVATIONS:

- **Automated Climate Control**
  Systems utilise sensors and AI algorithms to create optimal growing conditions for plants, improving growth rates and resource efficiency.

5. Disease and Pest Management

OVERVIEW:

Machine learning algorithms analyse vast amounts of data to identify patterns that indicate disease outbreaks or pest infestations.

KEY INNOVATIONS:

- **Early Detection Systems**
  AI can monitor crop health through computer vision technologies that identify symptoms of diseases or pest damage before they become widespread.

6. Supply Chain Optimisation

OVERVIEW:

AI enhances agricultural logistics by improving supply chain management from farm to market.

KEY INNOVATIONS:

- **Traceability Solutions**
  Digital technologies track produce throughout the supply chain, ensuring quality control and timely delivery.

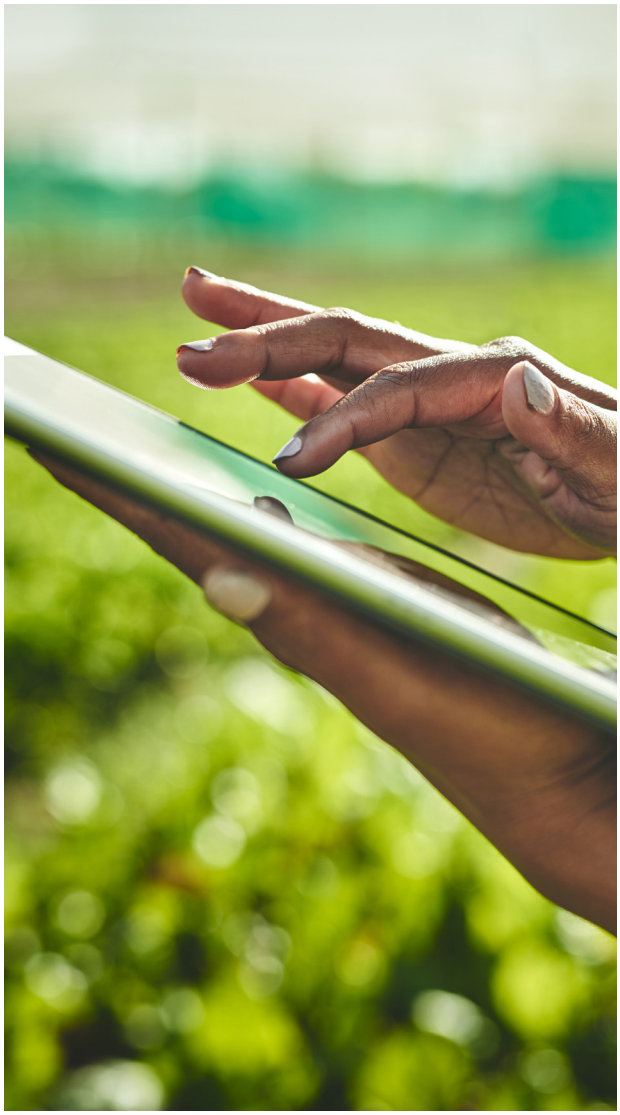
7. Edge AI for Sustainable Practices

OVERVIEW:

Edge AI enables real-time data processing at the source (e.g., on-farm sensors) rather than relying on cloud computing.

KEY INNOVATIONS:

- **Resource Efficiency:**
  This technology allows for immediate decision-making based on local conditions, improving the efficiency of resource usage while minimising environmental impacts.



Healthcare

1. AI in Diagnostics

AI is transforming diagnostics by analysing large datasets to detect diseases early. Key innovations include **digital pathology** platforms like PathAI and Data Pathology, which digitise pathology images for faster, more accurate cancer diagnosis. In **medical imaging**, Egypt's MediCals uses AI to assist radiologists by enhancing image analysis, reducing workloads, and improving diagnostic accuracy in underserved areas.

2. AI in Healthcare Operations and Administration

AI improves healthcare management by automating tasks and optimising resource allocation. **Operational AI** in South Africa's NetCare streamlines processes like sepsis detection and boosts hospital efficiency. **Patient data management** solutions, such as CTI Africa's AI analytics, improve patient tracking and responsiveness. Komodo Health integrates data sources to optimise patient care.

3. AI in Personalised Medicine

AI enables personalised treatments based on individual health data. Innovations include **risk stratification** by Helium Health, which tailors preventive care, and **predictive models** by IQVIA that enhance treatment choices for chronic diseases. **Precision medicine** initiatives, like Novartis and AstraZeneca's use of AI to identify drug targets and biomarkers, enhance cancer treatments. AI also supports **pharmacogenomics**, predicting drug responses from genetic profiles to reduce adverse reactions, as used by Roche.

4. AI in Supply Chain and Resource Optimization

AI optimises healthcare supply chains by managing inventory and ensuring traceability. **Inventory management** systems like Mckesson and Viebeg Medical predict demand to maintain stock levels, which is critical in

resource-limited regions. AI enhances **supply chain traceability**, reducing counterfeit risks and improving supply reliability.

5. AI in Telemedicine

AI-powered telemedicine enhances healthcare accessibility. **Telemedicine platforms** like Zambia's Welo Health support remote consultations, providing essential care to underserved populations. AI also aids in **automated patient scheduling**, which streamlines appointment management and reduces wait times in clinics and hospitals.

6. AI for Drug Discovery and Development

AI accelerates drug discovery by analysing large datasets to identify promising compounds. AI models are used to **design clinical trials**, optimising processes and speeding up new treatments. Molecule prediction with tools like **DeepMind's AlphaFold** expedites the discovery of novel drug candidates and deepens our understanding of biological mechanisms.

7. AI in Patient Monitoring and Wearables

Wearables equipped with AI continuously track patient health data, providing real-time alerts. **AI-integrated wearables**, such as smartwatches, monitor vitals like heart rate and oxygen levels, alerting healthcare providers to potential issues. For **chronic disease management**, AI monitors conditions like diabetes, predicting risks and enabling early interventions.

8. AI for Disease Outbreak Prediction and Management

AI supports outbreak prediction by analysing epidemiological data. **Predictive models** help forecast infectious disease spread, aiding early intervention efforts for diseases like Ebola or COVID-19. AI also optimises **vaccination distribution**, using demographic data to prioritise vulnerable populations.

9. AI in Mental Health

AI tools are emerging in mental health, improving accessibility and personalised support. **AI-powered chatbots** like Kenya's Sophiebot.ai provide affordable mental health screenings and preliminary counselling. In **therapy**, AI-driven tools adjust in real-time to patients' mental health needs, offering personalised guidance.

Education

Artificial Intelligence is fundamentally reshaping global education systems through innovations that enhance personalisation, accessibility, and efficiency. Key advancements include adaptive learning platforms, AI-powered tutoring, immersive technologies, and tools addressing equity gaps, all while navigating ethical challenges.

1. Personalised Learning Ecosystems

AI-driven adaptive learning systems analyse individual student performance to deliver tailored content, pacing, and feedback. Platforms like **Khanmigo** (powered by GPT-4) and **Squirrel AI** dynamically adjust lessons based on learners' strengths and weaknesses, ensuring no student is left behind. In Nigeria, a World Bank-supported pilot demonstrated AI's scalability: students achieved two years of curriculum mastery in six weeks—a 1,200% efficiency gain—with girls closing gender performance gaps. Such systems are particularly impactful in resource-constrained regions, offering equitable access to quality education.

2. Intelligent Tutoring and Mentoring

AI tutors like **ELSA Speak** provide real-time feedback on language pronunciation, while **Microsoft's Reading Coach** enhances literacy through personalised exercises. These tools act as 24/7 mentors, offering scaffolded support in subjects from maths to coding. For educators, AI reduces administrative burdens by automating grading and generating lesson plans, freeing time for targeted interventions.

3. Immersive Learning with VR/AR

Virtual and Augmented Reality (VR/AR) enable experiential learning in fields like medicine and engineering. Students interact with 3D anatomical models or historical simulations, deepening engagement and retention. As hardware costs decline, tools like **ClassDojo** gamify learning through scavenger hunts and leaderboards, merging education with interactive play.

4. Bridging Global Educational Inequity

AI addresses systemic barriers by delivering high-quality instruction to underserved populations. Singapore's **"Smart Nation"** initiative leverages AI to support students with special needs, while South Korea personalises homework based on learning analytics. Finland integrates AI with a focus on ethical frameworks, ensuring technology complements—rather than replaces—human educators.

5. Ethical AI and Future Frontiers

The rise of generative AI (e.g., ChatGPT) necessitates frameworks for responsible use. Over 57% of educators already employ AI daily, but emphasis is growing on transparency, data privacy, and mitigating algorithmic bias. Initiatives like the **AugmentED** program—a $25 million R&D effort—aim to co-create AI tools that reimagine teacher-student dynamics while prioritising equity.

Over 57%
of educators already employ AI daily

SME Enablement

AI is also playing a role in transforming the SME landscape globally. Innovations by companies like Sendbird and Square demonstrate the type of AI-driven advancements solving key SME challenges in developed and developing countries outside Africa. Similar technologies are increasingly being adopted by large corporations and innovative startups in Africa.

1. Sendbird

Sendbird is an innovative software company headquartered in California with two other offices in South Korea and Singapore. Founded in 2013, they are on a mission to build connections in a digital world, enabling conversations over digital media and bridging the gap caused by physical, cultural, and language barriers. The company offers AI-powered solutions for enterprises in various sectors including financial services, digital health, and retail.

- **Tailoring products for SMEs**

While Sendbird's products are used across various sectors and by leading digital enterprises such as the Hinge dating app, the company has also tailored products aimed at giving SMEs a competitive edge. Their products enable SMEs to improve their customer conversion, retention and engagement through **AI-powered chatbots** and solutions that use natural language processing and machine learning. These solutions decrease costs by automating more work while also increasing revenue through personalised recommendations and improved AI-powered customer engagement that contributes to customer retention. With AI coding expertise being both costly and scarce, especially for SMEs, Sendbird empowers its SME customers to build custom chatbots without the technical expertise usually required. This growing trend of **low- or no-code AI platforms** eliminates the skills barrier and makes AI solutions more **accessible** to SMEs, particularly in developing countries where the skills shortage is higher.

2. Square

Founded by Jack Dorsey and Jim McKelvey in 2009, Square was founded with a mission to increase the number of businesses that could accept credit card payments. Since then, the business has expanded to other countries like Ireland and the UK. They have also increased their product offering, with products such as Square Capital and Square Banking which give entrepreneurs access to funds and provide the full suite of banking services for SMEs.

- **Improving Access to Finance**

Square, like other innovative fintech companies, is leveraging AI and machine learning to revolutionise payment processing, financial services, and small business lending for SMEs. By harnessing the power of **big data analytics** and **AI algorithms**, Square is able to analyse vast amounts of transaction data to offer **tailored financial solutions** to SMEs, addressing a critical gap in the market.

One of the key applications of Square's AI-driven approach is in **credit risk assessment** for small business loans. This aligns with the growing trend of alternative credit scoring techniques being adopted by financial service providers to overcome the challenge of limited credit history documentation for many SMEs. By utilising AI to analyse transaction patterns, sales performance, and other relevant data points, Square can better assess the creditworthiness of SMEs, enabling them to access loans more easily and at better rates.

6.

What Will It Really Take in Sub-Saharan Africa?

The Roadblocks and Potential Solutions

AI solutions that might work in more developed countries of the world may face challenges when brought to Sub-Saharan Africa. There are a series of roadblocks that face implementers of AI solutions in this region.

Most of these are shared across all four of the sectors under review:

6.1 Data issues

- **Datasets are not widely accessible by the general public.**
  Start-ups desiring to use them have a real challenge to access relevant data in a usable form. Healthcare records are often paper-based and therefore still have to be digitised.
- **Inconsistent data collection**
  Outdated or irregular data collection methods in many areas result in significant information gaps and low quality data

SOLUTIONS

- **Invest in localised data collection**
  Collaboration between governments and private sectors can help build open data platforms. Crowdsourced data from the actual users (such as farmers or patients) via mobile apps can provide on-the-ground insights.
- **AI for data synthesis**
  Use AI techniques like transfer learning and synthetic data generation to work with sparse datasets.

6.2 Infrastructure constraints

- **Poor internet connectivity**
  Many areas in the region (especially more rural ones) lack reliable internet, which AI tools often depend on.
- **Lack of electricity**
  Stable power supplies are essential for AI tools, but stable and reliable electricity supply in most SSA countries is limited.
- **Low smartphone penetration**
  While mobile technology is widespread, many people do not own smartphones, limiting access to AI applications.
- **Poor network coverage**
  Insufficient 3G/4G coverage makes it difficult to access AI tools.

SOLUTIONS:

- **Invest in digital infrastructure**
  Governments should prioritise expanding internet and electricity access across all areas, possibly through public-private partnerships.
- **Low-cost solar energy**
  Solar-powered AI tools can enable data collection even in off-grid areas.
- **Mobile-friendly AI applications**
  Developers should focus on AI tools optimised for basic mobile phones or SMS platforms. Many start-ups have successfully managed to design their business models to allow regular feature phone distribution.

6.3 High Cost of Technology

- **Expensive hardware and software**
  Advanced hardware, such as sensors, drones and medical devices, are costly for the average small player.
- **Costly access to digital platforms**
  Many AI solutions require subscriptions or licences, which are prohibitive for low-income farmers, patients and parents.

SOLUTIONS

- **Subsidies and grants**
  Governments and international bodies like the **World Bank** could provide financial support for acquiring AI technology.
- **Shared Resources and Cooperatives**
  Cooperatives of users (as used extensively in agriculture) can pool resources to access AI tools collectively.
- **Open-source AI models**
  Promoting open-source AI platforms can reduce costs for developers and users.
- **Innovative financing models**
  Use micro-financing, leasing, or pay-as-you-go options for AI tools.
- **Digital financial inclusion**
  AI-enhanced credit scoring can improve access to loans for farmers or small enterprises.

6.4 Limited digital literacy and lack of top skills

- **Lack of technical knowledge**
  Many of the region's residents lack the skills to use AI tools.
- **Language barriers**
  AI platforms are often not available in local languages.
- **Lack of top skills**
  In all the countries there is a shortage of the top skills required to create advanced AI solutions.

SOLUTIONS

- **Training programs**
  Digital literacy initiatives should be rolled out to help students and citizens understand AI tools.
- **User-friendly interfaces**
  AI tools should have simple, multilingual interfaces. Voice-activated services in local languages can help bridge the language gap.

6.5 Challenges in model development

- **Lack of region-specific AI models**
  Most of the existing AI models have been developed for other geographical contexts, resulting in poor outcomes when they have been applied in Africa.
- **Lack of localised data**
  AI models require extensive datasets for training, but sub-Saharan Africa lacks much of the detailed local data needed, making it difficult to develop locally relevant models.

SOLUTIONS

- **Localised AI model development**
  Support local research centres to develop AI models suited to African conditions.
- **Collaboration with users**
  Involve farmers, teachers and doctors in AI tool development to ensure relevance to local practices.

6.6 Regulatory and policy barriers

- **Lack of digital policies**
  Many countries in the SSA region lack supportive regulatory frameworks. We have seen issues around data privacy and data sovereignty that are creating uncertainty and a slow-down in the rate of investment in AI solutions.
- **Limited funding for AI initiatives**
  Investment in AI for any of the sectors has not been a high priority for the governments of the region.

SOLUTIONS

- **Government support**
  Develop country or region wide digital strategies and clear policies.
- **Public-Private partnerships**
  Collaborate with technology companies and NGOs to fund AI development.

6.7 Resistance to change and community scepticism

- **Resistance to change**
  We have seen a reluctance amongst local people to adopt these new developments, especially amongst the older sectors of the population. This is particularly true in communities where the population is not fully literate. Getting a farmer to believe in advice from a "machine", or a patient to trust an AI-driven "doctor" has created friction to mass adoption.
- **Cultural relevance**
  In situations where new developments, especially technological, have been presented without local adaptation and consideration for relevance, these have not succeeded.

SOLUTIONS

- **Localised recommendations**
  Ensure AI outputs respect traditional practices.
- **Incremental adoption**
  Start with simple AI tools and gradually expand use as resistance is overcome.
- **Combine AI with traditional knowledge**
  Integrate local farming, medical or educational knowledge into AI models for better adoption.
- **Building innovation ecosystems**
  Strengthening Africa's innovation ecosystems in each sector is crucial. Fostering connections between tech companies, researchers, users, and policymakers can accelerate AI tool development. Innovation hubs focused on AI can serve as platforms for testing, scaling solutions, and building local talent.

7.

Ethical Considerations for Adopting AI Across Sub-Saharan Africa

Although AI promises incredible improvements to productivity and effectiveness across all four of our selected sectors, it is important that ethical and cultural considerations are intentionally recognised and considered when rolling out applications.

The region's unique cultural, historical, and socio-political landscape necessitates a tailored approach to AI deployment. Stakeholders must prioritise ethical frameworks that align with African values, address power imbalances in global AI governance, and safeguard against the erosion of cultural heritage and indigenous knowledge systems.

7.1 Foundational Ethical Principles for AI in Sub-Saharan Africa

1. Ubuntu Philosophy and Communal Ethics

The African philosophy of Ubuntu—emphasising **interconnectedness**, **communal welfare**, and **collective responsibility**—provides a critical ethical foundation for AI development. Unlike Western individual-centric models, Ubuntu prioritises community well-being, requiring AI systems to be designed for shared benefit rather than profit maximisation or unilateral control. For instance, AI-driven public health initiatives must balance efficiency with equity, ensuring rural communities are not marginalised by data biases or infrastructural gaps.

> Ethical AI frameworks must also integrate indigenous knowledge systems, which encompass centuries of ecological, medicinal, and social wisdom.

Extracting this knowledge without consent or fair compensation would amount to exploitation of the people involved. For example, AI applications digitising traditional farming practices should involve local custodians in data collection and interpretation to preserve contextual accuracy.

2. Cultural Sensitivity and Heritage Preservation

- **Safeguarding Intangible Cultural Heritage**

Sub-Saharan Africa's cultural heritage—encompassing oral traditions, rituals, and artisanal crafts—faces existential threats from globalisation and environmental degradation. AI tools for **heritage preservation**, such as machine learning algorithms cataloging linguistic diversity, must avoid reducing living traditions to static datasets. A hermeneutic-phenomenological approach, advocates for AI systems that interpret cultural artifacts through the lived experiences of communities, ensuring digital representations retain their spiritual and social significance.

However, AI-driven heritage projects risk **cultural imperialism** if developed without local input. For instance, Western-designed virtual reality simulations of African rituals could distort their meaning, stripping them of sacred context. Culturally sensitive AI requires participatory design, where elders and knowledge bearers co-create preservation tools that align with communal values.

3. Data Sovereignty and Managing AI Governance

- **Addressing Data Management**

  Sub-Saharan Africa's limited infrastructure and reliance on foreign tech corporations have created vulnerabilities in data sovereignty. Many AI systems depend on datasets extracted from African users without adequate consent or benefit-sharing, reinforcing economic dependencies. The draft **African Union Continental Strategy on AI** seeks to counter this by promoting local data governance laws, such as Rwanda's emphasis on domestic cloud storage and ethical AI audits.

  Managing AI governance also demands reviewing Western-centric regulatory paradigms. Current global AI ethics guidelines often neglect African nuances, such as the Yoruba concept of **Ìwàpẹ̀lẹ̀** (moral balance) or the Swahili principle of **Ujamaa** (cooperative economics). Regional bodies like the East African Community are now advocating for AI policies that prioritise communal rights over corporate interests, ensuring technologies like facial recognition do not exacerbate surveillance or ethnic profiling.

4. Equity and Inclusive Development

- **Bridging Gender and Accessibility Gaps**

  AI deployment in Sub-Saharan Africa must confront entrenched gender disparities. For example, AI-powered healthcare platforms often underrepresent women's health data, leading to biased diagnostic tools. Ethical frameworks should mandate **gender-balanced datasets** and involve women-led organisations in AI design processes. Similarly, AI solutions for education must accommodate **linguistic diversity**, avoiding overreliance on English or French algorithms that marginalise speakers of indigenous languages.

  Inclusive infrastructure is equally critical. While startups in Cape Town use AI to digitise endangered languages, rural areas still lack broadband access, widening the digital divide. Public-private partnerships, such as Nigeria's AI-driven tuberculosis screening initiative, demonstrate how localised infrastructure investments can enhance accessibility while respecting cultural norms.

5. Ethical Risks and Mitigation Strategies

- **Bias and Algorithmic Discrimination**

  AI systems trained on non-African datasets frequently perpetuate racial and cultural biases. For instance, facial recognition technologies misidentify darker-skinned individuals at higher rates, risking wrongful arrests or exclusion from services. Mitigating this requires **diversifying** training data and establishing AI fairness **audits** led by African ethicists. Ghana's proposed AI regulatory body, which includes traditional leaders and civil society advocates, exemplifies this multisectoral approach.

- **Environmental and Economic Justice**

  AI's environmental footprint—from energy-intensive data centres to e-waste—disproportionately affects African nations already grappling with climate change. Ethical AI deployment must prioritise **sustainable practices**, such as solar-powered edge computing, to minimise ecological harm. Economically, AI should empower local entrepreneurs rather than foreign corporations. Kenya's AI-driven agritech startups, which use machine learning to optimise crop yields while compensating farmers for data contributions, illustrate a model of **equitable innovation**.

8.

Policy Recommendations: Paving the Way for AI Across the Region

The importance of policy initiatives in establishing **safe and effective AI practices** cannot be overstated. As AI technologies evolve, robust policies are essential for addressing ethical, legal, and operational challenges, ensuring that AI systems serve the public good while mitigating risks.

8.1 Current Initiatives across the region

The following is a brief overview of the primary AI initiatives in the six countries:

Nigeria

Nigeria has been proactive in developing its AI landscape through the **National Digital Economy Policy and Strategy (NDEPS)**, which emphasises the integration of AI in various sectors. The government is fostering an ecosystem that supports startups and innovation hubs. Initiatives like the **Nigerian AI and Robotics Competition** aim to encourage youth engagement in AI technologies. Additionally, partnerships with international organisations are being formed to enhance local capabilities in AI research and application.

Ghana

Ghana's **National Artificial Intelligence Strategy (2023-2033)** aims to leverage AI for inclusive social and economic transformation. The strategy focuses on enhancing human potential and improving quality of life through AI applications across sectors such as healthcare, agriculture, and finance. The establishment of **Google's first African AI lab** in Accra highlights the country's commitment to becoming a regional tech hub. Moreover, various initiatives are underway to improve digital skills among the youth, including mentorship programs and coding workshops.

Togo

Togo has initiated efforts to develop its AI framework through partnerships with organisations like **Smart Africa**. The government is working on a national digital strategy that includes AI as a key component for economic development. Togo's focus is on building infrastructure and regulatory frameworks that support innovation while addressing ethical concerns related to AI deployment.

Kenya

Kenya is recognised for its vibrant tech ecosystem, often referred to as **"Silicon Savannah."** The government has launched several initiatives aimed at integrating AI into public services, including healthcare and agriculture. The **Kenya National Innovation Agency** is spearheading efforts to promote research and development in AI technologies. Additionally, the country has seen significant investment from private sector players in AI startups focused on solving local challenges.

Rwanda

Rwanda's **National Artificial Intelligence Policy** was enacted in 2023, aiming to harness AI for socio-economic development while adhering to ethical standards. The policy emphasises stakeholder engagement and capacity building within the local workforce. Rwanda has also established itself as a leader in **drone technology** for medical supply delivery, showcasing practical applications of AI in improving health outcomes. The government promotes partnerships with international organisations to bolster its AI capabilities.

South Africa

South Africa is advancing its AI initiatives through the **National Strategy on Artificial Intelligence**, which focuses on promoting ethical use of AI while enhancing economic growth. The country has established several research institutions dedicated to AI studies and applications. Initiatives like **Data Science for Social Impact** aim to leverage data analytics and AI to address societal challenges such as poverty and health disparities. Furthermore, South Africa is actively participating in international discussions on AI governance and ethics.

8.2 Policy Recommendations

Agriculture

There are several policy recommendations for policymakers in sub-Saharan Africa to increase opportunities for using AI in agriculture:

Invest in Digital Infrastructure

Governments should prioritise investments in digital infrastructure, including high-speed internet access, cloud computing resources, and data centres. This will enable the collection, storage, and processing of large volumes of agricultural data required for AI applications.

Promote Data Sharing and Governance

Policymakers should create incentives for public and private sector entities to share agricultural data. This could include establishing data trusts and developing data governance frameworks to ensure fair and ethical use of data.

Support AI Research and Development

Governments should allocate funding for AI research and development in agriculture, focusing on adapting AI solutions to local contexts. This can be done by partnering with universities, research institutions, and private sector players.

Develop AI-Focused Education and Training Programs

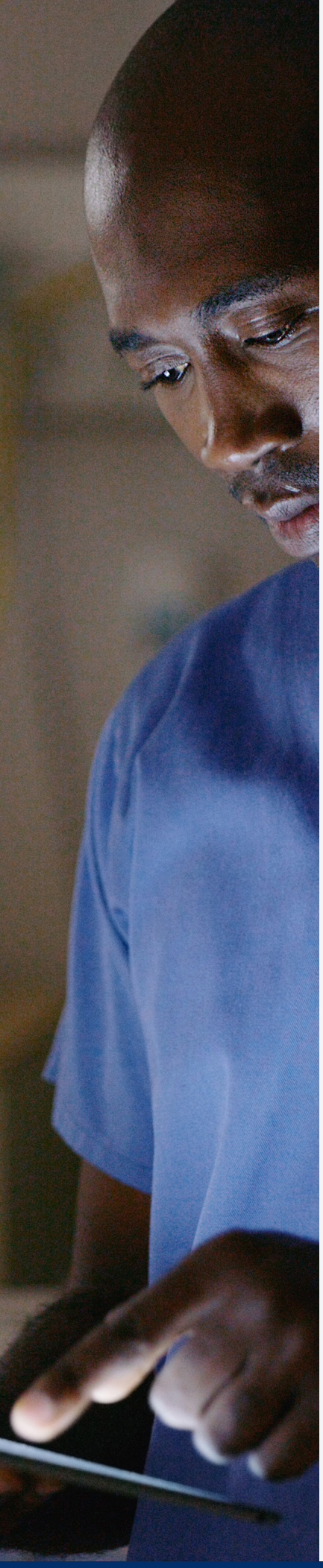
Policymakers should invest in education and training programs to build AI skills and knowledge among farmers, extension workers, and agricultural professionals. This will enable them to effectively utilise AI-powered tools and make data-driven decisions.

Establish AI Regulatory Frameworks

Governments should develop regulatory frameworks to ensure the responsible and ethical development and deployment of AI in agriculture. This includes addressing issues such as data privacy, algorithmic bias, and transparency.

Provide Financial Incentives for AI Adoption

Policymakers should consider providing financial incentives, such as subsidies or tax credits, to encourage the adoption of AI technologies by smallholder farmers and agribusinesses. This will help overcome the initial cost barriers associated with AI implementation.



Healthcare

To unlock the full potential of AI in healthcare and attract greater foreign direct investment, African countries need to embrace a more coordinated and strategic approach.

By fostering an environment of collaboration, clarity, and innovation, the continent can create a thriving ecosystem that not only benefits its citizens but also positions Africa as a leader in global healthcare innovation. Here are our key recommendations:

Increase Harmonization Across Countries

African nations should strive for greater regulatory alignment to create a more attractive environment for foreign direct investment. Harmonising regulations and standards across countries would simplify the process for investors and technology providers to operate regionally. This could involve establishing common frameworks for data governance, licensing, and the ethical use of AI in healthcare, making it easier for companies to scale their solutions across borders without encountering fragmented regulatory barriers.

Establish a Clear Checklist for Public Sector Adoption

A standardised checklist or set of criteria for technology adoption in the public healthcare sector would provide clarity and confidence for innovators looking to enter the market. By defining clear benchmarks for data privacy, interoperability, and clinical efficacy, governments can streamline the process of integrating new technologies into public health systems. This would also ensure that only high-quality, impactful solutions are adopted, improving overall health outcomes.

Leverage Existing Policy Guidelines

Policymakers should utilise and build upon existing frameworks, such as the guidelines developed by the **Intergovernmental Working Group** (initiated by the Novartis Foundation), to create a robust regulatory environment for AI in healthcare. These guidelines can serve as a foundation for national and regional policies, providing a structured approach to the ethical and effective use of AI. Aligning national policies with these established guidelines can also facilitate greater trust and collaboration with international partners.

Create a Centralised Health Data Framework

A centralised health data framework would enable African countries to share learnings, outcomes, and best practices across borders. This framework should include standardised data collection protocols, secure data-sharing mechanisms, and platforms for collaboration. By pooling data and insights from diverse healthcare projects, countries can accelerate the development and deployment of effective AI solutions, avoiding duplication of effort and ensuring that successful innovations are quickly scaled.

Define Minimum Data Standards for Collection

Establishing minimum data standards for health data collection is essential for ensuring that AI tools are trained on high-quality, consistent data. These standards should cover aspects such as data completeness, accuracy, and format, making it easier to aggregate and analyse information across different projects and regions. This will not only improve the quality of AI models but also enhance the reliability of insights derived from health data.

Clarify Policies for Utilising Global Cloud Infrastructure

African governments should provide clear guidance on how startups and innovators can leverage global cloud infrastructure. By setting transparent policies around data storage, processing, and compliance, countries can enable startups to build scalable, secure, and efficient solutions on platforms like **AWS**, **Google Cloud**, and **Azure**. This would reduce the cost and complexity of infrastructure development, allowing local innovators to focus on creating impactful healthcare technologies.

Facilitate Knowledge Sharing Between Countries

Countries with more advanced AI integration and regulatory frameworks should share their experiences and best practices with their neighbours. Establishing forums or partnerships for knowledge exchange would allow policymakers and innovators to learn from each other, accelerating the adoption of effective AI regulations and technologies. This collaborative approach would help raise the standard of healthcare across the continent and ensure that successful models are replicated in other regions.

Form a Startup Advocacy Body

A dedicated startup body or trade group could serve as a bridge between the innovation community and policymakers. This organisation would advocate for the needs and concerns of startups, providing insights into barriers to investment, challenges in hiring local technical talent, and other factors inhibiting business growth. By presenting a unified voice, this group can help shape policies that foster a more supportive and enabling environment for AI and healthtech startups.

Education

To harness the transformative potential of AI in African education, governments, policymakers, and educational stakeholders must address the existing challenges through a comprehensive and coordinated approach. Given the few countries with AI policy or AI referenced in national education policies and curricula, there is a gap in top-down guidance at a policy level.

This section provides actionable recommendations to pave the way for an equitable and effective integration of AI into education systems across the continent:

Build Infrastructure for the Future

To ensure that AI-driven educational tools can be widely adopted, significant investments in digital and physical infrastructure are required. Governments must prioritise expanding high-speed internet access and ensuring reliable electricity, especially in rural and underserved regions. Leveraging innovative solutions like solar-powered ICT labs as seen in Ghana, and mobile learning centres can help bridge infrastructure gaps, ensuring that all students—regardless of their location—have equitable access to AI-powered education.

Foster Public-Private Partnerships

Collaboration between governments, the private sector, and educational institutions is essential to fund and scale AI-driven solutions in education. Public-private partnerships can pool resources and expertise, allowing for the co-development of AI tools that are both technologically advanced and tailored to local educational needs. Governments can provide strategic direction, while the private sector offers the necessary technological capabilities and financial backing. This cooperation will accelerate the adoption and long-term sustainability of AI in education.

Develop AI-ready Policies and Regulatory Frameworks

Policymakers must update and develop regulatory frameworks that support the ethical, inclusive, and effective use of AI in education. These frameworks should focus on safeguarding data privacy, promoting equity, and ensuring access to AI-driven solutions, particularly in marginalised and underserved communities. A key aspect of this policy shift should be the establishment of a centralised body—such as a **Remote Education Administration Unit**—to oversee the strategic implementation and monitoring of AI technologies in education across the country.

Ensure Cultural Relevance and Inclusivity in AI Tools

For AI to be successfully integrated into African education systems, the solutions must be culturally relevant and inclusive. AI models should reflect local languages, customs, and educational goals to resonate with both students and teachers. Machine learning, the most common form of AI used in education as discussed elsewhere, relies on extensive datasets for training. If these datasets do not align with students' and teachers' aspirations and government school curricula, especially if developed abroad, their adoption rates in schools are likely to remain low, even if the digital infrastructure gap is addressed. Contextualising AI tools to align with national curricula and educational priorities will drive higher adoption rates, particularly in rural and multilingual regions. Localised AI solutions will also help ensure that marginalised communities are not left behind in the digital revolution.

Address Procurement Barriers for AI Tools

The complexity of government procurement processes often hinders the adoption of new technologies in education. To streamline this process, governments should align procurement strategies with national education priorities, ensuring that AI tools are integrated into foundational subjects such as numeracy and literacy alongside more advanced skills like coding. Simplified procurement will enable faster access to AI-driven solutions in public schools, particularly those with limited financial and administrative resources.

Boost Funding for Local AI Research and Development

Local AI research is crucial to creating contextually relevant and effective educational tools. Governments, in collaboration with universities and private sector partners, should invest in research and development (R&D) initiatives that focus on AI for education in African contexts. This will help ensure that AI tools are designed with local educational challenges in mind, such as language barriers and infrastructure gaps. Increasing funding for local R&D will support the development of AI solutions that can be tailored to the specific needs of African students and educators.

Build Capacity for Educators Through Comprehensive Training

Effective integration of AI in classrooms requires that educators are equipped with the necessary digital skills and tools. Governments and educational stakeholders must prioritise teacher training programs that focus on AI and digital literacy, providing continuous professional development to adapt to emerging technologies. By empowering teachers with the knowledge and confidence to use AI-driven tools, education systems can fully leverage AI's potential to improve learning outcomes.

Foster Stakeholder Engagement and Build Trust

AI's novelty in education, combined with concerns about data privacy and its effectiveness, has created a trust gap among stakeholders. Governments, educational institutions, and private sector actors should work together to build trust by validating the impact of AI tools through data and case studies. Engaging stakeholders—particularly educators, students, and parents—in the implementation process will help foster confidence in AI's role in improving educational outcomes, increasing its adoption across schools.

9.

Where to Focus Our Attention When Using AI in Sub-Saharan Africa

To ensure that this report delivers relevant and actionable insights, we have focused on moving beyond theoretical research into practical applications of AI. Recognising the diverse challenges within Africa's AI landscape, a methodology was developed to prioritise the most urgent and responsive AI use cases. This involved identifying critical pain points across each value chain and aligning AI use cases that could effectively address them.

CRITERIA	HIGH (5)	MODERATE (3)	LOW (1)

Agriculture

The Value Chain	Challenges	Strategic Alignment	Impact	Urgency	Inclusivity	Complexity	Feasibility	Total
Growing and Production	Lack of information on weather, soil and irrigation	5	5	5	4	3	4	**26**
Growing and Production	Lack of identification/ remedy for pests and diseases	5	5	5	4	4	4	**27**
End Markets	Knowledge of commodity prices, demand, volumes	5	5	5	4	3	4	**26**

Healthcare

The Value Chain	Challenges	Strategic Alignment	Impact	Urgency	Inclusivity	Complexity	Feasibility	Total
Providers	Shortage of Healthcare Professionals	5	5	5	4	3	4	**26**
Providers	Limited Access to Diagnostic Services	5	5	5	4	3	4	**26**
Product Intermediaries	Supply Chain Inefficiencies for Medicines and Supplies	5	5	4	4	3	4	**25**
Purchasers	High Prevalence of Infectious and Chronic Diseases	5	5	5	4	3	3	**25**

Education

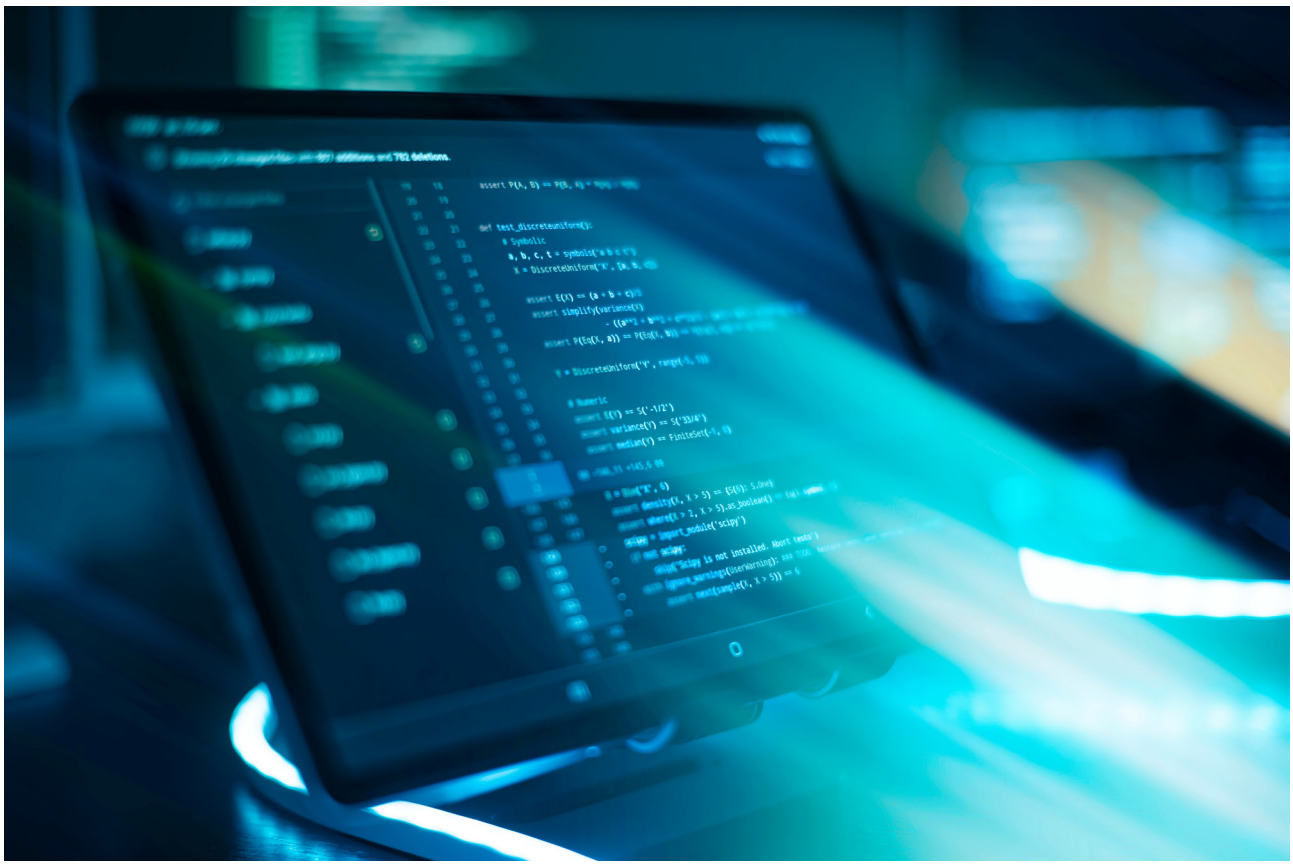
The Value Chain	Challenges	Strategic Alignment	Impact	Urgency	Inclusivity	Complexity	Feasibility	Total
LEARNING (Student Engagement and Success)	Overcrowded classrooms limit teacher-student interaction and engagement	5	5	5	4	3	4	**26**
	Inadequate infrastructure (poor / lack of facilities) hampers learning access / quality	5	5	5	5	3	3	**26**
TEACHING (Instruction/Workload Management)	High teacher-student ratios reduce attention per student.	5	5	5	5	3	4	**27**

SME Enablement

The Value Chain	Challenges	Strategic Alignment	Impact	Urgency	Inclusivity	Complexity	Feasibility	Total
Access to Finance	High interest rates	5	5	5	4	3	4	27
	Limited VC and equity investment	5	5	5	3	3	4	25
	Insufficiently documented history	5	5	5	3	3	4	25

10.

Conclusion: AI is the Only Way to Transform Critical Sectors in Sub-Saharan Africa



AI is poised to significantly transform key sectors in Sub-Saharan Africa, notably agriculture, education, healthcare, and small and medium enterprises (SMEs). Each of these sectors faces unique challenges that AI can help address, fostering economic growth and improving quality of life across the region.

Agriculture

The agricultural sector in Sub-Saharan Africa is crucial, with over 60% of the population engaged in farming and agriculture contributing approximately 23% of GDP. However, climate change poses severe threats to food security.

AI technologies can enhance agricultural practices through:

- **Precision Agriculture**
  AI can analyse satellite data to monitor crop health, soil conditions, and weather patterns, enabling farmers to make informed decisions about planting and resource management.
- **Disease and Pest Management**
  Tools like drones equipped with computer vision can identify crop diseases and pest infestations early, allowing for timely interventions that minimise losses.
- **Yield Optimisation**
  AI algorithms can predict yields based on various factors, helping farmers optimise their production strategies and improve food security.

Despite the potential, challenges such as limited infrastructure and data availability remain. Collaborative efforts between local stakeholders and international partners are essential to tailor AI solutions to the diverse agricultural landscapes of the region.

Education

In the education sector, AI offers opportunities for personalised learning experiences that cater to individual student needs.

Key benefits include:

- **Personalised Learning**
  AI can facilitate one-on-one tutoring by assessing students' learning levels and adapting materials accordingly. This approach enhances engagement and comprehension.
- **Administrative Efficiency**
  AI tools can automate administrative tasks such as grading and attendance tracking, allowing educators to focus more on teaching.
- **Access to Resources**
  With increasing internet penetration, AI can provide educational resources to remote areas, bridging gaps in access to quality education.

  However, the successful integration of AI in education requires a robust policy framework to address data privacy concerns and ensure equitable access to technology.

Healthcare

AI's impact on healthcare in Sub-Saharan Africa is particularly promising given the region's significant disease burden and shortage of healthcare professionals.

AI applications include:

- **Augmenting Workforce Capacity**
  AI can support community health workers by providing diagnostic assistance and treatment recommendations, effectively compensating for the shortage of trained medical personnel.
- **Data Management**
  AI technologies can streamline patient data management and enhance disease tracking systems, improving overall healthcare delivery.
- **Telemedicine**
  AI-driven platforms can facilitate remote consultations, making healthcare more accessible to underserved populations.

  Despite these advancements, challenges such as inadequate infrastructure and data quality must be addressed to realise the full potential of AI in healthcare.

Small and Medium Enterprises (SMEs)

AI can significantly benefit SMEs in Sub-Saharan Africa by enhancing operational efficiency and market reach.

Notable applications include:

- **Market Analysis**
  AI tools can analyse market trends and consumer behaviour, helping SMEs make informed decisions about product development and marketing strategies.
- **Supply Chain Optimisation**
  AI can improve logistics management by predicting demand fluctuations and optimising inventory levels.
- **Financial Services**
  AI-driven fintech solutions can provide SMEs with better access to credit through improved risk assessment models.

  For SMEs to fully leverage these benefits, there must be investments in digital infrastructure and training programs that equip entrepreneurs with necessary skills.

The transformative potential of AI across agriculture, education, healthcare, and SMEs in Sub-Saharan Africa is immense. However, realising this potential hinges on overcoming significant barriers such as infrastructure deficits, data accessibility issues, and the need for supportive policy frameworks. Collaborative efforts among governments, private sectors, educational institutions, and local communities will be vital in harnessing AI's capabilities to drive sustainable development across the region. As these sectors evolve with technological advancements, they hold the promise of not only improving economic outcomes but also enhancing the quality of life for millions across Sub-Saharan Africa.

11.

Case Studies

11.1 Crop2Cash, Nigeria

BACKGROUND:

Crop2Cash was founded in Nigeria on the 18th of May 2018 with a vision to eliminate hunger. They aim to achieve this through the empowerment of farmers.

Crop2Cash makes formal financing accessible to smallholder farmers using technology. Their operating system for agricultural lending makes it possible for farmers to pay and get paid; build a digital financial profile and get access to credit that will assist their business in becoming more profitable.

CHALLENGES:

- There are insufficient agricultural extension officers to serve the hundreds of thousands of smallholder farmers in sub-Saharan Africa. Farmers need assistance on inputs, type of crops to plant, timing of planting and harvesting, pesticides and fertilisers. They do not have access to smartphones to acquire this information.
- Farmers do not have access to financing to purchase seed and fertiliser. This is chiefly because they do not have a credit history or any evidence of their farming output.
- Farmers find it difficult to access high quality inputs in order to improve the quality and quantity of their farming output.

SOLUTIONS:

- Crop2Cash has created a toll-free, AI-powered helpline that serves as a digital extension officer for rural farmers. Customers can call on a standard feature phone without charge to obtain agricultural advice on planting, growing, harvesting, pests and disease, all in their own language. The advice is delivered by an AI chatbot using a locally developed large-language model.
- Crop2Cash provides a USSD-based solution for making and receiving digital payments. It also retains records, allowing the farmer to build up a financial identity and thereby access credit. Being operated on USSD means that no smart phone or internet access is required.
- Crop2Cash also offers a C2C app for sourcing quality agricultural inputs. These can be sourced and compared via the app, and then paid for using the digital payment solution. The inputs are then delivered to the farmer's location.

11.2 Netcare, South Africa

BACKGROUND:

Netcare, a leading private healthcare provider in South Africa, serves 15% of the population. Their services include hospital care, GP services, dentistry, psychiatric care, renal care, and emergency services.

> Netcare has been working to modernise healthcare operations through AI and data analytics initiatives, aiming to improve efficiency and patient outcomes.

15% of the South African population is served by **Netcare**

Netcare's **Data Management and Analytics team** consisted of **26** people in specialised roles

CHALLENGES:

- Heavily reliant on paper-based systems, which led to repetitive data collection from patients and inefficient workflow processes
- Had a limited ability to analyse and make use of the collected data
- Needed to maintain cost efficiency while serving a large patient population

SOLUTIONS:

- Implemented Electronic Medical Record (EMR) systems across all hospitals, which streamlined data collection and made patient information more accessible
- Created integrated data collection systems and established robust data governance frameworks to ensure data quality and security
- Formed a Data Management and Analytics team. This team included specialised roles such as data scientists, data engineers, data quality analysts, data governance analysts, and data architects

M-Shule

11.3 M-Shule, Kenya

18%

of rural households in Kenya have internet access

30%

of adults in Kenya own a smartphone

CHALLENGES:

In Kenya, many students, particularly in rural areas, face challenges in accessing the internet and smartphones—tools that are increasingly important for modern learning. Only 36.3% of households have internet at home, with just 3.4% of rural households connected . This lack of connectivity has created a significant barrier to the transformative potential of educational technology solutions, leaving many students without access to the resources they need to succeed.

SOLUTION:

M-Shule is an AI-driven platform designed to overcome these barriers by delivering personalised lessons to students via SMS, a technology that requires neither smartphones nor internet access. The platform uses machine learning algorithms to tailor lessons to each student's individual learning pace and needs. By analysing student performance data, M-Shule continuously adapts its content to ensure that students receive relevant and targeted educational support.

> The platform's reach extends to students in remote areas with little or no access to traditional educational resources.

For example, it delivers daily SMS lessons in subjects such as mathematics, English, and life skills, ensuring that every learner can benefit from a structured educational experience, regardless of their physical location or economic circumstances. Parents and teachers can also receive feedback on students' progress via SMS, enabling them to support their children's learning journeys more effectively.

RESULTS:

M-Shule's impact is promising. It not only democratises access to education for students in marginalised areas but also provides a scalable model for how AI can be deployed to address significant infrastructural gaps. By leveraging a simple yet powerful technology—SMS—M-Shule has created an inclusive, low-cost solution that ensures all students, regardless of their socio-economic background, have the opportunity to receive a quality education.

11.4 Digital Umuganda, Rwanda

The percentage of Rwandan people who live in rural areas:

70%

The increase in vaccination uptake that Digital Umuganda contributed to during the pandemic:

30%

CHALLENGES:

In Rwanda, there are approximately three urban residents (27.9%) for every seven rural residents (72.1%). With over 70% of the population in rural areas, access to timely and accurate information remains a significant challenge, especially for businesses and public services. Rural communities often lack access to essential services and information due to limited connectivity and language barriers. During the COVID-19 pandemic, this gap became particularly critical, with rural populations struggling to receive health-related updates and safety guidelines in their local languages. This not only hampers businesses' ability to scale but also prevents these communities from benefiting from important products and services. For businesses aiming to engage these communities, the challenge extends beyond just overcoming the connectivity issue —it involves overcoming linguistic diversity and low levels of digital literacy.

SOLUTIONS:

- Enabled AI platforms to speak to marginalised communities using open-source language datasets
- Developed AI-powered platform to deliver real-time information in local languages
- Developed AI algorithms to continuously analyse local dialects and user data to improve the accuracy and relevance of the information delivered, ensuring scalability across different regions and languages.
- Over 100,000 people in rural Rwanda have benefited from timely health updates and business-related information through its platform. During the pandemic, the company's AI tools contributed to a 30% increase in vaccination uptake in regions where language barriers previously hindered communication efforts

12.

Appendix

12.1 Methodology

Data for this research were collected through extensive primary research conducted from May through August 2024. The methodology was designed to gather insights from a broad range of stakeholders involved in the AI and healthcare space across Africa, with careful consideration given to regional representation and the potential for rapid changes in the landscape.

Our research methodology involved gathering perspectives from three key stakeholder groups: Private Sector Companies, Agencies (including NGOs, philanthropies, global institutions like WHO and World Bank, and donors), and both national and pan-African policy makers. By examining the current use cases of AI through these lenses, we aimed to provide a comprehensive understanding of the landscape, the regulatory environment, and the concerns and attitudes of regulators and agencies. This approach allows us to assess the current state of AI in healthcare in Africa, understand its trajectory, and make informed recommendations to regulators and donors on fostering an enabling environment that maximises AI's benefits while mitigating its drawbacks.

1. Landscape Analysis (n=569)

We began by reviewing a comprehensive database of healthtech innovators, supplemented with detailed desk research to identify AI innovators relevant to this study. Initially, our focus was on six countries - Rwanda, Kenya, Côte d'Ivoire, Ghana, Nigeria, and South Africa. However, recognizing that this approach resulted in an Anglophone-centric cohort, we shifted to a clustered approach to include companies from North, East, West, and Southern Africa. This adjustment allowed us to capture a broader and more representative view of the healthcare landscape across different regions of Africa. Despite this thorough approach, some companies may have been missed during the initial landscaping phase.

2. Screening and Ranking (n=100)

From the initial landscape analysis, we screened 569 private sector companies to ensure their relevance to our study's scope. These companies were then ranked using a scoring matrix that evaluated key metrics such as market traction, funding stage, diversity of AI solutions offered, and their current/projected impact on healthcare. This process led to the selection of the top 100 companies, with 60 moving forward for deeper engagement through interviews. It's worth noting that we avoided interviewing competitive companies falling within the same niche, as early interviews suggested that responses from these companies were nearly identical, providing little to no new insights.

3. Data Collection (n=39)

We reached out to the top 60 innovators, receiving responses from 39, with 38 providing full interviews. These structured interviews were conducted with founders and executives from both pre-Series A startups, and post-Series B scale-ups. The interviews focused on gathering detailed information about their business models, operational scale, funding stages, challenges in AI adoption, and their current and planned use of AI technologies.

Additionally, we conducted interviews with stakeholders from government agencies, public sector hospitals, NGOs, and Fortune 500 companies involved in the African healthcare space. These interviews aimed to capture the perspectives, concerns, and attitudes of these stakeholders regarding AI in healthcare. To ensure our research aligned with the most active startup ecosystems, we followed venture capital funding destinations, though this focus may have excluded some innovative companies operating outside traditional funding streams.

We specifically excluded healthtech investors from our interviews, as our research suggested that they tend to follow rather than drive trends in the industry.

1. Roundtable Discussions

To further enrich our understanding, we organised three roundtable meetings in Kigali, Accra, and Cape Town. These discussions brought together stakeholders from various sectors to explore the practical implications of AI solutions in real-life healthcare settings across different regions of Africa.

All interviews and roundtable discussions were recorded, and/or transcribed, and shared with participants for verification and updates, ensuring the accuracy of the data collected.

By combining these methodologies, our research provides a comprehensive examination of the AI landscape in African healthcare, offering deep insights into the current state of AI applications, the regulatory environment, and the role of various stakeholders, including agencies and governments, in shaping the future of AI-driven healthcare on the continent.

12.2 Limitations

While this research attempts to provide a comprehensive view of AI in healthcare across Africa, certain limitations should be acknowledged.

Firstly, despite our efforts to achieve a broad and representative view of the healthcare landscape by shifting to a clustered approach across different regions, some companies may have been overlooked in the initial landscaping phase. This is partly due to the inherent challenges in mapping the rapidly evolving and diverse healthcare ecosystems across the continent.

Additionally, the deliberate decision to avoid interviewing multiple companies within the same scope to prevent redundancy might have limited our ability to explore nuanced differences in strategies and approaches within specific sectors of the AI healthcare landscape. While this approach was intended to focus on gathering unique insights, it may have inadvertently constrained the depth of competitive analysis.

Our focus on venture capital-backed companies as indicators of a thriving startup ecosystem was another strategic choice that could have introduced bias. This emphasis on VC-funded innovators might have excluded other significant companies operating outside of these funding streams, potentially overlooking alternative models of innovation and growth.

Lastly, the dynamic nature of the healthcare and AI sectors means that the data collected, while accurate at the time of research, have not been independently verified and may become outdated as companies evolve. As such, the relevance and applicability of the insights presented in this report could shift over time, reflecting changes in the landscape that were not captured during the study period.

Google

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