African Scientific Research and Innovation Council

Africa's Regional Integration Project for Technology Hunting (ARIPTH)

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Preface

"Hunting Innovation" examines the intersection of technology, policy, and capability-building, focusing on how dynamic frameworks enable learning and adaptation. As institutions across Africa strive to harness the power of innovation, coordinating policies in areas like education, science, technology, and intellectual property rights (IPRs) becomes paramount. Technology acquisition alone is not enough; for innovation to drive development, it must be accessible, and policy frameworks must support trade and investment opportunities. The policy space for fostering innovation in Africa is complex and constrained, but the continent's future hinges on bridging technological divides and fostering environments that empower African nations to develop, adapt, and utilize modern technologies effectively.

At the forefront of addressing these challenges is the Africa Regional Integration Project for Technology Hunting (ARIPTH), an initiative that will organize Africa's priorities and coordinates efforts to advance technology across the continent. ARIPTH aims to streamline Africa's technological needs, focusing initially on digital agriculture. Digital agriculture, facilitated by technologies like AI, IoT, and big data, can revolutionize productivity and resilience within the sector. As African nations embrace technological collaboration, they can develop unified strategies to overcome shared challenges in areas such as climate resilience, rural infrastructure, and market access.

The drive to integrate digital solutions within agriculture also aligns with Africa's commitment to self-sufficiency and food security. The African Union's Digital Transformation Strategy for Africa (2020-2030) envisions a continent that not only consumes technology but produces it, positioning Africa as an active player in the

global economy. The framework promotes digital infrastructure, skills development, data-driven decision-making, and entrepreneurship to transform agriculture and other critical sectors. While the potential is immense, overcoming barriers: infrastructure limitations, digital literacy gaps, affordability challenges, and the need for robust data privacy regulations requires a unified effort from governments, technology developers, and international partners. By creating an inclusive environment that fosters digital literacy, enhances connectivity, and encourages entrepreneurial growth, Africa can transform its technological landscape. As global interest in African startups and digital initiatives grows, Africa's journey toward becoming a leader in innovation and self-sufficiency takes on new momentum, paving the way for a more resilient and prosperous future.

Acknowledgments

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Special appreciation goes to:

- **Prof. Manasse Mbonye** for his exceptional insight into the intersections of policy, technology, and capability-building, which laid the foundation for this transformative framework.
- **Prof. Ahmed Gabr** for his profound contributions to the development of strategic priorities that align with Africa's innovation-driven aspirations.
- **Prof. Dikabo Mogopodi** for bringing a multidisciplinary perspective that enriched the conceptualization of regional integration and collaboration.
- **Prof. Bassem Awad** for his thought leadership on intellectual property rights and their critical role in advancing technology and innovation across the continent.

This document is a testament to their collaborative efforts and shared vision for a technologically empowered Africa. Their work will undoubtedly inspire and guide efforts to build a resilient, innovative, and self-sufficient continent.

Introduction:

The African Union[1] is made up of 55 Member States which represent all the countries on the African continent. AU Member States are divided into five geographic regions (Figure 1.). which were defined by the OAU in 1976 (CM/Res.464QCXVI).

Figure 1: The five geographic regions of Africa

UNCTAD's Economic Development in Africa Report 2023 [2] examines the continent's potential to become a major participant in global supply chains for high-technology sectors like automobiles, mobile telephones, renewable energy and health care.

[1] https://au.int/en/member_states/countryprofiles2

[2] https://unctad.org/publication/economic-development-africa-report-2023

Manufacturers worldwide have been driven to diversify their production locations and geographical footprint in response to recent disruptions caused by trade turbulence, economic uncertainty, a global pandemic, and geopolitical events. African governments and businesses have the chance to establish the continent as the upcoming hub for worldwide supply chains.

The region possesses a plentiful supply of essential minerals required for advanced technology and environmentally friendly products. Additionally, it is inhabited by a youthful and technologically proficient population, a flexible labour force, and a rapidly growing middle class. The African Continental Free Trade Area (AfCFTA[3]) provides benefits by facilitating entry into regional markets and enhancing production networks throughout the continent, so enabling indigenous industries to better adapt to the global stage. The report suggests implementing policy measures to address the supply chain challenges that African countries encounter, such as inadequate logistics, insufficient technological capabilities, fragmented markets, limited access to capital, and weak institutional frameworks and laws.

Efficient technology plans rely on a comprehensive comprehension of the fundamental entity of technological activity, namely the industrial business, which imports, masters, utilises, and enhances technology. Furthermore, it consequently enhances the need for cutting-edge technologies. In order for the process to flourish, it requires proactive, encouraging, and dynamic government policies and frameworks. Effective utilisation of technology extends beyond the mere acquisition of machinery. It involves developing abilities, knowledge of technology, and a foundation of information; obtaining new technical expertise and managerial

[3] Africa Continental Free Trade Agreement (AfCFTA)

methods; and establishing connections with other companies and institutions. Proficiency in comprehending and proficiently using novel technology is essential, as is the capacity to tailor it to specific local circumstances and factors, and to enhance it as advancements in technology occur and novel goods emerge. Various companies employ the same technology with significantly varying degrees of efficiency. Furthermore, countries exhibit differences in their technological capacities.

The technological competitiveness of countries depends on how effectively they market their talents. Companies in developing nations frequently lack the proficiency to ascertain the specific new competencies, technological know-how, and organisational methods necessary to effectively utilise recently acquired innovations. Adopting new ways of thinking is necessary to establish connections and partnerships with other companies or organisations, and to develop expertise in technology. It is also important to address the issue of skilled personnel leaving for other opportunities. Companies may lack the necessary resources, expertise, funding, or other essential elements to enhance their capabilities.

Today's technology is ultra-advanced, which we are experiencing in our day-to-day life either through personal experience or through the media around us. The use of frontier technologies such as satellites, drones, mobiles, artificial intelligence, virtual reality, internet, 3D printing, robotics and blockchain are all shaking up the world as we know it. Advancement in science and technology has made people to believe that technological advancement will lead to machines and robots replacing human beings, rendering large swaths of the population jobless, while some section sees enormous potential for least developed countries (LDCs) to leapfrog along their development trajectories. Although, access to technology poses many challenges for

LDCs, who want to take advantage of the opportunities presented by the fourth industrial revolution (4IR), these countries will need to put in place certain measures to tackle issues around accessibility, affordability and the application of technologies.

Hunting Innovation:

Focuses on technological change and capabilities building wherein - Institutional frameworks that enable the creation of dynamic capabilities are critical for learning (national, sectoral).

Coordination of policies and incentives is critical; education, R&D, science and technology policy, technology transfer, intellectual property rights (IPRs), that are coordinated to promote interactive learning.

Technological learning is not only dependent on access to technologies but also opportunities in trade and investment.

The narrowing policy space in this context has implications for harnessing the developmental dimension of technological change.

Three sets of issues are critical while addressing how innovation can enable development in Africa[4]:

1. Bridging the technological divide through access to technologies:

- Promoting productive and absorptive capacities:
    - Arresting the growing technological divide.
    - Sharing experiences and successes: what works, what does not.
- Harnessing intellectual property rights (IPRs) for developmental goals:
    - Intellectual property as a catalyst to support innovation and creativity in Africa

[4] https://www.un.org/en/ecosoc/newfunct/pdf13/wipo_ecosoc_amr_dar_13_e_sampath.pdf

    - Strengthening Africa's capacity to develop robust IP strategies and commercialization policies.
- Promoting inclusive innovation within countries: Enacting national policies for innovation capacity and that make it possible to:
    - access, learn, adapt and diffuse existing technologies and create new knowledge.
    - Reduce inequality through labour and employment opportunities for all
    - Promote private sector development – small, medium and large firms

2. Reducing structural vulnerabilities of African countries through financing of innovation

- In a large number of developing countries, shallow financial markets often thwart their responses to developmental needs.
- Structural vulnerabilities can be reduced inter alia through promoting technological change, which supports structural diversification and reduces the dependence of countries and economies on commodity boom/bust cycles.
- Technological change is integral to this process, supporting the diversification of economic activities
- Financing of innovation to achieve this goal remains an imperative.
- The challenge of mobilizing such financial resources for technological development form a significant part of the post 2015 agenda through.
    - Reconfiguring the current knowledge paradigms
    - Financing innovation within the current global governance architecture

3. Promoting collaborations and alliances in sectors of public importance

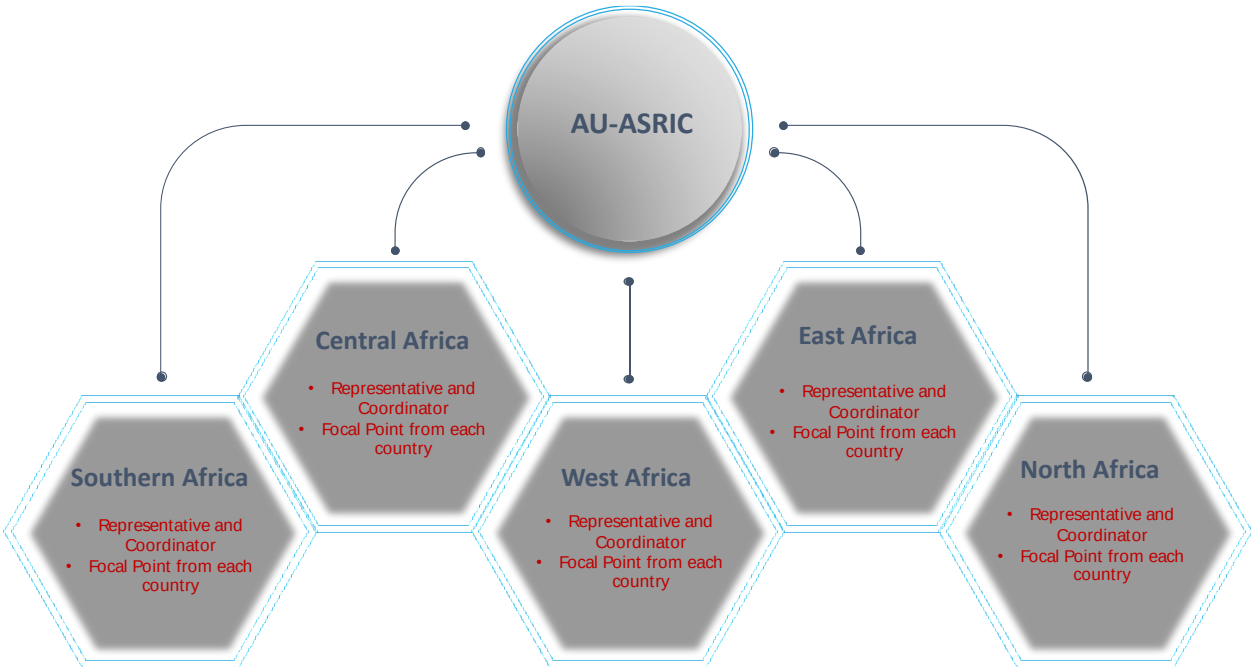
- Through existing means such as STI partnerships
- New means, particularly South-South collaborations

Concept and methodology

Africa has a lot of potentials and in the same time has a lot of suffering. But with the Africa's Regional Integration Project for Technology Hunting (ARIPTH), will categories the African priorities and work together for the future of the African industry rise.

Project architecture:

AU-ASRIC secretary, AU-ASRIC board, Project coordinators and focal points.



Each region is represented on the AU-ASRIC board by a designated representative, who collaborates with the project coordinator from their respective region. As an illustration, the North African region will consist of Morocco as the representative, Egypt as the project coordinator, and a focal point from the other North African countries.

The ARIPTH coordinators will have the responsibility of liaising with focal points and organizing the list of priorities for each region. Additionally, they will offer a

strategic viewpoint on how to tackle the technological demands for staying competitive, acquire new technology, and foster local technological advancement.

Example for starting the first phase of ARIPTH: Technology Hunting in Digital Agriculture

Why Technology Hunting in Digital Agriculture?

The advent of digital technology, primarily driven by the microelectronics revolution and subsequent advancements in Information and Communication Technology (ICT) throughout the 1970s, has had a significant and far-reaching influence on global economies. Frontier technologies such as Artificial Intelligence (AI), the Internet of Things, big data, blockchain, 5G, 3D printing, robotics, drones, gene editing, nanotechnology, and solar photovoltaic have had a profound impact on various sectors and workplaces in domestic economies globally. Specifically, the growing digitization has led to changes in the characteristics and operations of job markets, affecting both the need for workers and the availability of workers. Most of the attention about the connection between digital technology and the job market has been directed towards industrialized countries. In an era where digitalization and the corresponding skills are playing a crucial role in the economic transformation of countries, extensive research is being conducted to measure and comprehend the scale and characteristics of digitalization and the gaps in digital skills, with a specific focus on Africa.

Digital and data-driven agriculture refers to the utilization of advanced technologies and data to achieve sustainable development in various aspects of agriculture, including crop production, soil monitoring, livestock production and management, and fisheries. The agriculture sector is a significant contributor

to the Gross Domestic Product (GDP) of emerging countries, playing a crucial role in their economic development.

Agriculture possesses the capacity to unify African nations and exploit technology to enhance the quality of farms throughout the continent. Enhanced agricultural practices, greater production, and sustainable development can be achieved through collaboration and knowledge-sharing among African nations.

African countries may cooperatively tackle shared difficulties in the agricultural sector by exchanging their experiences, best practices, and innovative solutions. These factors encompass climate change, water shortages, rural infrastructure, access to finance, and market integration. Technology may have a crucial impact in facilitating the connection between farmers, academics, and policymakers, allowing them to share ideas, knowledge, and successful strategies.

Problem definition:

The global food production system encounters numerous challenges. Initially, society requires an increased quantity of sustenance. The worldwide population will reach 8 billion by 2023 and nearly 10 billion by 2050. Therefore, the digital transformation of agriculture is unavoidable to meet food security requirements faced by worldwide countries in general and emerging countries in particular[5].

Furthermore, there is a growing need for farming methods that prioritize both environmental and social responsibility. Individuals need nourishment that is both healthier for their well-being and more sustainable for the environment. As a society,

[5] https://www.mdpi.com/2077-0472/13/5/1067

it is imperative that we get food using methods that mitigate climate change, diminish greenhouse gas emissions and biodiversity loss, and aid in waste reduction. Likewise, the issue of food transportation, specifically the practice of flying and transporting food globally, requires attention and resolution. In order to do this, it is crucial for nations to enhance their self-sufficiency and resilience. Referred to as 'food security', the matter of the availability, affordability, and accessibility of food in a country is becoming increasingly prominent.

The Africa continent faces significant challenges regarding conventional farming practices, primarily due to the climate and land constraints.

Africa is confronted with a multitude of complex difficulties, including the rapid growth of urban areas and a growing population in rural areas that need to be fed. Additionally, most of agriculture in Africa are smallholder farming, 60% of Africa's population relies on smallholder farming, either directly or indirectly, as a primary economic activity. For example, agriculture accounts for about 23% of Sub-Sahara's GDP[6].

Unfortunately, despite the significant socio-economic potential and the aforementioned developmental frameworks of the African Union, agricultural activities in Africa remain mostly unexplored. Despite the growing investment in smallholder farming by African governments, agriculture in Africa still faces significant issues along the agribusiness value chain, which have not been adequately addressed. Hence, Africa's agriculture continues to be susceptible, as seen by the enduring prevalence of food insecurity throughout the continent[7].

[6] https://www.mckinsey.com/industries/agriculture/our-insights/winning-in-africas-agricultural-market#
[7] https://www.nepad.org/blog/bolstering-africas-precision-agriculture-smallholder-farming#_ftn1

Solution:

The advent of digital technology in agriculture will revolutionize the African agricultural sector, shifting its emphasis from self-sufficiency to becoming a prominent global player in food production.

The promise of digital solutions to address the issues encountered by smallholder farmers is well acknowledged, as highlighted in the 2020 report by GSMA. Most of countries, around the world, have already witnessed the significance of digital technologies during the COVID-19 pandemic, when movement has been limited owing to lockdown measures. In light of the increased reliance on digital technology due to the pandemic, it is crucial to address the potential exclusion of smallholder farmers and producers who lack experience with digital technologies, so as to prevent them from being left behind by the digital revolution. Utilizing digital technologies will enhance the resilience of smallholders in navigating various crises, including but not limited to COVID-like pandemics, geopolitical crisis, as well as climatic fluctuations. They have the potential to completely transform the way these communities safeguard and enhance their means of living.

Digital and data-driven Agriculture:

Indeed, Digital and data-driven agriculture holds great potential as a means to attain food security in Africa. Through the utilisation of technology and digital solutions, farmers may augment productivity, optimise resource allocation, and surmount diverse obstacles encountered. By leveraging mobile applications, precision agriculture techniques, remote sensing, data analytics, and e-commerce platforms, farmers may obtain vital information, optimise the marketing of their produce, and make educated decisions to enhance crop yields and overall farm management. Agricultural data can generate operational information on weather, soil, pests,

suitable crop varieties and facilitate trade in the agri-business sector. Smallholder farmers can be empowered by digital agriculture, which grants them access to financial services, weather predictions, crop advising services, and enhanced market connections. The amalgamation of technology and agriculture holds the capacity to revolutionise the agricultural terrain in Africa and make a substantial contribution to both food security and economic expansion.

Digital Agriculture technologies:

The technology employed in digital agriculture are always advancing. The sector is continuously advancing, with novel breakthroughs arising to tackle issues and enhance the sustainability of food production.

- **Internet of Things (IoT):** IoT devices, such as weather sensors and soil moisture monitors, are used to collect real-time data throughout the agricultural process. This data can help farmers make informed decisions regarding irrigation, disease prevention, and crop management.
- **Precision Agriculture:** It involves the use of sensors, drones, and satellite imagery to collect data on soil moisture levels, nutrient content, and crop health. This data helps farmers optimize irrigation, fertilization, and pest control, resulting in improved crop yield and resource efficiency.
- **Automated Farming Systems:** Robotics and automation play a significant role in digital agriculture. Automated systems can perform tasks such as seeding, harvesting, and monitoring plant health.
- **Big Data and Analytics:** Large-scale data analysis is employed to gain insights into crop performance, market trends, and environmental factors. Farmers can use this information to optimize production, predict market demand, and reduce risks.

- **Agricultural Drones:** Drones equipped with cameras and sensors can capture high-resolution images of crops, monitor plant health, identify pest infestations, and even spray fertilizers or pesticides.
- **Blockchain:** This technology enhances traceability and transparency in the agricultural supply chain, ensuring food safety and quality, as well as facilitating fair trade practices.
- **Mobile Applications:** There are numerous mobile apps available for farmers that provide information on crop management, pest control, market prices, and farm financial management. These apps enable farmers to access real-time data and make informed decisions on-the-go.
- **Farm Management Software:** These tools help farmers with various tasks, including crop planning, inventory management, financial analysis, and market forecasting.
- **Weather Forecasting:** Accurate weather prediction is crucial for agricultural planning. Farmers can use weather forecasting technologies and apps to receive real-time weather updates, helping them make informed decisions about planting, harvesting, and crop protection.
- **Geographic Information System (GIS):** GIS technology combines spatial data with digital mapping to provide farmers with detailed information about their land, including soil composition, topography, and land-use history. This helps optimize land and resource management decisions.
- **Robotics and AI:** Robots and AI technologies are being used in various aspects of agriculture, including planting, harvesting, sorting, and grading crops. These technologies can improve efficiency, reduce labor costs, and enhance overall productivity.

- **Vertical Farming:** It involves the cultivation of crops indoors using controlled environments, LED lights, and hydroponic or aeroponic systems, maximizing production in limited spaces.

One of the important frameworks to encourage digital agriculture across African countries is the African Union's Digital Transformation Strategy for Africa (2020-2030)[8].

Strategy vision is an Integrated and inclusive digital society and economy in Africa that improves the quality of life of Africa's citizens, strengthen the existing economic sector, enable its diversification and development, and ensure continental ownership with Africa as a producer and not only a consumer in the global economy

This framework aims to harness the power of digital technologies to transform various sectors, including agriculture, across the continent. It recognizes the potential of digital tools and platforms in improving agricultural productivity, enhancing value chains, enabling access to financial services, and promoting agri-entrepreneurship.

The framework recommends the following key actions to foster digital agriculture:

- **Enhancing digital infrastructure:** Improving access to affordable and reliable internet connectivity, as well as investing in appropriate hardware and software systems.
- **Developing digital skills:** Equipping farmers, extension workers, and other stakeholders with the necessary digital literacy and skills to effectively utilize digital tools and platforms.

[8] https://au.int/sites/default/files/documents/38507-doc-dts-english.pdf

- **Promoting data-driven decision-making:** Encouraging the collection, analysis, and sharing of agricultural data to support evidence-based decision-making processes at various levels.
- **Enabling digital financial services:** Supporting the development and adoption of digital payment systems, mobile banking, and other financial tools to enhance access to financial services for farmers and agribusinesses.
- **Facilitating digital marketplaces:** Creating platforms and networks that connect farmers with buyers, promote fair trade, and facilitate market access.
- **Supporting innovation and entrepreneurship:** Promoting the development and adoption of innovative digital solutions, such as mobile apps, remote sensing technologies, and IoT devices, to address agricultural challenges and drive entrepreneurship in the sector.

By implementing this framework, African countries can unlock the potential of digital agriculture, leading to improved productivity, increased resilience, and sustainable agricultural development across the continent.

It's important to note that the adoption of digital agriculture varies across countries and regions within Africa, influenced by factors such as technological infrastructure, farmers' digital literacy, and supportive policies. Moreover, digital technologies offer immense opportunities for Africa's agriculture sector, several challenges need to be addressed for their successful development and implementation:

1: Limited Access to Infrastructure: Many rural areas in Africa have limited access to internet connectivity, and telecommunications infrastructure. Without these basic infrastructure components, widespread adoption of digital technologies becomes challenging.

2: Digital Divide and Limited Skills: There is a significant digital divide in Africa, with disparities in access to digital devices, internet connectivity, and digital literacy

skills. Many farmers, particularly in remote areas, lack the necessary skills to effectively use and benefit from digital agricultural tools.

3: Affordability and Cost Constraints: The affordability of digital technologies and services remains a significant constraint for farmers in Africa. The cost of smartphones, tablets, sensors, and other digital tools may be prohibitive for resource-constrained farmers, limiting their access to these technologies.

4: Language and Localization: Many digital agriculture solutions are developed in foreign languages, making them less accessible or less effective for farmers who primarily communicate in local languages. The localization of digital platforms and content is crucial for widespread adoption and user engagement.

5: Data Privacy and Security: The collection, storage, and use of farmers' personal and agricultural data raise concerns regarding privacy and security. Establishing robust data protection frameworks and ensuring secure data management practices are critical to gaining farmers' trust in digital technologies.

6: Limited Integration and Interoperability: There is a need for interoperability and integration among various digital platforms and solutions to create holistic and seamless agricultural ecosystems. Lack of integration hampers data sharing, limits the scalability of solutions, and reduces overall impact.

7: Policy and Regulatory Environment: The absence of clear policies and regulatory frameworks specific to digital agriculture can create uncertainty and hinder investment and innovation. Addressing regulatory gaps and establishing conducive policies are essential for fostering the development of digital technologies in agriculture.

8: User-Centric Design and Adaptability: Developing digital solutions that are user-friendly, context-appropriate, and adaptable to local farming practices is crucial. Failing to address the specific needs and preferences of farmers may lead to low adoption rates and a limited impact.

Addressing these challenges requires collaboration among governments, technology developers, research institutions, and farmers themselves. It involves investments in infrastructure, capacity-building programs, digital literacy initiatives, supportive policies, and partnerships to ensure the sustainable and inclusive development of digital technologies for Africa's agriculture sector.

Entrepreneurship in Digital Agriculture[9, 10]:

Startup ecosystems are often looked at through the prism of Silicon Valley, a paradigm that includes successful new companies, technology hubs, and access to funding. However, Africa is challenging this traditional narrative by leveraging its unique strengths and turning challenges into opportunities. Governments across the continent are taking proactive steps to foster a conducive environment for startups, transforming their nations into hotbeds of innovation.

How African Nations Are Creating Opportunity

The focus on infrastructure and connectivity is essential for any economy to thrive, but in Africa, it takes on an even more critical role. Governments are investing in internet infrastructure, thereby increasing digital literacy rates and providing a foundation for tech startups to grow. Policy reforms are also underway to encourage foreign investment and create a more business-friendly environment.

Digital Literacy and Policy Reforms

[9] FAO and ITU. 2022. Status of digital agriculture in 47 sub-Saharan African countries. Rome. https://doi.org/10.4060/cb7943en

[10] https://www.africa.com/changing-the-narrative-the-rise-of-startup-ecosystems-in-africa/

Promotion of digital literacy contributes significantly to enabling younger generations to partake in the digital economy actively. Meanwhile, policy reforms targeted at business registration, taxation, and ease of doing business act as an impetus for entrepreneurs to set up shop.

International Support

Investors and organizations across the world are starting to take note. From venture capitalists to international development agencies, there is a growing interest in supporting African startups. Mentorship programs and funding opportunities are on the rise, providing fledgling businesses with the resources they need to succeed.

Insights from the Global Startup Ecosystem Index (GSEI) 2023

Established in 2017, the GSEI by StartupBlink offers data-driven insights into the vitality and strength of new businesses across the globe. The 2023 report reveals a fascinating landscape for startups in Africa.

Top 10 Leading Countries for Startups in Africa in 2023:

1. **South Africa (Score: 3)**
    - Leading in tech innovation and access to funding.
2. **Mauritius (Score: 2.1)**
    - Known for its business-friendly policies and offshore financial services.
3. **Kenya (Score: 1.97)**
    - Nairobi, the tech hub of Africa, offers a nurturing environment for startups.
4. **Nigeria (Score: 1.94)**

- Home to Nollywood and a booming tech sector, the country offers diverse opportunities.

5. **Egypt (Score: 1.64)**
    - A growing fintech market and government support make Egypt a startup haven.
6. **Ghana (Score: 0.73)**
    - Accra is rapidly becoming a hotspot for tech startups.
7. **Cape Verde (Score: 0.72)**
    - Emerging as a center for tourism and tech innovation.
8. **Senegal (Score: 0.63)**
    - Dakar is carving out a niche in fintech and renewable energy sectors.
9. **Namibia (Score: 0.62)**
    - Offers a stable political environment and a growing focus on tech and tourism.
10. **Tunisia (Score: 0.56)**
    - Tunis is becoming a hub for software development and IT services.

Africa is at a tipping point, poised to become a significant player in the global startup scene. Government initiatives, policy reforms, and international support are creating fertile ground for businesses to grow. As more and more startups thrive, they not only contribute to economic growth but also play a crucial role in solving local and global challenges. The future is bright, and the opportunities are endless, as African nations continue to rise in the ranks of the global startup ecosystem.

The Government of Benin has made great efforts in reforming education and enhancing the digital and innovation capacities of youth. For example, the Sèmè City project trains students and researchers and supports entrepreneurs in spurring

innovation. Schools and NGOs have also begun to focus on the improvement of digital capabilities by providing computer related courses. Also, an e-learning platform has been established and will soon be operational with the support of the European Union through the Project d'Appui au Development Durable du Secteur Agricole (PADDSA), which will facilitate access to knowledge. In addition, some startups like Cabinet S-Lab offer training on the use of digital tools. All of those practices generate opportunities in digital capacity development and improve digital skills of the new generation.

Digital entrepreneurs in Burundi are limited but emerging. This is impacted by the high cost of data, electronic gadgets and a small market for digital solutions. Additionally, finance for startups is not available due to institutional and policy support for new digital entrepreneurs. Examples of budding start-ups include PayWay a payments platform aggregator, E-Soko (an online e-commerce market platform), and Nova taxi (a ride-hailing application).

The ideal of creating an ICT cluster in Cabo Verde is based on the transformation of the country into an international center for business. To that end, the government has created the Institute of Support and Business Promotion (Pro Empresa) offering several programmes such as Young Startups, Micro Entrepreneurship, Procredit and Express+. REMPE and PROMEB are supported by FAO and the African Development Bank (AfDB) to promote blue economy innovation and entrepreneurship.

Cameroon has a number of innovative startups such as Digifarms, Help Farmers Cameroon, Africaware and Agrocom that provide a range of solutions from data management, e-commerce, advisory services, financial and marketing linkages to

early warning solutions. Jangolo is a farm management mobile application that supports farm productivity, serving 8 000 farmers in Cameroon, and providing a platform for bookkeeping, logistics, sales, training, and access to the market prices. Agrix Tech provides recommendations in local languages using interactive voice response (IVR), and Freshbag is a platform that connects farmers and vendors.

Digital innovation in Cameroon is supported through various initiatives such as Globetrotter, which aim at supporting young digital start-ups to transition their projects into digital companies. In addition, 200 Cameroonian startups were trained in digital entrepreneurship by the Cameroon-Israel Cooperation Programme, and each year, a dozen of young Cameroonians take part in the Huawei Seeds for the Future international programme under the cooperation framework between Cameroon and China.

Moov launched Cyberlab to train 4500 entrepreneurs in mastering digital tools and to develop activities on the Internet. In 2017, MTN Business Côte d'Ivoire launched the programme Y'ello Startup aimed at supporting young local tech entrepreneurs and identifying future business partners for MTN Y'ello Startup and Seedspace Abidjan, with local impact investors like TRECC or Comoe Capital. In 2018, the ecosystem experienced a promising growth with the launch or announcement of new initiatives like MEST (2019), Orange Corners and Seedstars Academy. Given the nascence of the overall ecosystem, the incubation and acceleration offerings are substantial.

The budding tech space has also seen private players organising accelerator programmes for young start-ups such as xHub Addis, iCog Labs, iceaddis or the blueMoon lab, which organises competitions twice a year to identify new startups

that ultimately benefit from training and coaching programmes over the span of four months. Growth Africa lab organises training workshops in finance and business development for start-ups with turnovers over USD 50000 over a span of six months. Through such spaces new start-ups such as Yerras Gebeya, Yene-pay, Awesome Africa, and Mesafint Alebel currently provide relevant services ranging from disease management, mobile payments, training via mobile technology and livestock trading in Ethiopia.

Gambia's digital ecosystem is transforming its agriculture sector. Existing agritech startups include Tesitoo, Money farm, Farmfresh, Jollof-Trade and Technofarms, which provide opportunities for farmers to market their produce directly to consumers. GamFruits collect and digitize important agricultural data on climate-smart agriculture.

The Gambia established a strong publicprivate partnership to enhance infrastructure and service delivery aimed at the digitalization drive. For instance, the government supported innovators and private investors to develop the YEP Tech Startup support programme, aimed at providing an enabling environment for digital businesses to thrive in line with the National Development Plan.

AGRO-INNOVATION

Startup Incubator Gambia supports the development of young Gambian entrepreneurs through an array of business support services and resources. Empretec Gambia trains and prepares entrepreneurs to establish successful enterprises or to grow and expand their businesses. Special emphasis is given to computer literacy and IT. There is only one embryonic tech hub, Jokkolabs, hosted by the YMCA. Jokkolabs works at a very low scale with very limited capacities.

Saboutech is a non-profit organization focused on identifying and supporting SMEs and startups in IT, renewable energies or the environment in crucial stages of their development by creating a privileged space and a stimulating environment dedicated to spurring the growth of these SMEs. They are also a venue for various events around entrepreneurship and innovation in Guinea.

However, to date, a number of digital solutions and innovations in agriculture have sprouted across the ecosystem from the capital city. Nairobi is regarded as the cradle of technological innovations in Kenya with a growing number of tech-hubs, start-ups and innovation programmes.

The local Vodacom Innovation Park is an incubator and accelerator program established in 2015 to support the development of sustainable, high impact, job-creating startups and social enterprises in Lesotho. Since its launch, the Vodacom Innovation Park has trained entrepreneurs in a wide range of industries including agriculture, fashion, e-commerce, and mobile app development.

In 2018, Nigeria attracted the highest number and amount of Africa's digital investment deals. The African Tech Startups Funding Report shows that Nigeria emerged as the premier investment destination on the continent in 2018, with 58 start-ups raising a total of USD 95 million (Disrupt Africa, 2018). Investment funding for Nigerian start-ups, including agritech, was more than USD 100 million in 2016, increasing to USD 117 million in 2018

Examples include the Human Capital Development (HCD) incubator in Freetown, which is used for local start-ups, the private and public sectors as well as academia

for innovation in health, agriculture and education, and to collaborate, share data and access services. The Sensi Tech Hub aims at creating employment through innovation and entrepreneurship. Several other promising startups in agri-technology operate in the country, such as Jalimi Farms for smart farm solutions, and Born to do Business. Sierra Leone

Innovation Axis Sierra Leone was launched in March 2017 as an entrepreneurship support and innovation and technology management entity. It focuses on developing growth-oriented startups and building a dynamic and well-functioning ecosystem that supports entrepreneurship and innovation in agritech solutions.

According to the StartupBlink Global Startup Ecosystem Rankings 2020, Somalia ranked among the top 100 countries, landing at position number 95 in the global country rankings. In the same report, Mogadishu proved to be by far the most prominent start-up ecosystem in Somalia. The city ranks 14 out of the 36 African cities that were assessed. Significant investment has been made in renewable energy, while agriculture is the country's most important sector. However, Mogadishu is not the only example. Hargeisa is another city with a budding innovation hub that has a lot of activity and growth. Through fundamental policies and a few key initiatives, Hargeisa has developed a significant start-up ecosystem that is expected to continue blossoming in the future.

South Africa's start-up market is one of the most competitive in the continent, and agro-innovation ventures are emerging. Popular upcoming venture include, 3DIMO, a local startup in a joint venture with the University of Cape Town. 3DIMO developed the Thola infrared imaging tool, which helps small and medium scale farmers who are at the most risk of losing their income. Another start-up called

swiftVEE uses artificial intelligence to match buyers and sellers of livestock globally. Buyers can acquire livestock at the most optimal times.

Agriculture development is still critical for Zambia in terms of poverty reduction, job generation and enhanced food security. With emerging technologies and startups, Zambia is witnessing a transformation of its food system.
Muzinda Hub Harare is a training centre that develops skills required for the creation of high-quality websites and mobile applications. Tech Hub Harare is a start-up development platform, supporting early-stage start-ups with access to networking opportunities through events and one-on-one sessions with selected mentors. It organizes the Zim4AgriStartups debate on digital agriculture innovation. Zimbabwe,

Digital Agriculture and Intellectual Property Rights

Intellectual property regimes, such as copyright, patents, trademarks, undisclosed information (trade secret), industrial designs, geographical indications, traditional knowledge and plant breeders, play a critical role in the various stages of the agricultural value chain. From specific characteristics of the soil to developing new plant varieties, to the use of specific software or technology to improve crops, to the design and packaging of agriculture products, intellectual property covers a vast range of activities in the agriculture sector.

Intellectual property regimes are designed to protect the rights of creators and innovators, encouraging them to invest in research and development while allowing the society to benefit from the dissemination of knowledge.

Intellectual property rights are territorial and apply to various industries, including digital technology in agriculture. This framework aims to

- Raise awareness of the role of IP rights in the digital agriculture sector.
- Improve the intellectual property literacy of the various players in the agri-business industry.
- Introduce best practice methods of leveraging intellectual property rights related to digital agriculture and examine relevant mechanisms of collaborative innovation for African farmers.
- Explore the various policy mechanisms for data stewardship.
- Develop an afro-centric approach to the use and commercialization of data and IP rights with regard to digital agriculture.

Objectives:

The objective is to mentor and support creative African individuals in order to achieve the end result and foster effective partnerships between scientific research communities and industries in Africa, with a particular emphasis on intellectual property rights (IPRs).

When it comes to technology hunting for digital agriculture in African countries, there are a few key frameworks and approaches that can be helpful.

The objective of is to search and document technologies developed in Africa for Africans with the intent to promote their uptake in terms of adapting and adopting them. Through promotion of uptake of African technologies wide technological gap between Africa and the rest of world could be bridged. Further we shall search for other technologies developed outside Africa that can be adopted, adapted or even possibly reverse engineered to suit African context.

For examples;

- **Assess Local Needs:** Understand the specific challenges faced by farmers in African countries and identify the areas where technology can make a meaningful impact. This can include improving productivity, access to market information, crop management, and supply chain efficiency.
- **Engage Stakeholders:** Collaborate with local farmers, agricultural organizations, research institutions, and government bodies to gain insights and build partnerships. This ensures that the technology solutions align with the needs and realities of the local agricultural sector.
- **Identify Suitable Technologies:** Research and identify existing technologies that have demonstrated success in similar contexts. Look for solutions that are cost-effective, scalable, and adaptable to local conditions. Some promising technologies in digital agriculture include precision farming, remote sensing, IoT-based monitoring, and mobile applications for agricultural extension services.
- **Encourage Innovation and Entrepreneurship:** Support local innovators and entrepreneurs who are developing technology solutions for agriculture. This can be done through funding, mentorship, and capacity building programs. Foster an ecosystem that encourages creativity and collaboration in the agricultural technology space.
- **Implementation and Adoption:** Ensure that the selected technologies are effectively implemented and adopted by farmers. This involves providing training, technical support, and addressing any infrastructure or connectivity challenges. Monitor the impact of the technologies and collect feedback to continuously improve and refine the solutions.

Strategic driver

- Digital Agriculture industry is a competitive market where best in class products, manufacturing know-how and intellectual property contribute to market leadership and increases barriers to entry.
- In some circumstances it is more cost effective to purchase companies which have already developed successful products than develop these in-house. Hunting therefore expects to continue to grow by acquisition, adding products and services that complement the existing portfolio.
- Hunting's market leverage can be enhanced by ensuring many of our products are available in all geographic regions. These revenue based synergies are the driving force behind our sales efforts to maximise our market position.
- Hunting is investing in a portfolio of leading proprietary technologies aligned to increasingly complex customer requirements.
- Hunting offers enhanced end-to-end services which integrate into the customer supply chain and offers customers the highest level of quality and service which are critical to our sector.
- We target to manufacture and sell Hunting's complete product offering across our geographic region.
- Often the technology could developed and introduced into EU or USA markets and adopted into other geographic regions.

Methodology:

Intellectual property rights (IPRs) are central to technological activity and are found to be critical so that within this project it must be determined which technologies are protected and by what mechanisms they are protected, which technologies' protection have expired, and which ones are not protected.

- Collect data from IP Offices appropriate in Africa who can assist with access to their technology database

  - To collect data on existing technologies or ongoing technology development from these IP offices could be done through questionnaires/surveys distributed across Africa as a way of working toward creating technology "directory"
- **Hunting Innovation: Integrating technology scouting and corporate venturing into the African innovation process.**
  - Effective Strategies for the Technology Scouting Process
  - Obstacles in the process of technology scouting
  - Advantages of a Scouting Platform
- Start academy dialogue for digital agriculture from the view of policy gaps in each region.
- Prepare a white paper for Entrepreneurship on Digital agriculture
- Start the white paper for Entrepreneurship on Digitalization (AI) in animal husbandry and fishing
- Initiative for a platform across all innovates houses in Africa etc., Exhibitions for agriculture innovations, like Cairo International Exhibition for Innovation and Alibaba-Backed Africa's Business Heroes Competition
- Set an indicator to understand the digital technology readiness in each country.
- The agricultural entrepreneurship program, led by the African Union's African Scientific Research and Innovation Council (AU-ASRIC), is a collaborative effort between public and private partners in Africa. It is sponsored by African donors etc., the African Development Bank and other sources.

Project Activities

Adopting hunting technology is a prevalent strategy to maintain relevance in a rapidly evolving business landscape. Technology scouting is an essential aspect of maintaining a competitive edge for any major corporation. However, it is a highly

demanding endeavor that necessitates a combination of expertise, experience, and a scout's refined intuition. Recognizing an opportunity and taking advantage of it are distinct actions: achieving success in the field of technology requires the skill to diligently monitor and thoroughly assess, evaluate, and compare various prospects.

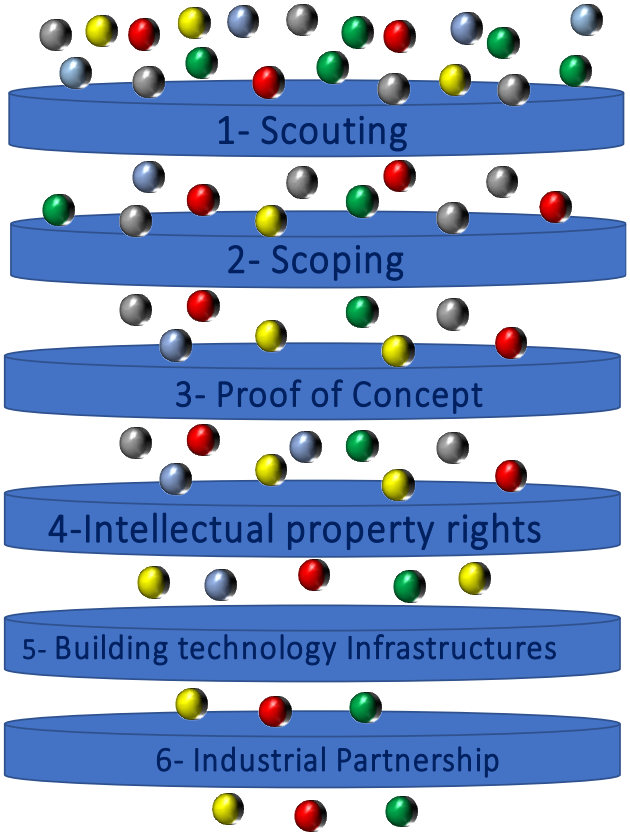
Building the AU-ASRIC Scouting (hunting) platforms: it will provide us with the ability to search, assess, and negotiate during the hunting process, thereby empowering them.

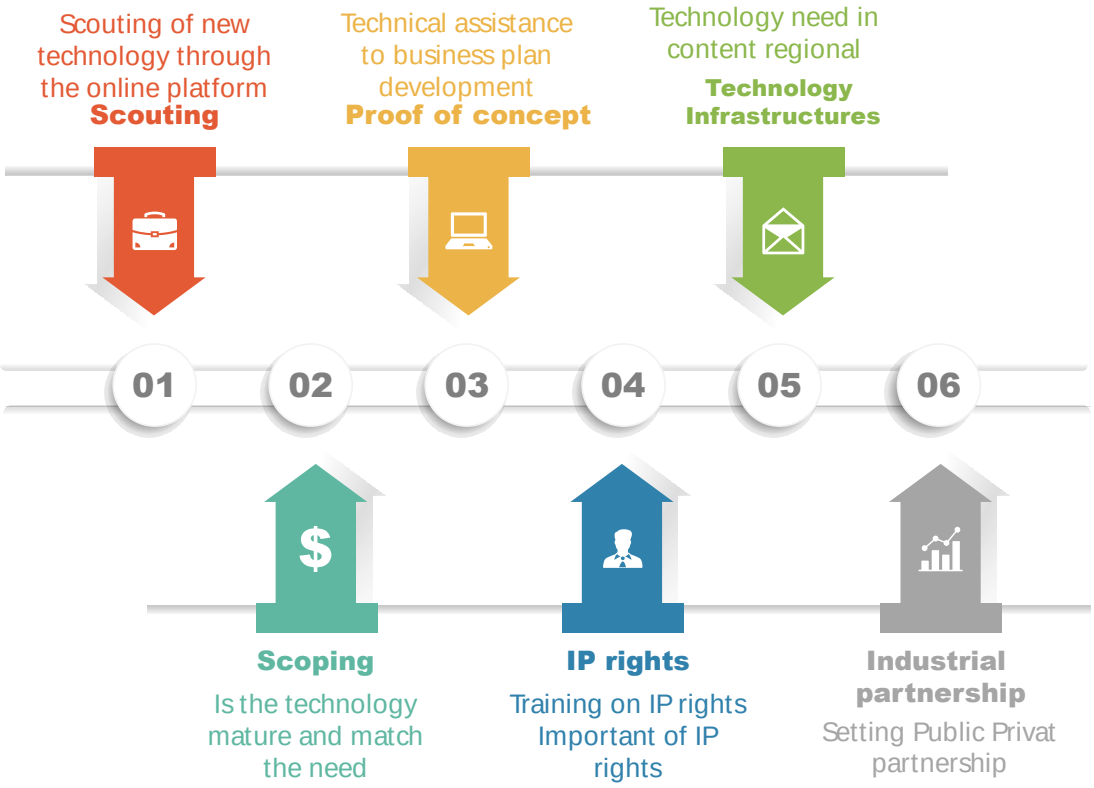
Implementing a scouting platform can enhance the effectiveness of any technology scouting team by establishing a uniform approach to evaluating different chances. This will enable the team to more effectively prioritize and assess these prospects, both individually and in relation to one another. While every idea, technologies, firms is unique, the tech scout can employ a tool to evaluate them objectively and strengthen their instincts about a certain technology.

A scouting platform may aggregate, categorize, prioritize, and organize all the accessible information. Its most important function is to disseminate this information to all members of the scouting team (AU-ASRIC members). Simultaneously, a scouting platform can be utilized to amalgamate the networks of the entire scouting team, resulting in a significant increase in the number of individuals accessible for gathering information. In addition, this simplified data input facilitates extensive acceptance. The success achieved by a single scout or scouting team while utilizing a scouting platform serves as motivation for other scouts and scouting teams to use scouting platforms as well. In the competitive realm of global and multinational enterprises, the inability to adjust and evolve might determine whether a company becomes an acquirer or is bought by another organization.

Utilizing a scouting platform offers a clear depiction of the ongoing interactions among scouts within the same team, between various scouting teams, between scouting teams and other departments within the country, and across different countries in the content. A scouting platform can also be utilized to gain a comprehensive understanding by uncovering valuable insights concealed within your data.

All of these reasons result in a highly profitable financial outcome, an enhanced ability to negotiate, and the capacity to manage a far greater collection of assets.


1- Scouting
2- Scoping
3- Proof of Concept
4-Intellectual property rights
5- Building technology Infrastructures
6- Industrial Partnership


Scouting of new technology through the online platform
Scouting
Technical assistance to business plan development
Proof of concept
Technology need in content regional
Technology Infrastructures
01
02
03
04
05
06
Scoping
Is the technology mature and match the need
IP rights
Training on IP rights Important of IP rights
Industrial partnership
Setting Public Privat partnership