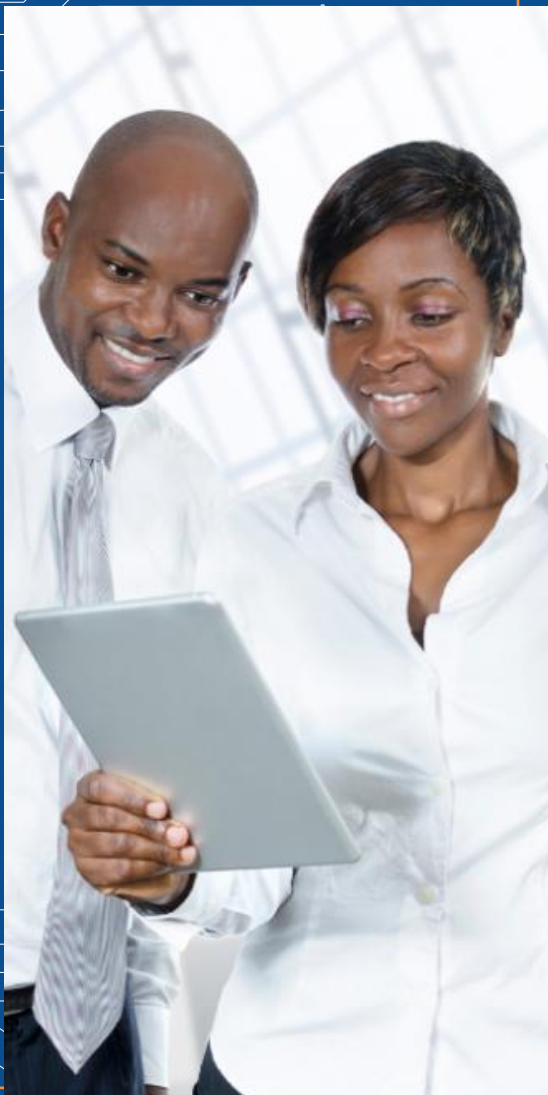
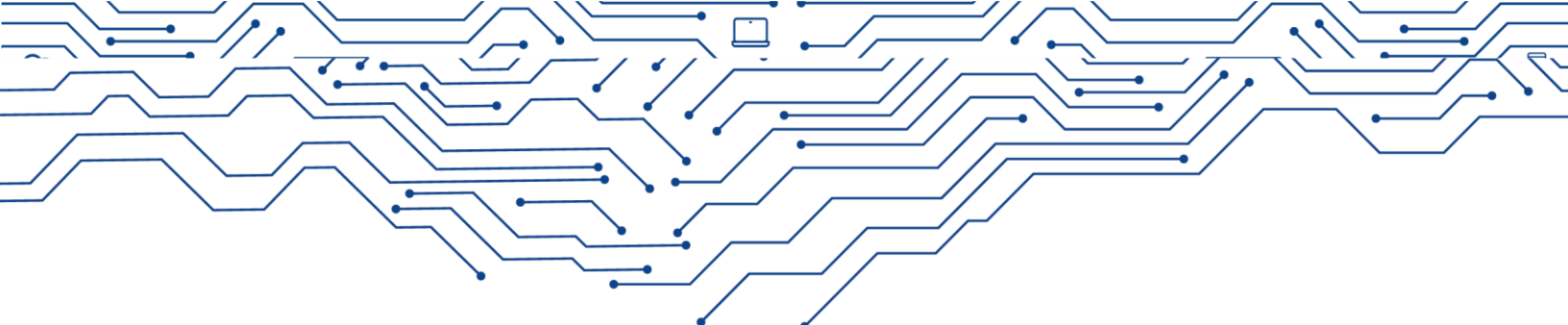




BLUEPRINT Inclusive adoption of smart devices in Africa

// May 2022



BLUEPRINT FOR INCLUSIVE ADOPTION OF SMART DEVICES IN AFRICA



There is a French version of this document.

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PREFACE



With an average age of only 18, the African continent has the youngest and fastest growing population in the world and its youth promises to be a catalyst for innovation, change and economic growth.

I highly appreciate the work that Smart Africa is doing for the digital transformation across the African continent and am very happy about the way Smart Africa is working with like-minded international partners to further the joint agenda of an interconnected and digital Africa.

Today, more people have access to a mobile phone than to clean water and sanitation, yet half of the world's population is still unconnected. The internet may have spread at an unprecedented speed around the globe, but the full potential of connectivity will only be reached if all people have equal access to it. Access to infrastructure and hardware does not remain the only barrier, however. With ever faster developing technologies, digital literacy is becoming just as crucial to cope with the demands of digitalization. By the same token, transforming Africa into a Single Digital Market requires access to digital technologies as well as the internet, greatly enabled through more and more cheaply available smart devices and increased broadband penetration, as

well as the skills and knowhow to utilize this access to societal benefit. That is why we are proudly supporting the development of the Smart Devices Blueprint, the implementation of the Smart Africa Digital Academy and the development of National Broadband Strategies for Smart Africa Member States.

Considering the rapid changes in technology taking place within the world today, the description given to a Smart Device will vary between countries and contexts, as will be the focus of each nation. Understanding and unlocking the potential in use of smart devices to benefit the people in our partner countries, however, is universal. Digital inclusion and access to socio-economic services are important to any single citizen and span digital services in the fields of government interaction, education, health, agriculture and commerce among others.

With this blueprint, Smart Africa is, once again, leading the way, presenting a reference point and baseline for Smart Africa Member States for the development of their respective Smart Devices Policies and Strategies.

The Smart Africa Alliance has set itself an ambitious goal with establishing a Single Digital Market by 2030. With our partnership, we are supporting this vision. We believe that sustainable development is only possible if it is initiated and supported from within the countries we are working with and we look forward to a bright future ahead.

Mr. Martin Kraft

Country Director GIZ Rwanda



ACKNOWLEDGEMENTS



Since the endorsement of the Smart Africa Manifesto by Seven (7) Heads of State on 29 October 2013, the Smart Africa Alliance has since grown in size and in strength and includes 32 African Member States that represent over 815 million people (as of December 2021). The same Manifesto was also endorsed by all Heads of State and Government of the African Union at the 22nd Ordinary Session of the Assembly of the African Union in Addis Ababa. This development placed the Manifesto at the heart of the ICT agenda for Africa.

Chaired by His Excellency President Paul Kagame, President of Rwanda, the Smart Africa Board brings together the 32 Heads of States and Government along with the International Telecommunication Union, the African Union Commission as well as Smart Africa's Partner Organizations and Private Sector Members, with one common goal: "To transform Africa into a single digital market".

By creating this platform, our leaders are aiming to bring about sustainable development, enable a cashless economy, increase citizen participation, increase production, productivity and efficiency, increase transparency, trust and accountability, increased evidence-based decision making and last but not least, create jobs, especially for the youth and marginalized groups.

It is within this context that the Smart Africa Member States give a great importance to promote digital inclusion, by fostering the adoption and use of smart devices, as well as the development of a single market for smart devices in Africa.

To operationalize the Smart Africa Manifesto, the Smart Africa Alliance identified flagship projects led by Member States. One of these flagship projects is "Inclusive Adoption of Smart Devices in Africa" led by the government of Republic of the Congo (Brazzaville). Smart Africa Secretariat embarked into the development of the "Blueprint for inclusive adoption of smart devices in Africa" aiming at empowering individuals and businesses with smartphones, tablets, personal computers and smart boards, which are the smart devices within the scope of the blueprint.

Our sincere appreciation goes to German Federal Ministry for Economic Cooperation and Development (BMZ) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, which provided the financial support that enabled us to recruit the expertise of "LBC", our lead consultant for the development of this blueprint. We would like also to acknowledge and thank the Smart Devices Project Working Group with membership from Smart Africa Alliance members, key stakeholders and partners, ranging from Smart Africa Member States, Smart Africa Partner Organization, Smart Africa Private sector Members, Smart Africa Secretariat, other organizations outside the Smart Africa Alliance, for their invaluable inputs and insights during the development of this blueprint.

Our deep gratitude goes to our partners Intel, GSMA, Maraphones and Meta for availing their expertise that helped materialize this Blueprint. The support and leadership of the project flagship country Republic of the Congo (Brazzaville) has been enormous, and appreciation goes to the Minister of ICT in Congo, Honorable Augustin Maliba, for accepting to take up and supporting the Smart Devices project as the Flagship of the Republic of the Congo (Brazzaville).

Mr. Lacina Koné

Director General, Smart Africa Secretariat

EXECUTIVE SUMMARY

As digital technology becomes more pervasive in all spheres of life, no society or economy can progress without empowering all its citizens with smart devices (SD) with primarily a human interface, such as, smartphones, tablets, personal computers and smart boards, which are the scope of this blueprint. Smart devices part of the Internet of Things (IoT) is not within the scope of this blueprint.

Smart devices are becoming a necessary and indeed a central part of individual quality of life, of business activity and of the socio-economic development of a society. In the new digital world of massive data, of very rich content and of customized services at the fingertip of anyone via smart devices, it is individuals and businesses, more than governments and research institutions, that will drive innovation in all spheres of life.

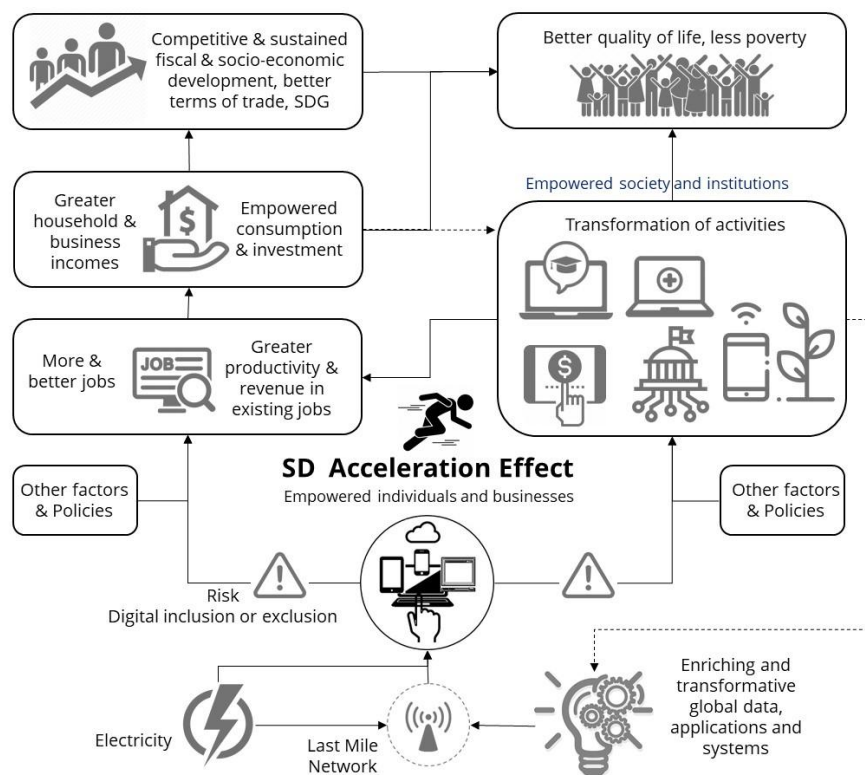
Smart device inclusive adoption calibrates the speed of digital transformation in Africa

Empowering individuals and businesses through a massive program for promotion of inclusive adoption of smart devices, complemented by adoption in the public sector, without adding an additional layer of exclusion on those less prepared and already disadvantaged in society, will accelerate digital transformation in Africa. Not acting will not have a neutral effect, but a limiting effect on development.

A Formidable but Worthy Aspiration

Bringing all Africans online by 2030, as defined in the Digital Transformation Strategy for Africa (2020–2030)¹, approved in 2019 by the African Union, and by the United Nations Broadband Commission is a formidable endeavor.

It implies bringing digital connectivity to 220 million



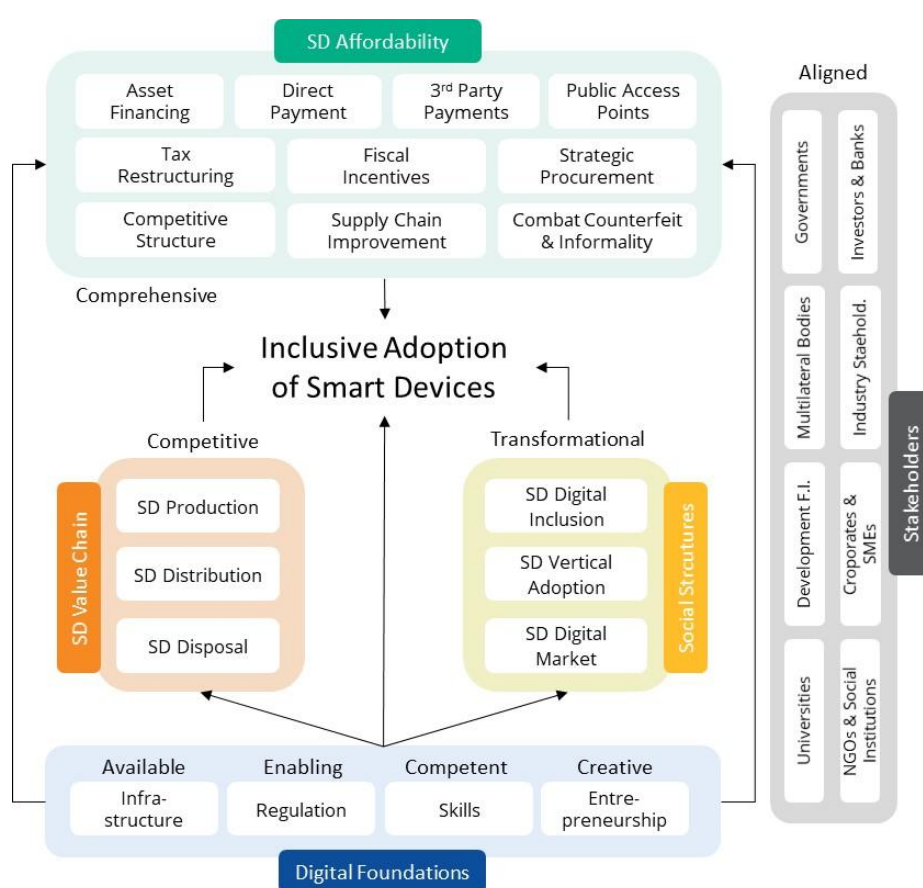
SD will either accelerate or bottleneck digital transformation in human activities.

¹ AU, *Digital Transformation Strategy for Africa* <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

people from 2016 to 2021 and to 560 million people from 2021 to 2030, to achieve universal access by 1.1 billion African, as part of the 100 billion USD moonshot broadband strategy for Africa (counting from 2019). It will also mean making available smartphones to 765 million people if every African it to own a smartphone. Doubling the penetration rate of PCs from 11% to 22% of households, will mean an addition of 25 million PCs, at affordable prices of purchase and of use. This would require maintaining the average purchase cost of smartphones well below 100 USD, the cost of tablets under 200 USD and the cost of PCs under 400 USD (Cost of PCs vary from Good = \$199 – 249 ; Better \$249 -399 & Very Good \$349 – 599) and furthermore, reducing user costs and increasing incomes substantially so that the average price for fixed broadband diminishes from the current 18.3% of GNIpc to the 2% set by the United Nations Broadband Commission and the average price for mobile broadband diminishes from the current 3.3% of GNIpc to 2%.

This requires a comprehensive approach and the mobilization and alignment of all relevant stakeholders.

First and foremost, it requires a very comprehensive program for addressing the affordability challenge in Africa. Our research shows that devices and connectivity are not more expensive in Africa. It is just harder for most people to pay for them. Margins are thin. Strategies to address affordability need to be well thought, not to be counterproductive, and should be comprehensive, through measures that are sensitive to different



A comprehensive approach for Inclusive Adoption of SD

user groups in society: i) structural actions, such as promotion of smart device competitive market structures, supply chain improvement and combating informality, ii) transversal actions, such as tax restructuring, fiscal incentives, strategic procurement and public internet access points, and most of all, iii) a massive program of individual and group direct financial support through measures such as, asset financing, direct payment actions and 3rd party payments.

	Vulnerable Groups	Beyond Their Means	Lower Income	Lower-Middle Income	Middle Income	Public Sector Users	Others
Structural Strategic Actions	🕒	🕒	●	●	●	●	●
Tax Restructuring	🕒	🕒	●	●	●	●	●
Fiscal Incentives	○	○	●	●	●	●	●
Strategic Procurement	🕒	🕒	○	○	○	●	○
Public Access Points	●	●	🕒	🕒	🕒	🕒	🕒
3rd Party Payments	●	●	🕒	🕒	○	○	○
Asset Financing	●	●	●	●	●	●	●
Direct Payment Actions	🕒	🕒	●	●	●	●	●

Impact of recommended action on different user groups

The challenge of inclusive adoption of smart devices also requires a digital foundation comprised by four pillars: i) Available digital infrastructure for broadband access, ii) Enabling regulation that promotes competitive market structures moving towards a single digital market, attracts investors, promotes entrepreneurship and protects users in terms of privacy and security, iii) Competent digital skills that raises awareness and empowers citizens and businesses, as consumers and also as producers, and iv) Creative entrepreneurship that feeds innovation and makes things happen, creating new jobs, raising incomes and fiscal revenue and transforming the way of producing, consuming and living.

It also requires the strengthening and further development of a competitive smart device value chain in Africa, that moves Africa from consumer of technology to a player that also produces technology in terms of manufacture of smart devices, software development and producer of relevant content, under an Industry 4.0 framework, with new technologies such as additive manufacturing, robotics, IoT, connected ecosystems, AI, blockchain and other emergent technologies.

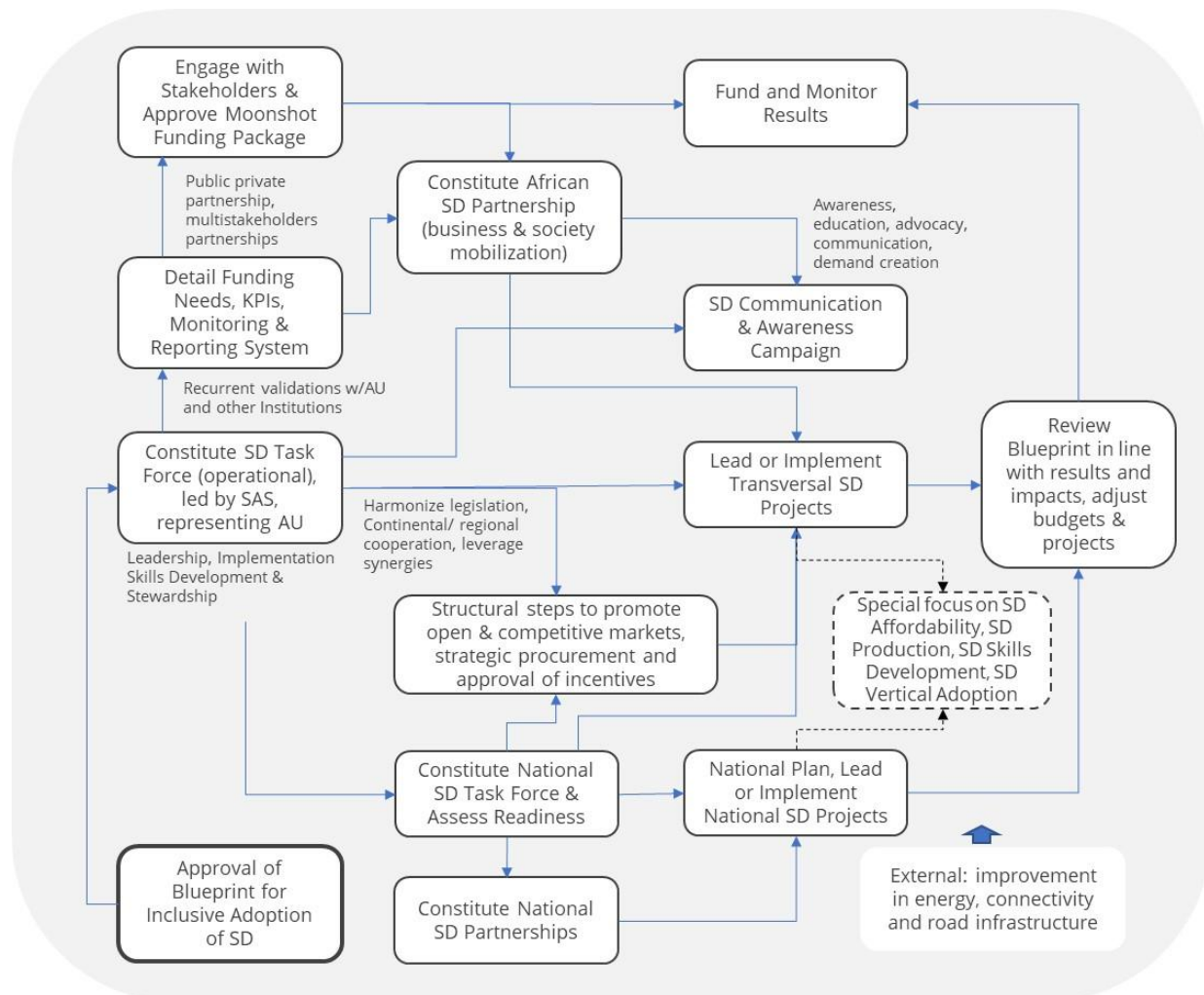
At the same time, a transformational impetus is necessary in three key areas of society: i) the promotion of a single SD market that diminishes current barriers and introduces automatic market incentives in relation not only to the exchange of goods and services but also in relation to data governance and data management in Africa, ii) the reduction of the digital divide with the poorest and the most vulnerable user groups, such as young girls and remote rural dwellers. In addition, it is necessary to accommodate and even accelerate the impactful digital transformation in agriculture, health, education, government, finance and commerce.

The economic and social impacts of such endeavor for Africa would be huge. With the highest concentration of poor people in the world, a large young population that will enter the job market in the following years, African leaders should not ignore the disruption and the opportunities brought by digital technologies and the critical role played by smart devices.



Making it Happen

The challenge, as always, is making it happen on the ground and impacting on people's lives. This Smart Devices Blueprint intends to serve as a reference for a Smart Devices Continental Strategy and as a baseline for Smart Africa Member States to develop their respective Smart Devices (SD) Strategies.



Making it happen involves a Road Map requiring decisions and actions at political levels, such as the African Union and each African country, the engagement of multiple stakeholders, the definition of funding, monitoring and reporting mechanisms, agreement on and mobilization of the necessary funding, adoption of structural measures at continental and national levels, as well as awareness campaigns and concrete implementation focused on SD affordability, SD production, SD skills development and SD vertical adoption. External to the blueprint are fundamental actions relating to the necessary energy, connectivity and road infrastructure, as well as broader actions on skills development.

This endeavor requires not only an integrated approach, but also large amounts of investment and full and committed engagement of all relevant stakeholders.





An estimated investment for the implementation of this Blueprint was produced and handed to Smart Africa Secretariat for further analysis, refinement and engagement with stakeholders and financiers. However, this blueprint also provides content for the United Nations Broadband Commission's digital infrastructure moonshot strategy for Africa "Connecting Africa Through Broadband" of 2019², which aims to reach universal access by 2030 and to mobilize 100 billion USD for this effect.

A set of flagship projects are proposed as a starting point for this implementation.

Platform for SD Digital Skills Online Learning; Foundation SD skills for informal market operators; Creation of a distinct continental entity in charge of the development of Africa's smart devices regulation, within ITU or the Africa Union; Create a collaborative tool for training skills in the SD Value chain; Develop an economic feasibility study for SD manufacturing investment; Launch a call for a SD value chain in Africa's innovative hubs; Continental Platform for sharing data and best practices of e-waste management; Continental Eco-design Directive for Smart Devices; Bursaries for professors and students in top international universities in the field of smart devices; Government backed Commercial Bank's SD Credit Programs; Coalition for 3rd Party SD Finance for Africa; 5 -year National Roadmap for Public Internet Access Points to the Internet; Create a SD Single Market Digital Platform; Create a unitary marking, patent and trade-mark system for SD in Africa; Impactful Technology Capacity Program - a University and Expert Exchange and Bursary Program on Big Data, AI, Cloud and Advanced Technologies (Blockchain and others); Create a digital training task force for public employees; Ensure broadband connectivity and stimulate the creation of computer labs in primary and secondary schools; 1 Interactive board per secondary school Program (interactive boards although they work in all grades and bring value, typically bring the most value in early learning stages Grade 0 to 3 as students are consuming content and not having to create content).

² Broadband Commission, Connecting Africa through Broadband:
<https://www.broadbandcommission.org/publication/connecting-africa-through-broadband/#:~:text=Connecting%20Africa%20Through%20Broadband%3A%20A%20strategy%20for%20doubling,by%202021%20and%20reaching%20universal%20access%20by%202030>





1. INTRODUCTION





1. INTRODUCTION

The evolution of digital technology has led to smart devices, such as mobile phones and personal computers, becoming a necessary and indeed a central part of modern private and business life. As digital technology becomes more pervasive in all spheres of life, smart devices (SD) are determinant to the possibilities in a persons' life and indeed to the socio-economic development of a society.

This Blueprint intends to serve as a reference for a Smart Devices Continental Strategy and as a baseline for Smart Africa Member States to develop their respective Smart Devices (SD) Strategies.

This blueprint is aimed at promoting four major outcomes.

MASSIFY SD OWNERSHIP	PRODUCE SD IN AFRICA	GUIDE MEMBER STATES	MOBILIZE & ALIGN STAKEHOLDERS
Contribute to make Smart Devices (SD) Ownership part of basic necessity in Africa, taking into special consideration the challenge of affordability.	Stimulate a Smart Devices Single Market in Africa, taking into consideration the production of smart devices in Africa as well as the sustainable treatment of smart device waste.	Guide Member States on their SD Strategy, in order to facilitate and accelerate implementation, considering country and regional differences.	Contribute to align and mobilize major stakeholders, actors and resources, in order to ensure impactful and sustainable progress.

The impact of these four outcomes on the promotion of economic competitiveness, on growth and sustainability within the framework of the 4th Industrial Revolution that is changing the way of producing and living at the global level, is a strong contribution to the achievement of Sustainable Development Goals (SDG), to the promotion of new jobs, to the increase of income levels, to the reduction of poverty levels and to socio-economic transformation.

Africa is on the move, but further acceleration is drastically needed

Africa, as continent, has challenges of high poverty levels and low socio-economic indicators. The socio-economic disruption caused by digital technologies provides Africa with a one in a lifetime opportunity to leapfrog development stages. But it also poses a threat of further distancing Africa from the world average and the most advanced regions. Given the decisive impact of digital technology in socio-economic dynamics and its pervasive impact in all spheres of life on a global scale, the





challenge of digital transformation is crucial for Africa.

Africa's digital transformation is currently underway, with ICT allowing countries to leapfrog chronic development constraints in education, health, economic production, trade and government services, generating changes across all economic sectors and providing much-needed socio-economic development. While still distant from developed economies, Africa has recorded the highest growth rates globally on several market parameters for ICT.

Access to digital and cellular technology resulted in innovative practices across the continent as Africans developed mobile lending applications and digital platforms for e-commerce, along with the creation of over 400 technology hubs across the continent alongside incubators, accelerators, innovation hubs, technology parks and co-working spaces that support them. Investments into African Tech Startups has reached US\$2,148,517,500 in 2021, a rise in 206,3% over 2020, involving a record number of 564 startups, a rise of 42,1% over 2020.³

Speed of response and adoption is a critical element to succeed in the accelerated dynamics of a globalized digital transformation revolution. However, Africa still lags in many critical areas of digital transformation, namely in access to connectivity and digital content and services and the integration of these into socio-economic activities. Africa needs to accelerate drastically its digital transformation.

Smart Devices comprise a key element to propel Africa forward in digital transformation, also promoting a more even distribution of

digital technology and knowledge within Africa. There is a need to give greater centrality to smart devices, taking into consideration existing limiting factors and building on the young energy and the advantages of the African continent to reinforce a moonshot strategy for digital transformation in Africa.

1.1. Scope

The definition of smart devices varies and is changing as a result of the rapid evolution in digital technologies.

Smart Devices with Primarily a Human Interface

The specific scope of this blueprint are smart devices with primarily a human interface, mobile-able and most widely used in society by individuals, such as smartphones, tablets and portable laptops and personal computers. While interactive boards, a niche smart device relating mostly to educational and organizational use, is also addressed in chapter 7.3. Smart Devices Vertical Adoption.

Inclusive Adoption of Smart Devices

Smart device ownership and use empowers individuals to improve their lives in social and economic terms. The underlying premise of this blueprint is that smart devices ownership and relevant use should be part of the basic necessity of life for the citizens of Africa as a necessary and conditional step to take full benefit of broadband and digital services, thus improving their quality of life, helping to accelerate digital transformation in Africa and contributing to socio-economic development at continental and country level.

³ Disrupt Africa: African Tech Startups Funding Report 2021: <https://disrupt-africa.com/funding-report/>

1.2. Relevance of Smart Devices

The exponential growth of digital capacities worldwide is spurring a digital transformation of the economy and society which is blurring the lines between physical and digital and fueling the Fourth Industrial Revolution (4IR). Digital transformation and the creation of a single digital market in Africa seems to be the one catalyst that can accelerate Africa's socio-economic progress, particularly in the context of the African Continental Free Trade Agreement (AfCFTA), which entered into force in May 2019.

The adoption of digital technologies has a measurable positive impact on socio-economic development. It leads to the increase of household incomes⁴ and is positively correlated with GDP growth in Africa⁵. Studies show the positive impact of digital inclusion, especially internet availability, on welfare in Africa and concluded that it generates more and better jobs for lower-income people, and hence reduce the poverty rate. The key takeaway being that the more digital access Africans have, the more likely they are to escape poverty over time.⁶

Software applications, continuous innovations and increasing digitalization of data associated with smart devices can open a new frontier of economic productivity, empowered consumption and quality of living, stimulating job creation and contributing to addressing

poverty, reducing inequality, facilitating the delivery of goods and services, and contributing to sustainable development and the achievement of many of the key transformational outcomes of Sustainable Development Goals.

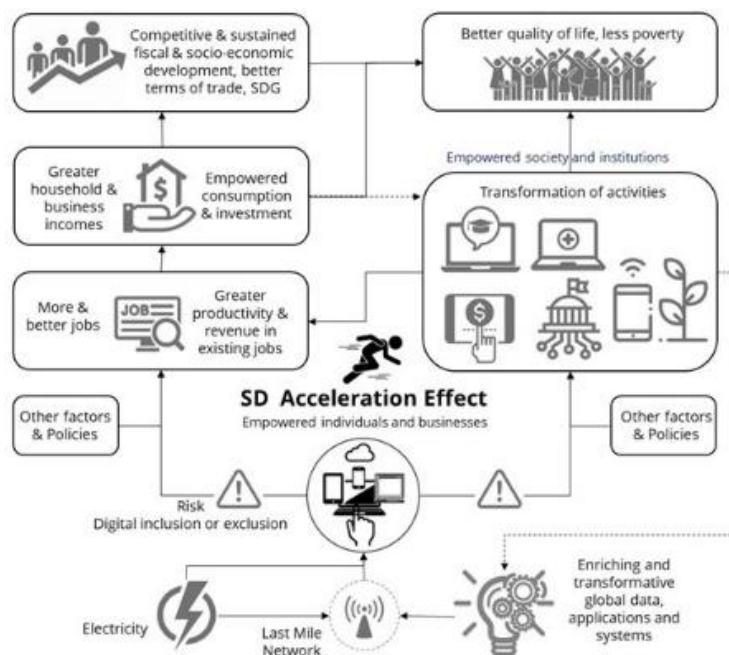


Figure 1. SD will either accelerate or bottleneck digital transformation in human activities.

Widespread adoption of smart devices for its own sake will result in an unbalanced supply side approach relative to “impactful” adoption and use: if people have smart devices but do not make full use of its potential, or if there is limited relevant content for them, the socio-economic impact will be little. Therefore, a beneficiary/ user focused approach is needed in specific areas of daily-life relevance such as

⁴ ITU, The economic contribution of broadband, digitization and ICT regulations (2018):

https://www.itu.int/en/ITU-D/Regulatory-Market/Documents/FINAL_1d_18-00513_Broadband-and-Digital-Transformation-E.pdf

⁵ The impact of digital technology usage on economic growth in Africa, Solomon and Klyton (2020):

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7456578/>

6

<https://www.worldbank.org/en/news/feature/2021/09/24/narrowing-the-digital-divide-can-foster-inclusion-and-increase-jobs>



E-agriculture services, E-payments/finance services, E-commerce services, E-health services, E-education services and E-government services. In addition, digital development efforts need to include the conditions and actions that promote socio-economic development, productivity, competitiveness, fiscal income and job creation.

Efficient and affordable smart devices and the contents and services associated, combined with enabling policy and regulatory environments, enable individuals, businesses and governments to participate in the digital economy, helping citizens and countries boost their overall economic well-being.

1.3. Focus of the Strategy Recommendations

Affordability

Affordability of smart devices and connectivity is a key factor for adoption and use. The pricing of handsets is clearly vital to uptake in Africa, as well as the level and cost of access to connectivity. The price point for an entry-level smartphone is gradually descending but needs to be accelerated. At the moment, a price under 100 USD and preferably in the price range of 40 - 60 USD for an entry-level device seems to be necessary to have a significant impact on increase of uptake. A price range below 200 USD for Tablets and below 400 USD for Personal Computers is essential (Cost of PC's vary from Good \$199 – 249; Better \$249 -399 & Very Good \$349 – 599). However, low incomes and high poverty levels are at the basis of affordability limitations in Africa. Absolute costs are not higher in Africa in comparison to the rest of the World. It is just harder for most people to pay for them. As such, it is important that affordability targets for smart devices are

not only set in terms of market price, but price as a fraction of the average monthly income.

Local Manufacture in Africa

Although the widespread usage of smart devices will create opportunities for growth and improved quality of life, extreme technological dependency on external markets and high import costs can hamper the performance of African economies. Particular attention to strategies that promote local assembly, production and innovation of smart devices is a critical factor to reduce import costs, improve terms of trade, generate jobs and local taxes. Africa should aspire to serve its own market but also the global market in specific components.

Comprehensive Perspective

Multiple factors and interdependencies impact on smart device adoption and use. Lack of infrastructure limits the addressable universe for smart device adoption, as does basic literacy and digital literacy. A policy balance between supply side (for example, cost of device and connectivity) and demand side (for example, affordability and lifestyle) are needed.

Besides affordability, the challenge of adoption and use needs to be addressed from a comprehensive perspective, giving special attention to digital skills.

One Size Does Not Fit All

Africa is an entity with shared characteristics that are distinct from other continents. It is a mobile-first environment. It is mostly a pre-paid market. It has lower levels of income. It lacks connectivity and affordable access, limiting the addressable universe. Therefore, benchmarking of policies and case studies from non-African contexts requires interpretation and adaptation.



However, it would be a limiting exercise to treat all Africa as a uniform entity. Recommended strategy actions take into consideration, as far as possible, regional and country differences.

Finally, it is necessary to take into consideration the present and future impact of COVID-19 on the economy and society.

1.4. Goals

The recommendations proposed in the Smart Devices Blueprint builds upon the Digital Transformation Strategy for Africa (2020–2030)⁷, approved in 2019 by the African Union, which aims to transform African economies and promote their integration, through the use of digital technologies and innovation. This strategy is in line with Agenda 2063⁸ and the UN's Sustainable Development Goals (SDG)⁹.

This Smart Device Blueprint also takes into special consideration the Broadband Commission's digital infrastructure moonshot strategy for Africa "Connecting Africa Through Broadband" which aims to reach universal

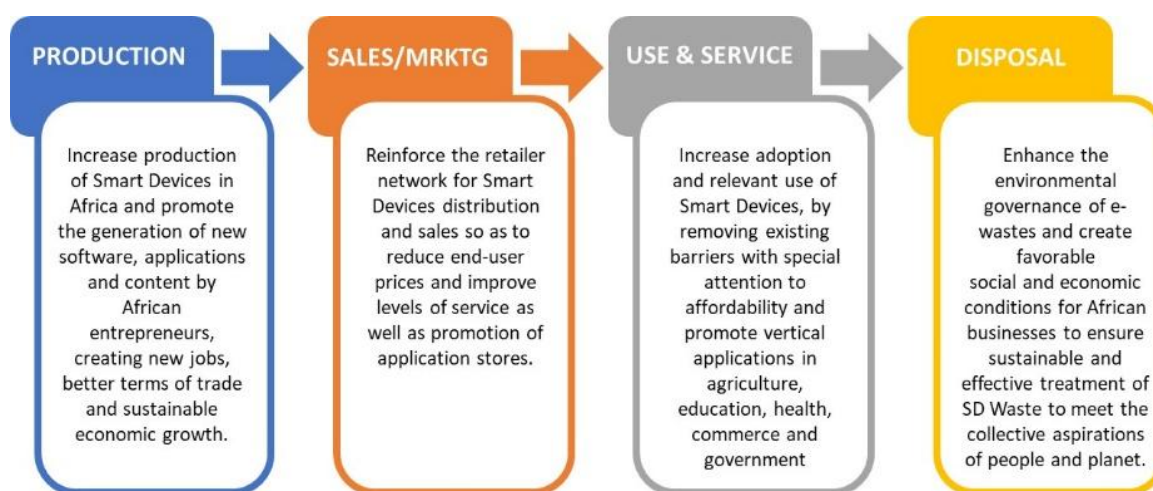
access by 2030 and to mobilize 100 billion USD for this effect.

This blueprint addresses objectives in the four major components of the smart device value chain, giving special attention to the adoption and relevant use of smart devices.

More specifically this blueprint aims to promote the following objectives, within a period of five years (2022 to 2027):

- (i) Increase total connections of smart phones (excluding licensed cellular IoT) in Sub-Saharan Africa and Northern Africa from 48% and 54% respectively, in 2019, to 70% in 2027.
- (ii) Increase computer penetration in Africa from 11% in 2020 to 22% in 2030 and reduce disparities between countries by half.
- (iii) Increase market share of smartphones produced in Africa from below 0.5% in 2020 to 3% in 2027
- (iv) Serve the global market in specific smart phone components.

Figure 2. Objectives to Strengthen the Smart Devices Value Chain in Africa



⁷ AU, *Digital Transformation Strategy for Africa* <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

⁸ AU, Agenda 2063: https://au.int/en/Agenda2063/popular_version

⁹ UN, SDGs: <https://sdgs.un.org/>



2. SMART DEVICES ECOSYSTEM



2. SMART DEVICES ECOSYSTEM

2.1. Definition and Scope

Smart devices are electronic devices with internet access, capable of performing autonomous computing in a context-dependent manner¹⁰.

According to this definition, there are three features which all smart devices share in common: *connectivity* — the device is able to connect (wire or wirelessly) to a network of devices for data exchange, *context-awareness* — the device is able to collect data and react according to pre-established programs and *autonomous computing* — the device performs automatic data processing.

Other features are also commonly associated with smart devices such as mobility and user-interaction. Several smart devices are not mobile as is the case for desktops and interactive white boards, while devices which only interact with other electronics but are nevertheless part of the network would still fall under the umbrella of the term.

This blueprint will focus on three types of smart devices, that are fundamentally mobile, of widespread use and oriented for individual user-interaction — Smartphones, Tablets and Laptops/Personal Computers (PCs). Laptops and personal computers are referred to as

personal computers in this blueprint for ease of communication, since, for policy recommendation, their basic functionalities are very similar. In addition, the blueprint also addresses Interactive White Boards (IWBs), a niche smart device used for group interaction and knowledge sharing (in Chapter 7.3. Vertical Adoption Pillar).

Smart Devices

Blueprint Scope:

Mobile individual user-interaction:

1. Smartphones
2. Tablets
3. Personal Computers
(Laptops, Notebooks and 2-in-1's)

Niche Smart Devices:

1. Interactive White Boards

Out of Scope:

1. Basic and Feature Phones
2. Desktops
3. Computer Servers
4. Internet of Things Devices

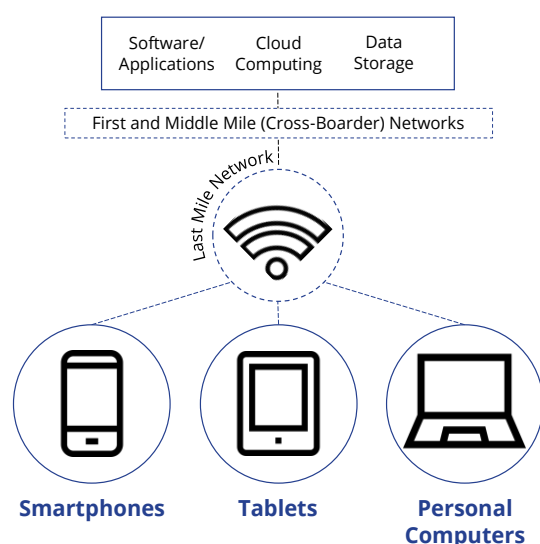
Figure 3. Smart devices within the scope of the blueprint.

Increasingly, it is *things* rather than people which are connected. The Internet of Things (IoT) includes sensors, voice-activated devices,

¹⁰ Adapted from the definition proposed by Silverio-Fernández *et al.* (2018):

<https://link.springer.com/article/10.1186/s40327-018-0063-8>

geospatial instruments, machine to machine communications, vehicle to vehicle communications, etc. and the intelligence of the network resides in the *cloud* rather than in the devices themselves. Therefore, to harness benefits from the digital transformation, abundant, low-cost connectivity is essential. That is why broadband drives productivity, innovation and growth.



Computer servers, smart devices that relate to the Internet of Things (IoT), like Smart Watches and Televisions, and new digital ecosystems, such as Smart Homes, Smart Factories and Smart Cities are not within the scope of this blueprint. However, there is increasing convergence, interdependence and complementarity between technologies. In fact, smartphones and personal computers are often the main interface of data generated by IoT devices, and the adoption of IoT devices typically promotes the expansion of smart phones and personal computers. IoT devices

are an interesting subject for future blueprints, with concepts such as Smart Villages¹¹ and Smart Cities¹² having been featured in previous Smart Africa published works.

To clarify the definitions and scope of this blueprint, a description of relevant devices can be found in the Annex 1.

2.2. The Smart Devices Ecosystem

A Platform Driven by Individuals

Technologically, smart devices have evolved from being a simple local equipment (not so smart) to a platform with access to huge data and services in the cloud. A key feature of this change and of the latest wave in smart device innovation is that it is being driven by individuals — by consumers and by employees — rather than IT departments of companies. The shift to data-enabled devices opened-up a brand-new world of possibilities to individuals, empowering them socially and economically.

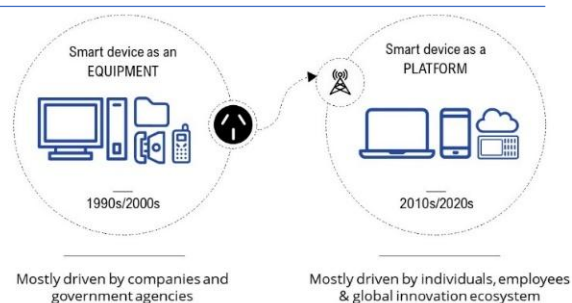


Figure 4. Smart devices are platform-based and driven by individuals.

Socially, it allows for much richer information – videos, games, photos, music, location-based services, multiple apps in all spheres of life activity, such as education. Economically, it

¹¹ <https://smartafrica.org/knowledge/movie-recommendation/>

¹² <https://smartafrica.org/knowledge/smart-sustainable-cities-a-blueprint-for-africa/>

allows for new businesses for self-employed persons and entrepreneurs and makes it easier for employees to work from home without being tied to the office desk.

Therefore, the aim of making smart device ownership a basic necessity in Africa is key for social and economic empowerment of individuals and for digital transformation of Africa at large. In this context, the issue of affordability of total cost of ownership of smart devices becomes central to effective digital transformation in Africa.

But this involves businesses too, as digital devices are changing the way employees (individuals) do their work and therefore the way businesses operate and compete. There is a case for incentives for businesses to have their employees to use more smart devices in their operations.

Technological innovation comes increasingly from individuals who engage in new start-ups, supported by a global venture capital industry and by start-up ecosystems, local and global. This reverses the trend of previous decades when technological developments came essentially from government research agencies and the IT departments of large businesses. This has implications for the need to stimulate existing and new technological ecosystems in Africa to invest more in smart device technology and ecosystem.

From Simple to Complex Global Ecosystem

The structure of the smart device and the mobile industry has changed from a simple

supply chain to an ecosystem of mobile businesses that encompasses mobile web, apps, m-commerce and more. The industry has changed from what was once a relatively simple supply chain from hardware manufacturers to final customers to a complex ecosystem of digital and mobile technologies and vertically specialized producers focused on the global market – device manufacturer, device retailer, software developers, equipment vendors, content providers, payment systems, mobile carriers, machine to machine technologies, resellers, digital platforms, cloud platforms, among others.

Convergence in devices – smart phones, tablets, laptops/personal computers and others - will be complemented by increased integration between networks, with mobile and fixed networks being complementary and increasingly interdependent.

Below is a simplified value chain of smart devices, that highlights the four major stages. However, the reality is a maze of non-sequential interactions with multiples interdependencies.

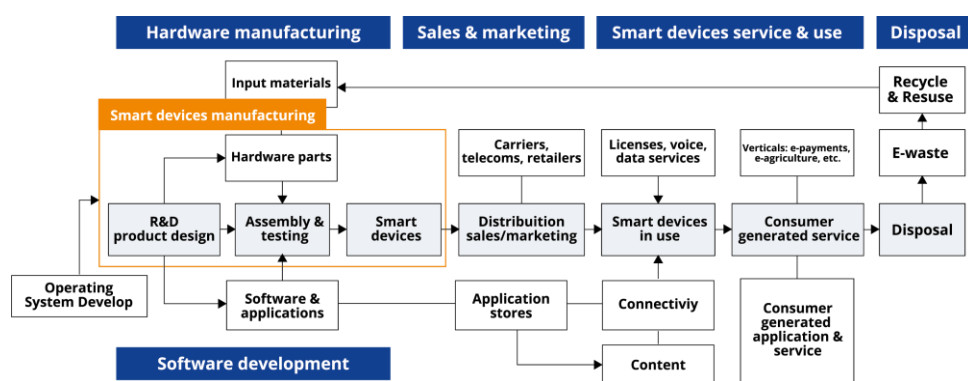


Figure 5. Smart devices value chain.

The complexity of the value chain has implications for the production of smart devices in Africa. It is much more than hardware

components. The software, the content and the business model are as relevant. Today, any final production of smart devices is an assembly ecosystem with more-or-less in-house value added. Global procurement, partner/production ecosystem, market power,

branding and distribution are as important as independent manufacturing capacity. Being digital devices a global market, manufacturers also have to excel at specific components globally, rather than in all components, and have to aim to the global market.

2.3. Main Factors for Smart Devices Adoption

Being widespread adoption of smart devices such a crucial step for acceleration of digital transformation in Africa, through empowerment of its citizens to new social and economic possibilities, it is important to understand the several factors that impact on smart devices adoption by individuals.

The recommendations of this blueprint take into consideration five factors that can broadly be identified as having incentive or deterrent implications on smart device acquisition and use.

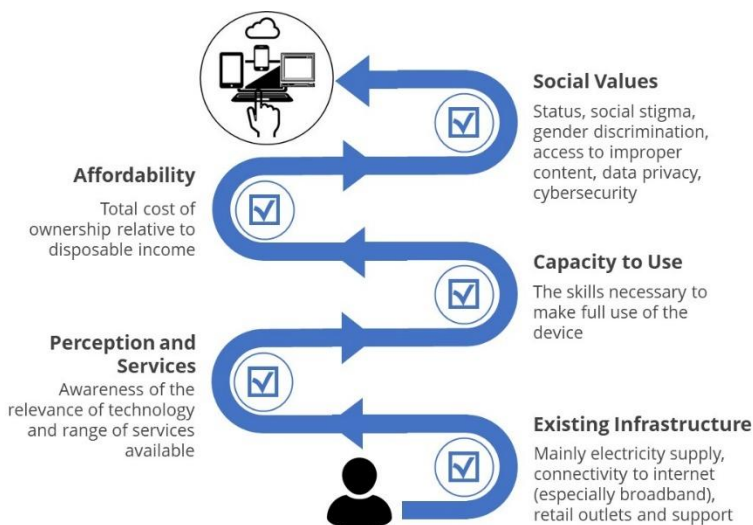


Figure 6. Main factors for SD adoption.

Meaningful Connectivity

In addition, not everyone connects to the internet in the same way. According to The Alliance for Affordable Internet (A4AI), the United Nations' (International Telecommunications Union) definition of internet use, which is "internet use from any location/device within the last 3 months" does not account for the huge differences in how people connect and use the internet. Some will only use a messaging app on a 2.5G mobile connection once a month, while others will video-conference on a high-speed broadband connection several times a day. Ignoring the huge differences in how people connect will only exacerbate inequalities online and offline.

The Alliance for Affordable Internet (A4AI) proposed a new target — meaningful connectivity - to help decision makers better enact policies that help people connect to an internet that is useful and empowering. With greater access and more meaningful connectivity, countries can start to scale their digital economies.

The meaningful connectivity target is a tool to raise the bar for internet access and set more ambitious policy goals for digital development. It sets minimum thresholds across the four dimensions of internet access that matter most to users:



- Regular internet use | minimum threshold: daily use
- An appropriate device | minimum threshold: access to a smartphone
- Enough data | minimum threshold: an unlimited broadband connection at home or a place of work or study
- A fast connection | minimum threshold: 4G mobile connectivity.

This blueprint does not have the base data to analyze and propose policies taking these four dimensions into consideration. However, the key principle of quality access to the internet is adopted in the analysis and in the recommendations. Africa should not settle for substandard measurements, but aim to continuously aim higher, one step at a time.



2.4. Contribution to Socio-Economic Development

Digital and mobile technology is driving significant changes in individuals living in society and in businesses within a rapidly evolving economic structure.

In this context, it is important not only to promote the adoption of smart devices but also to steer and accelerate its impacts in the best possible way within a user-centric approach.

The major impacts of smart devices in key vertical applications in Africa are highlighted below.



Figure 7. The benefits of e-sectors through smart devices.

2.4.1. Role of SD in E-Commerce and E-Payment



Africa's digital economy and services are fundamentally based on mobile devices, namely smartphones, which can download mobile money apps. Financial security is a factor on device preferences, as mobile money apps allow users to access their money independently of location, without the risks associated with carrying physical currency.

Access to formal financial services has been historically limited in the continent¹³. This is a key constraint on employment and the economic growth — especially for MSMEs. Financial technologies (*fintech*), namely digital wallets reduce these constraints by allowing mobile users to access digital financial services (e.g., payments, savings, credit, crowdfunding, insurance, etc.) while bypassing traditional providers (*i.e.*, banks). Online alternatives to banks are particularly relevant for people who do not own a bank account or for whom the commute to a physical bank is challenging due to transportation costs and the loss of work hours.

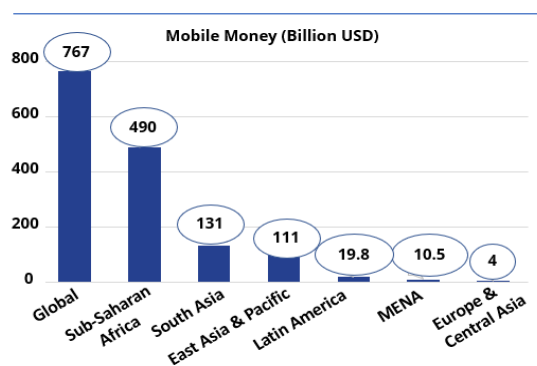


Figure 8. Total mobile money value transacted by region (2020). Source: GSMA¹⁴.

Mobile money has been widely adopted in Africa. **Sub-Saharan Africa** was the world region with the highest value of total mobile money transacted in 2020 (490 billion USD) — according to GSMA.

Africa is moving fast on fintech. The growth has been impressive. In 2021, 184 African fintech startups raised 1,038,456,500 USD of investment funds, up 547.7% on 160,319,065 USD in 2020, representing almost 50% of the total African tech startup investment. Investment in the sector was boosted by the COVID-19 pandemic.

Nigeria is currently a powerhouse in the sector housing the biggest e-commerce platforms in the continent — Jumia, and the second most funded African startup of 2020 — Flutterwave — a B2B payment service, which partnered with Alibaba to offer African merchants access to Chinese markets and vice-versa.

Smart devices can bolster the scaled potential of e-commerce. Consumer surveys between those with basic access and those with meaningful connectivity (which includes smartphone ownership) indicated those with meaningful connectivity were 17% more confident in how to buy a bus/train ticket online, how to open a bank account online, where to buy a book online, and how to hire

¹³IFC, Access to Finance: Sub-Saharan Africa (2013): https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/financial+institutions/resouces/access+to+finance+sub-saharan+afrika

¹⁴ GSMA State of the Industry Report on Mobile Money 2021: https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/03/GSMA_State-of-the-Industry-Report-on-Mobile-Money-2021_Full-report.pdf

someone for a service.¹⁵ They were also more likely to have bought and sold something online, looked for a job, and made an online payment.

2.4.2. Role of SD in E-Agriculture

E-agriculture relies heavily on communication with and between smallholder farmers. The sector was initially dependent on basic and feature phones (through SMS communication) but has since moved onto online applications enabled by smartphones, which provide a wider range of services. The capacity to capture and exchange images is also important in agriculture for activities such as disease diagnosis.

Large farms with administrative personnel, on the other hand, need to gather and process large amounts of information. For this reason, they often require devices designed for data management, and which enable extended user input (*i.e.*, tablets, laptops, notebooks, and 2-in-1's).

Propelled by the COVID-19 pandemic, the prevalence of undernourishment¹⁶ in Africa rose up to 21% in 2020, from the previous 18%, following the global trend¹⁷. The adoption of smart devices and agriculture technologies (*agritech*) can help mitigate this impact.

Digital Information Services (*e.g.*, *online knowledge databases, peer-to-peer online forums, etc.*) are among the most important services available to farmers and provide a wide range of knowledge including: i) general good and sustainable practices in agriculture, ii) specific crop or livestock information, iii) weather and climate forecasts, iv) pest surveillance and disease diagnosis, v) information on formal land titles and farm boundaries.

With 35% of the food production output in Sub-Saharan Africa¹⁸ coming from smallholder farmers¹⁹, Africa's food sector is heavily reliant on small-scale producers — which in turn are particularly vulnerable to disturbances in the food supply chain. Digital financial services can improve farmers financial stability.

Africa *Agritech* start-ups raised 95,101,000 USD in funding in 2021²⁰. As the pioneer of the *Agritech* business in Africa, Kenya remains the main market, accounting for over a quarter of funded startups and over 70% of total investment - up from 59.5% of total investment in 2020. Twiga Foods has often led the way here, and did so once again in 2021, with more than 50% of funding.

As surveyed by CTA, it is estimated that 70% of African digital service enterprises for agriculture are currently generating revenue

¹⁵ A4AI, Advancing Meaningful Connectivity (2022): <https://a4ai.org/research/advancing-meaningful-connectivity-towards-active-and-participatory-digital-societies/>

¹⁶ "The proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal active and healthy life." FAO

¹⁷ FAO, The State of Food Security and Nutrition in the World 2021 Report: <https://www.fao.org/documents/card/en/c/cb4474en>

¹⁸ Note: This is Sub-Saharan Africa without Nigeria — whose individual share is lower (5%). For MENA the share is 20%. <https://www.sciencedirect.com/science/article/pii/S0305750X2100067X?via%3Dihub>

¹⁹ Smallholder farmers — individuals who farm crops or livestock in less than two (2) hectares of land.

²⁰ Disrupt Africa: African Tech Startups Funding Report 2020 <https://disrupt-africa.com/funding-report/>

and over a quarter of them are running profitable²¹.

2.4.3. Role of SD in E-Health



E-Health platforms for patient-use depend on the communication between users and healthcare workers, and therefore rely mostly on mobile devices (basic and feature phones, and smartphones). Smartphones enabled online platforms extend the range of services and information offered to users.

Platforms for service providers on the other hand are based on devices designed for data management and extended user input (*i.e.*, tablets, desktops, laptops, notebooks, and 2-in-1's). Given the confidential nature of medical data, desktops are suited for data management since they are not portable. Meanwhile, portable devices, such as tablets, offer more flexibility for training through visual media.

Mobile e-health applications are booming in Africa thanks to the increase in smartphone adoption over the past 10 years. A total of 55 startups — 9.8% of the African total — secured investment, a figure that was a 34.1% increase on the 41 that raised in 2020. African e-health startups raised 122,542,000 USD, close to a 20% increase on 2020, which at 102,994,000 USD was double all of the previous five years combined.

E-health startups across the continent are also reporting an increase in customer adoption resultant from the COVID-19 pandemic, with some founders telling they feel the sector has

progressed by five to ten years in the space of these twelve months.²²

2.4.4. Role of SD in E-Education



E-Education platforms are available on all smart devices. However, the majority rely on visual media (educational videos, e-books, remote classes, etc.). For this reason, devices with larger screen sizes such as tablets, laptops, notebooks, and 2-in-1's offer a more comfortable experience.

The fact that these devices are portable is relevant because many students do not have internet access at home and need to go to local internet hotspots.

Interactive white boards are specifically designed for communication with large audiences such as classrooms. Alternatively, personal computers can be coupled to projectors.

Market research reports show that the demand for e-education products and services is rising rapidly in Africa²³, with several e-education platforms emerging in recent years for all education levels; Primary School (*E.g.*, Tanzania's Ubongo — online and televised educational cartoons, freely broadcast across 18 countries available in 9 languages, reaching over 24.6 million households in 2020)²⁴; High School (*E.g.*, Togo's OkpaBac — online educational resources for students to prepare for the Baccalaureate exams, which determine university admission for students across the western Francophone coast of Africa; Professional Training (*E.g.*, Kenya's Moringa

²¹ CTA's The Digitalisation of African Agriculture Report (2019): <https://www.cta.int/en/digitalisation-agriculture-africa>

²² Disrupt Africa: African Tech Startups Funding Report 2020 <https://disrupt-africa.com/funding-report/>

²³ PAHO (2014). Possibilities and Challenges of E-learning in the African Continent: <https://www.campusvirtualsp.org/en/possibilities-and-challenges-e-learning-african-continent>

²⁴ <https://www.ubongo.org/>

School — online coding courses. Since 2015, Moring School has had over 3 thousand students enrolled and an 85% meaningful employment rate (6 months post-graduation)²⁵.

Online resources can be used to complement traditional education by engaging students during and outside classes via smart devices. These facilitate the process of sharing knowledge as it makes learning more interactive and dynamic. It also familiarizes students with devices and digital content further preparing them for the digital economy.

Fully digitally equipped and empowered students will be in a better position for career advancement, both academically and professionally, a crucial aspect in reducing the high levels of informal employment in Africa.

2.4.5. Role of SD in E-Government

E-Government can be defined as: *“the use of ICT to transform governmental service (in terms of its processes, procedures and structures) by making it more accessible, effective and accountable”*.¹⁵⁹

According to the E-Government Development Index²⁶ of 2020, four countries in Africa (Mauritius, Seychelles, South Africa and Tunisia) have performances above the global average.

Online public services are available to citizens through various platforms. Websites/ Portals,

used to access information and government-emitted documents, are typically designed for devices with large screens that offer a better reading experience (tablets, desktops, laptops, notebooks, and 2-in-1's).

On the other hand, services such as personal identification apps are largely designed for mobile devices (*i.e.*, smartphones), allowing citizens to carry their identification everywhere.

These services normally handle large sets of data, and their maintenance requires devices that can support it, such as desktops and laptops. Desktops being suited for confidential data since they are not portable.

Developing countries are catching up in e-government services, but it is important to guarantee that Africa's adoption of these platforms serves the majority of their citizens. Services like e-taxation and e-billing are important but they may impact the low-income people negatively, so it is important to create initiatives that would also support them.

Africa is in a unique position in terms of implementing e-government services as there is the possibility to leapfrog towards modern technologies, bypassing part of the traditional trial and error stages of development.

²⁵ <https://moringaschool.com/why-moringa-school>

²⁶ The E-Government Development Index (EGDI):

: [https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20\(Full%20Report\).pdf](https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf)



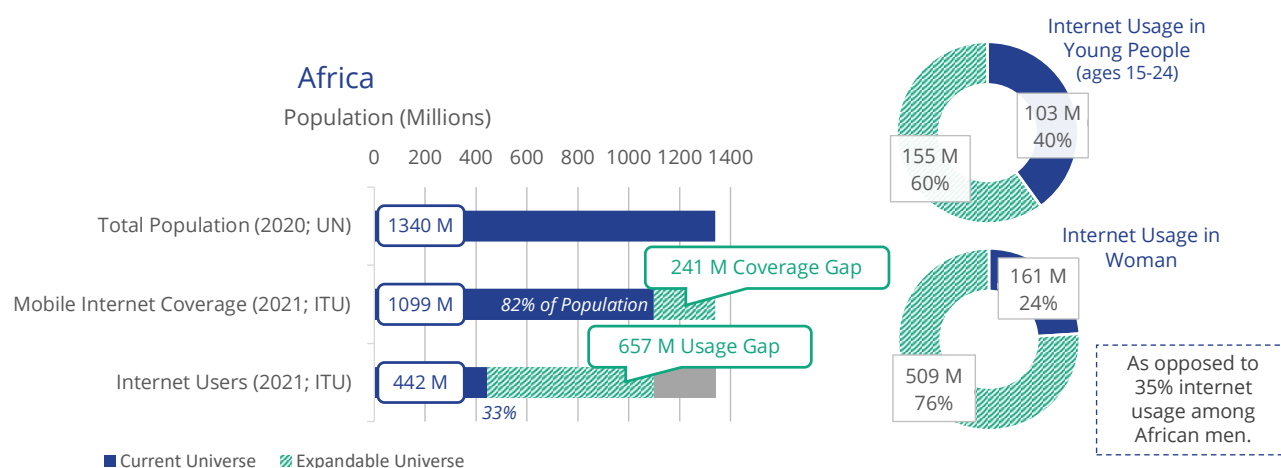
3. CURRENT SITUATION AND CHALLENGES



3. CURRENT SITUATION AND CHALLENGES

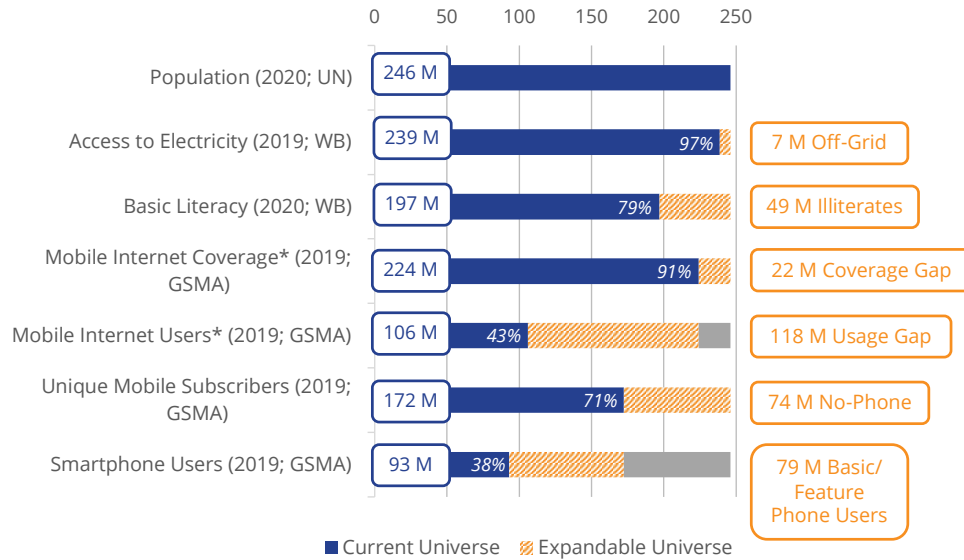
Africa is currently undergoing a digital revolution with a rising number of internet users and new mobile subscribers, propelled by its young population. These trends are enabled by the increase adoption of smart devices in the continent with Africa witnessing a rise in smartphone adoption and (to a lesser extent) computer access, in the past years. The digital progress has been supported by an increase in basic literacy, access to electricity, technological startup funding and innovation hubs across the continent, which are essential to the digital economy and its associated socio-economic benefits. Meanwhile, African leaders have been increasingly supportive of the digital revolution and the African Single Market — a sentiment reflected in the Digital Transformation Strategy for Africa 2030 and Agenda 2063, which strengthens Africa's current outlook and future growth.

3.1. The Addressable Universe of Smart Devices



Northern Africa

Population (Millions)



Sub-Saharan Africa

Population (Millions)

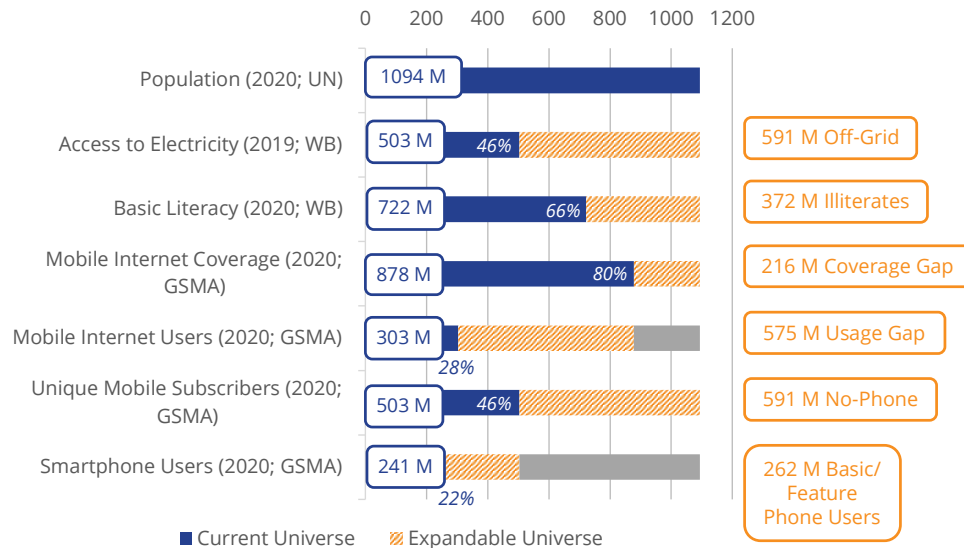


Figure 9. The addressable universe of smart devices.²⁷

²⁷ Note: Smartphone users were estimated by multiplying the number of unique mobile subscribers and the rate of smartphone adoption (share of mobile connections represented by smartphones).

3.2. The Major Limitations

Three main barriers need to be surpassed for Africa to ensure inclusive adoption and relevant use of smart devices, broad adoption of the Fourth Industrial Revolution solutions by businesses and consumers, and to reach the average world digital development or even leapfrog in some areas.

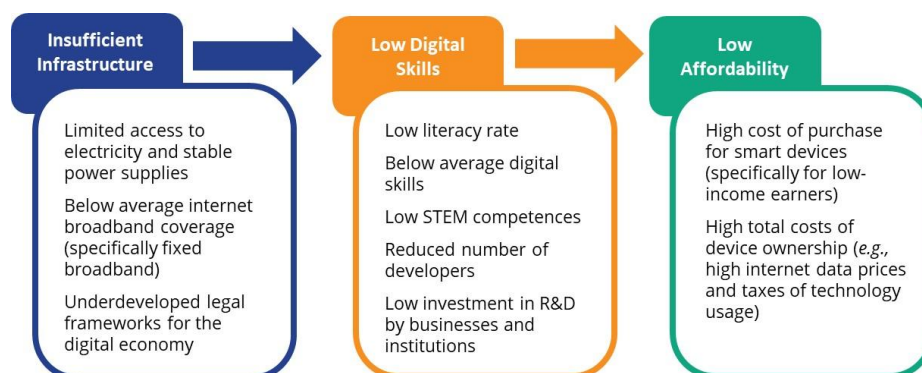


Figure 10. Major limitations to Digital Transformation and Inclusive Adoption of SD

3.3. SWOT Analysis

Many of the constraints are structural and require time and investment, such as insufficient infrastructure and shortage of skills. The average low-income level is a major stumbling block. Covid-19 has consumed a lot of the fiscal budget. Others will depend on Government's capacity to act, such as regulation. But Africa has many strengths, such as a rapidly growing entrepreneurial ecosystem and a young and growing market.

Table 1. SWOT Analysis of Africa's current situation.

Strengths	Weaknesses
<i>Of special importance to SD adoption and use</i>	
- Young population (with a median age of 19.7 years) with ambition and an aptitude for a new digital culture, growing at a fast pace making Africa the major consumption market for SD over the next three decades. More than 60% is below the age of twenty-five — according to UN data²⁸. - Rapid rates of IT adoption when there is adequate offering. - Many African countries have already developed policy initiatives which are either exploring the feasibility or preparing the ground for the adoption of 4IR technologies which will propel SD adoption and use.	- Skills: Low literacy rates and low digital literacy rates. - Infrastructure: Low penetration of electricity and internet broadband. - Low-income levels and high unemployment reduce affordability to acquire and use SD. - High internet prices are a deterrent to relevant use – - The average cost of an entry-level internet-enabled phone in Sub-Saharan Africa was the highest in the world in terms of affordability (cost compared to income) in 2019.

²⁸ United Nations, Department of Economic and Social Affairs, Population Division (2019). *World Population Prospects 2019, Online Edition. Rev. 1*. Accessed at: <https://population.un.org/wpp/DataQuery/>



Of special importance to SD Production	
Local production of SD has already started thus providing learning opportunities and a base for acceleration.	- Low numbers of people in STEM fields. - Shortage of technically trained human resources - Shortage of mature value chains – gaps especially in logistics and distribution.
Opportunities	Threats
Of special importance to SD adoption and use	
- Emergence of digital platforms are a pull for SD. - Rebound growth of world economy. - Onboarding the 240 million people currently without internet access could result in significant gains in SD adoption, as well as gains in economic productivity which in turn promote further adoption of SD. - Competitive pressure for further digital transformation will motivate the private sector to invest in digital skill development with a positive spread effect on SD - In Sub Saharan Africa, 230 million jobs will require digital skills by 2030, according to the IFC²⁹. - Expected increase in deployment of 4G and 5G networks will allow for higher performance of SD and emergence of a whole new set of services, thus increasing the attraction power of smart devices. - Rapid growth of IoT will promote the growth of SD.	- The war centered around the Ukraine has created new geo-strategic tensions and can develop into a strong recession in the World Economy, diverting funds and attention from Africa. - Disparities in income levels, disrupted supply chains and the increasing cost of smart devices among and within African countries, make policy implementation more complex. - Diversion of investment to address the crisis created by the COVID-19 pandemic, jeopardize the capacity of many African countries to keep pace with digital transformation. - Sub-Saharan Africa exhibits the lowest capacity of all regions to enable work from home during the Covid-19 pandemic. - Only around 50% of countries in Africa have computer skills as part of their school curriculum, compared to 85% globally, which is a threat for future growth.
Of special importance to SD Production	
- African Continental Free Trade Agreement (AfCFTA). - High import costs are an incentive to local production. - SD global value chains are looking to diversify their production networks outside of Asia. - By 2030, Africa will be home to more than a quarter of the world's population under 25 providing a growing home market. - The current rapid growth of the digital entrepreneurial ecosystem will reinforce innovation and technological productive capacity and act as a multiplier of growth.	- Continuous shortages in the world supply chain relating to digital components can compromise the viability of new SD investments in Africa - Delays in the implementation of AfCFTA - Disparities among African countries in industrialization levels and in IT innovation & entrepreneurship and digital economy. - Disparities in regulations and taxes.

²⁹IFC, Digital skills in Sub-Saharan Africa:
https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/education/publications/digital+skills+in+sub-saharan+africa





4. VISION AND PILLARS OF ACTION





4. VISION AND PILLARS OF ACTION

4.1. A Vision for Africa

The structure of recommendations proposed in this Smart Devices Blueprint builds upon the Digital Transformation Strategy for Africa (2020–2030)³⁰ (DTSA), approved in 2019 by the African Union, which aims to transform African economies and promote their integration, through the use of digital technologies and innovation.

The vision represented in the DTSA is that of an integrated and inclusive digital society and economy in Africa that improves the quality of life of its citizens, strengthens 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.

The overall objective is to harness digital technologies and innovation to transform African societies and economies to promote

their integration, generate inclusive economic growth, stimulate job creation, break the digital divide, and eradicate poverty for the continent's socio-economic development and ensure Africa's ownership of modern tools of digital management.³¹

The inclusive adoption of smart devices is a key accelerator of digital transformation, taking into special consideration the challenge of affordability.

In addition, the increase of production of smart devices in Africa as well as the sustainable and effective treatment of smart device waste, constitute a challenging but necessary journey for Africa to be a producer and not only a consumer of the 4th Industrial Revolution, leading to greater job creation, sustainable socio-economic development and better terms of trade.

³⁰ AU, *Digital Transformation Strategy for Africa* <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

³¹ African Union – The Digital Transformation Strategy for Africa (2020-2030)



4.2. Building Blocks

To provide a comprehensive strategy for smart device (SD) development in Africa four building blocks and 16 pillars of strategic actions were defined.

The Foundation Pillars are aligned with the conceptual structure of the Digital Transformation Strategy for Africa (2020–2030), in which this blueprint fits, addressing infrastructure, skills, entrepreneurship and regulation.

The Value Chain Pillars ensure that the strategy of action for inclusive adoption of smart devices is grounded on the way smart devices are produced, distributed, used and disposed.

The Critical Issues Pillars address challenges in line with the major blockages (affordability), aspirations (single market), relevant socio-economic uses of SD (vertical adoption) and equity (digital inclusion).

The Implementation Pillars address the necessary elements to make these recommendations a reality.

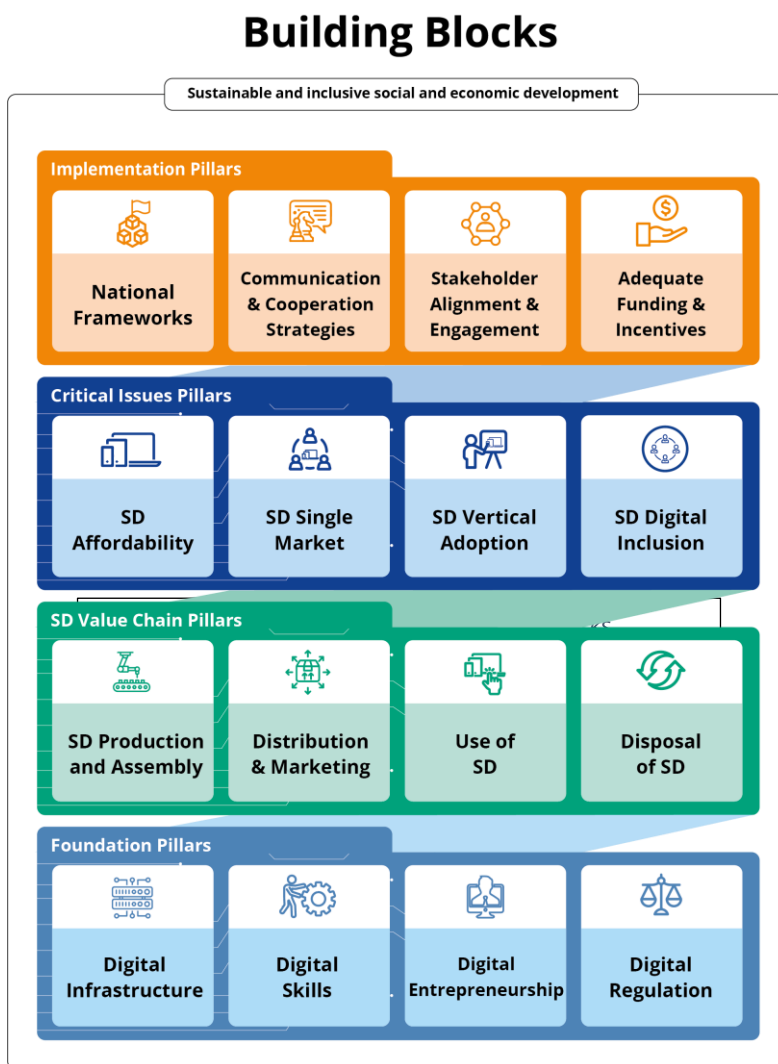


Figure 12. Blueprint building blocks.



4.3. Summary of Recommended Actions

A cluster analysis of African countries in terms of smart device was constructed based on the following criteria: internet users (% population), Connectivity affordability ranking (integrating the affordability of five connectivity indicators measured by the ITU), digital skills ranking, manufacturing ranking.

As a result, five clusters were defined: A: Leaders; B: High Performers; C: Medium performers; D: Low performers; E: Non-performers. The recommendations below are best suited for some clusters than others. However, even within countries there are wide disparities, so that most recommendations apply to all countries, but with differing relevance.

A common framework of inclusive smart device maturity assessment, with a KPI score card,

must be developed to define the SD maturity assessment of each country, position each country in a matrix and check evolution over time (annually). The building blocks and the indicators used in this blueprint should constitute the basis for the construction of this assessment and annual SD Inclusive Adoption Score Card. This score card should be a basis for pan-African policy regarding the implementation of this Blueprint.

This blueprint has:

- 16 pillars of action
- 43 recommendations
- 68 initiatives
- 18 flagship projects

Pillar	Recommendations	Initiatives and Suggested Projects	Best Recommended for Cluster
Pillar 1: Digital Infrastructure	1.1. Produce 5-year long Spectrum Roadmaps in All African Countries	1.1.1. Accelerate access to sub-1 GHz spectrum to provide widespread rural mobile broadband services 1.1.2. Ensure access to mid-band spectrum, in particular 3.5 GHz, given its importance to the future of 5G	All
Pillar 2: Digital Skills	2.1. Raise Awareness of Smart Devices Impact	Actions defined	All
	2.2. Massive Training of SD Users	2.2.1. Each country should design a National SD Skills Program, including gender-disaggregated targets <i>P.2.1. Platform for SD Digital Skills Online Learning</i> 2.2.2. Define a substantial budget to finance and incentive all stakeholders of the National SD Skills Program 2.2.3. Establish Continental and National SD Skills Coalitions <i>P.2.2. Foundation SD skills for informal market operators</i>	All
	2.3. Training the multipliers	2.3.1. Train and reinforce service providers 2.3.2. Train content developers, software developers and advanced technology experts	A,B,C,D
	2.4. Accelerate the digitalization of essential public services for smart devices	Actions defined	A,B,C





Pillar	Recommendations	Initiatives and Suggested Projects	Best Recommended for Cluster
Pillar 3: Digital Entrepreneurship	3.1. Increase the capture of potential projects, investments and financing instruments by entrepreneurs	3.1.1. Conduct road shows/ webinars to activate the innovative community in Africa to the SD value chain 3.1.2. Foster joint SD projects between universities and providers 3.1.3. Promote SD living labs with community involvement 3.1.4. Finance AI startups in agritech, healthtech and edutech 3.1.5. Finance investment in the production of smart devices	A,B,C
	3.2. Develop the entrepreneurs of the future, providing them with the skills, interest, and commitment	3.2.1. Finance coding schools to feed start-ups and corporations 3.2.2. Finance a network of fab labs throughout Africa with 3-D printing directed at the SD industry	A,B,C
Pillar 4: Digital Regulation	4.1. Capacity building program on smart device legislation	Actions defined	ALL
	4.2. Study and enact legislation concerning smart devices	4.2.1 Study and enact legislation on billing limits and billing practices of smart mobile devices, especially regarding roaming within Africa 4.2.2 Study and enact legislation on cyber security of smart devices 4.2.3 Study and enact legislation regarding manufacturing of smart devices in Africa 4.2.4 Study and enact legislation to protect lives on the road by limiting the use of hand-held mobile phones while driving <i>P4.1. Create a distinct continental entity in charge of the development of Africa's smart devices policies, within ITU or the Africa Union</i>	ALL
Pillar 5: Assembly and Production of Smart Devices	5.1. Develop an attractive investment environment for manufacturing and assembling projects in the SD Value chain in Africa	5.1.1. Prepare Special Economic Zones for Investment in SD Value Chain 5.1.2. Invest in Human Capital for the Production Value Chains <i>P.5.1. Create a collaborative tool for training skills in the SD value chain</i> 5.1.3. Continue to work on conditions that reduce production and trade costs	A,B
	5.2. Promote the investment in SD Value chain Manufacturing and Assembly projects, making sound feasibility projects, using locations with political and economic stability and gradually expand in the value added created	5.2.1. Establish an investment fund to create the African Smart Device Initiative <i>P.5.2. Develop an economic feasibility study for SD manufacturing investment</i>	A,B
	5.3. Bring in the innovative ecosystem and the entrepreneurs to support the expansion of SD Value chain	5.3.1. Create a 5-year investment program directed at the African Start Up Ecosystem to develop solutions for the Smart Devices Value Chain <i>P.5.3. Hackaton for SD Value Chain Innovations</i> 5.3.2. Stimulate and support the creation of a smart device's accelerator in Africa 5.3.3. Support innovative projects for the reuse of smart devices in disadvantaged rural areas	A,B,C
Pillar 6: Distribution and Retail of Smart Devices	6.1. Digitize Africa's Supply Chains	6.1.1. Increase the adoption of point-of-sale (POS) systems in retail stores	ALL
Pillar 7: Use of Smart Devices	The use of Smart Devices is an affordability challenge (which will be treated in greater detail than the other chapters)	Presentation of some Use Cases and Relevant Services and Applications	
Pillar 8: Disposal of Smart Devices	8.1. Design an Action Plan for Smart Device e-waste disposal in each country and at Continental level	8.1.1. Conduct and assessment of Circular Economy (CE) opportunities in each African country and region 8.1.2. Design a Continental Plan and National Plans for e-waste treatment of smart devices	ALL





Pillar	Recommendations	Initiatives and Suggested Projects	Best Recommended for Cluster
	8.2. Analyze and enact legislation on SD e-waste treatment	8.2.1. Evaluate the existing legal and institutional infrastructure to manage e-waste and SD e-waste at continental and country level <i>P.8.1. Continental Platform for sharing data and best practices of e-waste management</i> 8.2.2. Evaluate and enact legislation requiring that mobile phones, tablets and PCs are designed to be resource efficient (circular), including consumers' rights to repair <i>P.8.2. Continental Eco-design Directive for Smart Devices</i> 8.2.3. Adopt a Pan-African SD Marking Framework 8.2.4. Adopt green procurement standards 8.2.5. Stimulate smart device trade-in programs	ALL
	8.3. Develop competences and promote jobs in e-waste circular economy	8.3.1. Promote and finance SD STEM competences at university-level <i>P.8.3. Bursaries for professors and students in top international universities in the field of smart devices</i> 8.3.2. Tax-Incentives to the e-waste economic activities	ALL
	8.4. Promote awareness of the relevance of e-waste treatment	8.4.1. Implement an awareness campaign for SD consumer environmental behavior	ALL
	8.5. Finance and build e-waste repair and recycle hubs in each African region and the countries with the SD markets	8.5.1. Develop SD e-waste repair and recycle facilities all across Africa, according to market studies of present and future e-waste	ALL
Pillar 9: Smart Devices Affordability	9.1. Promote direct payment actions	9.1.1. Stimulate Voice and Data Bundles 9.1.2. Stimulate Intercompany benefits/loyalty incentives to reduce acquisition cost	A,B,C,D
	9.2. Promote Financing of Smart Device Acquisition	9.2.1. Government led programs to encourage MNOs, retailers, banks, start-ups and fintech's to finance acquisition and use of Smart Devices <i>P.9.1. Government backed Commercial Bank's SD Credit Programs</i>	A,B,C,D
	9.3. 3 rd Party Finance	Programs defined <i>P.9.2. Coalition for 3rd Party SD Finance for Africa</i>	C,D,E
	9.4. Public Internet Access Points and Collective Use	9.4.1. Deploy public wi-fi hotspots in public space areas, public buildings and low-income high density residential neighborhoods 9.4.2. Partner with schools and universities, libraries, post offices and municipalities to ensure public access to computers and tablets with internet connection, for free or at a reduced price 9.4.3. Increase support and investment in telecenters, especially in rural areas 9.4.4. Provide free broadband access to multipliers: accelerators, training centers, fab labs, and the like 9.4.5. Deploy public wi-fi hotspots, supported by satellite or FWA coverage in unserved areas, especially in rural areas <i>P.9.3. 5-year National Roadmap for Public Internet Access Points to the Internet</i>	C,D,E
	9.5. Tax Restructuring and Fiscal Incentives	9.5.1. Reduce import fees and VAT of all smartphones under 100 USD of retail cost, to a minimum level (5%) 9.5.2. Reduce VAT for all personal computers bought by MSMEs under 400 USD retail cost to a minimum level (5%)	A,B,C
	9.6. Strategic Procurement	9.6.1. Contract an SD expert procurement officer 9.6.2. Centralize the public procurement of Smart Devices 9.6.3. Use digital platforms to support procurement processes	ALL





Pillar	Recommendations	Initiatives and Suggested Projects	Best Recommended for Cluster
	9.7. Competitive Sector Structure	Actions defined	ALL
	9.8. Supply Chain Improvement	Actions defined	ALL
	9.9. Combat counterfeit and parallel informal markets in SD	Actions defined	A,B,C,D
Pillar 10: Smart Devices' Single Market	10.1. Negotiate a Trade Protocol for Smart Devices Under AfCFTA	-	ALL
	10.2. Study the challenges and opportunities of a SD single market and produce continental, regional and country SD Single Market Roadmaps	<i>P.10.1. Create a SD Single Market Digital Platform</i>	ALL
	10.3. Introduce mechanisms that will accelerate a SD single market	10.3.1. Define rules of origin and industry standards 10.3.2. Accelerate trade facilitation in smart devices 10.3.3. Establish new sourcing and procurement efforts considering a wider African market than individual countries <i>P.10.2. Create a unitary marking, patent and trade-mark system for SD in Africa</i>	ALL
	10.4. Make provision for free movement of talent, capital and of labor in SD	10.4.1. African standardization of the evaluation and validation of regulated professionals 10.4.2. Streamline administrative procedures and facilitate pan-African expansion of business activities associated with smart devices value chain	ALL
	10.5. Evaluate and introduce mechanisms for equitable distribution of benefits of the SD single market, under AfCFTA	10.5.1. Devise regional development plans around SD manufacturing and entrepreneurship 10.5.2. Impose Minimum Local Integration between Manufacturers and Local SMEs and give incentives to entrepreneurship and innovation in SD	ALL
	10.6. Build capacity to create intelligent data from the raw data extracted from the smart devices of African citizens and global citizens	10.6.1. Promotion and support of African Digital Platforms 10.6.2. Build competences in Big Data, Cloud and AI and New Advanced Technologies <i>P.10.3. Impactful Technology Capacity Program - a University and Expert Exchange and Bursary Program on Big Data, AI, Cloud and Advanced Technologies (Blockchain and others)</i> 10.6.3. Promote and subsidize African Datacenters and promote one hyperscale data center in Africa	A,B,C
	10.7. Develop appropriate models of governance of data flows	10.7.1. Build a pan-African governance model within a Digital Single Market perspective 10.7.2. Integrate processes of definition of global governance of data	ALL
Pillar 11: Smart Devices Vertical Adoption	11.1. Centralization of the acquisition of smart devices for the public sector in terms of e-government, e-education and e-health		ALL
	11.2. Provide training in the use of smart devices for public employees	<i>P.11.1. Create a digital training task force for public employees</i>	ALL
	11.3. Support African companies and technological startups that invest in the creation of apps for e-health, e-government, e-education, e-agriculture	<i>P.11.2. Ensure broadband connectivity and stimulate the creation of computer labs in primary and secondary schools</i> <i>P.11.3. 1 interactive board per secondary school Program</i>	A,B,C,D
Pillar 12: Digital Inclusion	12.1. Raise awareness of smart devices' impact on raising quality of life	Actions defined	ALL





Pillar	Recommendations	Initiatives and Suggested Projects	Best Recommended for Cluster
	12.2. Specific Training of SD Users from Excluded Groups	12.2.1. SD digital skills training to empower women and girls 12.2.2. SD digital skills training program in rural remote areas with solar energy 12.2.3. SD digital skills training program to elderly and abandoned children	ALL
	12.3. Develop relevant content for illiterate and disabled people	12.3.1. SD Competition for content development for illiterate and disabled people	ALL
	12.4. Make smart devices affordable to low-income people	12.4.1. Make SD available for low-income people to use for free or at low prices 12.4.2. Make SD affordable to buy and use them more regularly	ALL
Pillar 13: National Frameworks for Inclusive Smart Device Adoption	13.1. Smart devices maturity assessment 13.2. National Plan		ALL
Pillar 14: Communication & Cooperation Strategies	Actions defined		ALL
Pillar 15: Stakeholders Engagement & Alignment	Actions defined		ALL
Pillar 16: Adequate Funding & Incentives	Actions defined		ALL





5. FOUNDATION PILLARS





5. FOUNDATION PILLARS

The promotion of inclusive adoption of smart devices in Africa builds upon the same foundation pillars defined in the Digital Transformation Strategy for Africa (2020–2030)³²(DTSA): digital infrastructure, digital skills, digital entrepreneurship and digital regulation.

In each pillar, the main lines of action of the DTSA are mentioned briefly and further strategic actions specifically related to the adoption of smart devices are added.

5.1. Pillar 1: Digital Infrastructure

5.1.1. Introduction

Among the four foundation pillars of digital transformation, infrastructure has a unique relationship with smart devices, which can be seen as an extension of this digital infrastructure.

5.1.2. Current Status

Electricity access and the stability of power supplies is one of the major barriers to overcome in Sub-Saharan Africa. The share of population with access to electricity in the region is just over 46%, as of 2019³³ — which is a constraint to internet usage, smart device adoption and consequently digital inclusion. Access has been consistently improving, with an

increase of roughly 40% over the last decade. Furthermore, the African Development Bank has recently launched The New Deal on Energy for Africa with the goal of increasing access to electricity across the continent³⁴. An effort that must continue in order to expand the addressable universe previously mentioned in Chapter 3.1. When it comes to the Middle East and North Africa region, access currently stands at 97% and is steadily moving towards the 100% milestone, with the majority of Northern African countries having shares above 90%.

Meanwhile, internet coverage has seen an exponential growth in the continent. Until 2010, Africa was practically disconnected from the worldwide web, when the region got its first

³² AU, *Digital Transformation Strategy for Africa* <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

³³ World Bank, share of population with access to electricity (2019): <https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>

³⁴ ADB, *The New Deal on Energy for Africa* (2017): https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Brochure_New_Deal_2_red.pdf



undersea fiber-optic cable system operational³⁵, connecting South-East Africa to Europe and North America. Today, Africa has more than 1.2 million kilometers of internet cables running across its shores, and 82% of the continent's population is covered by 3G mobile-broadband network or above — according to ITU³⁶. Much like in the rest of the world, coverage is higher in urban areas (practically 100%) than rural areas (71%). Access to internet at home, meaning fixed broadband connections, is also higher in urban Africa (28%) when compared to rural Africa (6%).

Sidenote: One of the most recent achievements in the field of internet routes was the launch of the shortest terrestrial fiber route between the Eastern and the Western coasts of Africa, which connects Mombasa (Kenya) to Muanda (DRC), by Liquid Intelligent Technologies³⁷. With its completion, announced in October 2021, Liquid establishes a new route between Asia and the US through Africa, avoiding bottlenecks in Europe and the Middle East, while providing internet to landlocked African cities.

However, broadband connectivity is still quite low in Africa, limiting the addressable universe of digital transformation and broadband connectivity costs remain high relative to average incomes, limiting full use of existing capacity.

According to GSMA, during 2019, 3G overtook 2G to become the leading mobile technology in Sub-Saharan Africa, with just over 45% of total connections by the end of the year. 3G adoption doubled from 2017 to 2019 as a result of network coverage expansion and cheaper devices. Sub-Saharan Africa lags other regions in 4G adoption. By the end of 2018, 4G accounted for 7% of total connections, compared to the global average of 44%. The high cost of 4G-enabled devices and delays in assigning 4G spectrum to established service providers in some markets have been among the factors holding back 4G uptake. This is beginning to change though, with new 4G spectrum assignments in several countries and a marked increase in network deployment. 4G adoption will overtake 2G in 2023 and rise to 23% of connections by 2025.

5.1.3. Strategy for Action

Several relevant strategy documents have defined Africa's strategic actions regarding digital infrastructure: i) The Digital Transformation Strategy for Africa (2020–2030)³⁸, approved in 2019 by the African Union, ii) the Broadband Commission's digital infrastructure moonshot strategy for Africa “Connecting Africa Through Broadband” of 2019³⁹, which aims to reach universal access by 2030 and to mobilize 100 billion USD for this

³⁵

https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/impact-stories/africa-cooperation-connection-communication

³⁶ ITU, Measuring digital development: Facts and figures (2021):

<https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

³⁷ <https://liquid.tech/about-us/news/Liquid-Intelligent-Technologies-announces-a-new-AsiaUSA-global-Internet-transit-route-via-Africa>

³⁸ AU, *Digital Transformation Strategy for Africa (2020–2030)* <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

³⁹ Broadband Commission, *Connecting Africa through Broadband*: <https://www.broadbandcommission.org/publication/connecting-africa-through-broadband/#:~:text=Connecting%20Africa%20Through%20Broadband%3A%20A%20strategy%20for%20doubling,by%202021%20and%20reaching%20universal%20access%20by%202030>

effect, and iii) the Smart Africa Broadband Blueprint of 2020⁴⁰.

All three documents address broadband from an integrated perspective.

Main Recommendations of Previous Strategy Documents		
Digital Transformation Strategy for Africa (2020–2030)	Connecting Africa Through Broadband – UN Broadband Commission	Smart Africa Broadband Blueprint of 2020
Promote national, regional and intra-continental interconnectivity Promote infrastructure sharing Boost investment in telecom infrastructure at national, regional level to an interconnected continent, and develop financial instruments through partnerships between investors, government, financial institutions and international partners Promote a favorable regulatory environment for competitive and harmonized regional and continental connectivity markets Promote measures that increase affordability of broadband and technology devices & services Invest in green ICT Commit to undertake or strengthen ICT and postal policies reforms Define a new framework for the role of the postal sector in particular in providing universal access to ICTs and Facilitate postal services access to funding for investment and infrastructure development and capacity building Facilitate the coordination efforts to migrate to digital terrestrial broadcasting and harmonized use of the digital dividend at regional and continental level	Areas of Action: Digital Infrastructure Policy and Regulatory Frameworks to Enable Digital Transformation Digital Skills and Local Content Development Targeted Approach for Device Affordability	Areas of Action: Technology, Infrastructure and Devices Demand Side Capacity Building Content, Applications and Services Policies and Regulatory Frameworks Cybersecurity and Personal Data Protection Social Inclusion

Below are some of the policies defined by these strategy documents relating specifically to digital infrastructure:

<i>Connecting Africa Through Broadband</i>	• Provide public/donor funding support for larger, high-cost infrastructure investments to reduce risk and increase commercial viability. • Promote long-term sustainability by ensuring that appropriate technical skills to operate and maintain digital infrastructure are increasingly available on the continent.
<i>Smart Broadband 2025</i>	• Implementing a “dig once” policy: broadband [and electricity] infrastructure laid in coordination with other utilities or transportation infrastructure works. • Consider the use of aerial fiber for faster rollout and satellite solutions, including a mix of technology as a cost-effective means of direct connection or of expanding terrestrial networks, especially in small cities, suburban and rural areas.

⁴⁰ Smart Broadband 2025:
<https://smartafrica.org/knowledge/customer-segmentation/>



- Releasing new spectrum in a timely and affordable manner to significantly reduce costs and barriers to entry for mobile network operators.

*Digital
Transformation
Strategy*

- Establish Internet exchange points (IXPs), and promote stakeholder support for IXPs, remove barriers to entry for IXPs, and nurture a competitive Internet-interconnection and traffic exchange environment.
- Establish Data Center Infrastructure designed to host mission critical servers and computer systems to support the development of a local digital ecosystem.

Smart Africa has undertaken a number of initiatives regarding broadband, such as: SMART Broadband 2025 Strategy Project: A flagship project led by Senegal; Cloud and Data Centers for Africa Project; A flagship led by Djibouti; The Intra-African Connectivity Project: A flagship led by Guinea; and Bulk Purchase of Submarine and Satellite Broadband Bandwidth Capacity Project: A Smart Africa Initiative.

Taking all of these into consideration, this blueprint adds one recommendation regarding infrastructure which is key to the improving connectivity in Africa

Recommendation 1.1. – Produce 5-year long Spectrum Roadmaps in All African Countries

Objectives: To ensure there is enough spectrum to meet surging demand for mobile services in both the short and long term

Parties Involved: National communication authorities, in alignment with Providers (MNOs, manufacturers and assemblers)

Spectrum Roadmaps help governments: i) Identify future technological trends and drivers and assess their impact on spectrum needs a few years in advance. ii) Plan spectrum management programs to maximize opportunities. iii) At the same time, roadmaps mean increased certainty for mobile operators to invest based on the government's future

allocation, renewal plans and management of radio spectrum.

Associated with these roadmaps, is the issue of pricing. On the one hand, governments want to take the most out of spectrum resources. On the other hand, operators require fair access to sufficient radio spectrum to deliver affordable, high quality mobile broadband services. Governments should seek a virtuous balance between price and improved mobile broadband services, using experts and independent regulators for this purpose.

Governments should also be prepared for new technologies that can substantially optimize spectrum and reduce costs and allow for better broadband services to citizens and businesses. Such is the case of Open RAN, especially regarding 5G. At its simplest, the concept is for a more open radio access network architecture than provided today. Current RAN technology (Radio Access Network) is provided as a hardware and software integrated platform. The ambition for Open RAN is to create a multi-supplier RAN solution that allows for the separation - or disaggregation - between hardware and software with open interfaces and virtualization, hosting software that controls and updates networks in the cloud. The promised benefits include supply chain diversity, solution flexibility, and new capabilities leading to increased competition and further innovation.





A public-private joint work on this new technology could be relevant. If operators move to Open-RAN solutions the cost of deploying and operating networks could be much reduced, which is relevant to bring mobile broadband to more rural areas, where the economics of network deployment by conventional methods are challenging due to low-ARPU. Three in five people in the Africa live in rural areas. This new technology would also allow for more diversity of network equipment supply chains, opening up space for more African-based suppliers.

Initiative 1.1.1. – Accelerate access to sub-1 GHz spectrum to provide widespread rural mobile broadband services

Lack of access to sub-1 GHz spectrum due to slow digital switchover (DSO) can negatively affect coverage expansion. Without this range, it can be very expensive to provide widespread rural mobile broadband services.

Initiative 1.1.2. – Ensure access to mid-band spectrum, in particular 3.5 GHz, given its importance to the future of 5G

GSMA analysis shows that a total of 2 GHz of mid-band spectrum, on average, will be required to support the growth of 5G during the 2025–2030 timeframe. Refarming 2G, 3G and 4G bands can, in time, sustain the growth of 4G and contribute to meeting some of the future spectrum requirements for 5G which will ultimately require new bands.

The importance of Data Centers is addressed in Chapter 7.1. - Pillar 10: SD Single Market

5.2. Pillar 2: Digital Skills

5.2.1. Introduction

The permanent development of digital skills is critical to ensure the massive adoption and use of smart devices in Africa, as well as for the reinforcement of critical mass capable of guaranteeing the production of smart devices in a single market framework and for relevant content creation for continental users.

As stated in the World Bank report – A Global Study on Digital Capabilities - “Digital skills are a prerequisite for citizens, professionals, civil servants and policy makers to reap digital economic dividends across all sectors of the global and regional economy”⁴¹.

5.2.2. Current Status

In general, African countries have been registering a positive trend towards the development of digital skills for smart devices, mainly smartphones, essentially motivated by the use of social networks and by the youth. Skills in the use of PCs have been progressing slower, pushed mainly by the business world.

However, Africa is lagging behind the world average and bringing 550 million people online will require a massive investment in skill development in terms of basic use and of being able to take full benefit of an expanding digital world of possibilities.

Most African countries face structural challenges to achieve the goal of preparing their population with the skills and abilities needed for the job market and for everyday life as

⁴¹ A global study on digital capabilities Report, World Bank.



citizens and consumers, and digital skills are not exception. Among the main challenges are: the low levels of basic literacy and digital literacy in the vast majority of the population, especially in vulnerable groups such as the extremely poor, remote rural communities and young women; limited capacity of the education sector to offer education and training services that respond to current market challenges and global socio-economic development (infrastructures, equipment and human resources); the limited size of the service provider ecosystem; high dropout rate for cultural and economic reasons; high percentage of remote rural population with a deficient supply of products and services; and reduced income of a large part of the population to acquire equipment and develop digital skills and abilities as a self-taught person.

The current situation of digital skills in Africa varies from country to country and even within each country. According to ICT Skills Capacity Building Blueprint 2021, African countries can be grouped in 5 clusters⁴².

Digital Skills

The development of digital skills in general is a very broad matter. The concern of this blueprint are those skills that most closely relate to being able to use smart devices. There are several definitions of digital skills and there is no unified definition. The following definition will be considered: “digital skills are the skills that you need to live, study and work in the current fast-evolving digital and smart world. These skills include learning how to use and adapt the right smart device, applications, software and systems to find, review, organize and share information successfully”.

Some of the basic digital skills are “being able to”:

1. Communicate using smart devices (smartphones and computers)
2. Handle information and content available in the digital world in personal and professional contexts with the support of smart devices
3. Carry out transactions using technological platforms through smartphones and computers
4. Solve problems supported by digital tools and smartphones and computers
5. Be safe and legal online when using smartphones and computers.

5.2.3. Goals

Goals

The main Goals in the digital skills component are:

1. To have a population with enough digital skills to make a productive and safe use of smart devices.
2. To have a continental industry with capacity to create relevant content and applications to stimulate the improvement of the population's living conditions.
3. To have a pool of experts capable of responding to the challenges of implementing a single market smart devices in Africa.

To achieve each of these goals, the following objectives are proposed:

⁴² ICT Skills Capacity Building Blueprint, 2021, Smart Africa

- 
1. Stimulate people's interest in the use of smart devices.
 2. Improve people's digital skills at personal, professional and social levels.
 3. Train high quality specialists in digital skills and related fields.

Objectives

Mobile Literacy

Of global mobile phones users, nearly half (47%) *"mainly use their device to place a voice call or send a text message"*⁴³. In Africa, nearly half of all mobile users are using basic and feature phones, as opposed to using smartphones. Moving from voice and text message to interactions with smart devices requires a new set of higher order skills. There is a critical need to bridge the gap between using a phone for basic functions and using sophisticated smartphones. The estimated increase in smartphone adoption until 2025 is 16% and 21% for Sub-Saharan and Northern Africa respectively. Therefore, it is reasonable to assume that until 2025 roughly 212 million people will be developing new skills to use smartphones on their own or with assistance.

Some of the people moving away from feature phones will skip the stage of using personal computers (PCs) entirely, moving directly to smartphones, or to tablets, both of which are powerful handheld computers. Mobile literacy has emerged to meet this need by identifying the necessary digital skills smartphone users need in order to optimize their mobile internet experience.

Tablet and PC Literacy

In order to move up the ladder of participation and gain from engagement with digital technology, the use of a PC is essential, in the office, at home or at school. PC penetration in Africa is very low and will necessarily rise if businesses want to be more competitive and lucrative, governments want to modernize their public administration and public sector and improve education standards.

Doubling the current penetration of PC users in African households would imply training nearly 150 million people⁴⁴ in basic and intermediate digital skills.

5.2.4. Strategy for Action

There is a set of recommendations on the development of digital skills in Smart Africa's strategic documents that are also relevant in the context for smart devices, namely:

- Raise awareness around ICTs to change mindsets
- Develop digital sovereignty awareness for education system
- Standardize and harmonize teacher training through an adapted ICT competency framework
- Scale the training of digitally competent teachers to introduce ICT in the classroom
- Create the conditions for a vibrant local edtech ecosystem
- Encourage the development of ICT-oriented / intensive job opportunities
- Introduce ICT courses at primary and secondary school levels
- Leverage on ICTs to improve the quality of resources and teaching of stem

⁴³ GMEI 2017: Global Mobile Engagement Index. GSMA. February 2017

⁴⁴ Total population in Africa times the share of households with computer access.



- Invest in TVET to reduce the digital skills gap in the labor market
- Develop ICT-sector applied research through strategic partnerships and collective efforts
- Invest in higher education to create a critical mass of highly qualified ICT experts - and retain them
- Partner with the private sector to develop accredited and fast track programs to quickly and efficiently train digital experts and integrate them in the workforce

The implementation of these initiatives has a direct impact on the improvement of the population's digital skills for a better use of smart devices. Even so, there is need to complement these interventions, with more specific ones in terms of smart devices.

To reinforce digital skills to use smart devices three set of actions are necessary focusing on mobile skills and PC skills:

- to create awareness and stimulate people's interest in using smart devices and develop digital skills
- to build capacity to develop 3 levels of digital skills for smart devices: basic (consumption of content and use of applications), intermediate (consumption and some production of content and applications) and advanced (production of content and applications)
- to create a pool of experts for the smart device industry

The proposed initiatives that are presented below have a common denominator: the change of culture, moving from a traditional analogical culture to a digital one. *"A strong digital culture ensures that no person is left behind as each country advances in its digital transformation"*

Table 2. Recommended Strategy Actions for Skills Development that will promote SD Adoption.

Strategy	Short Description	Main Entities Involved	Type of Strategy
Raise Awareness of SD Impact	Raise awareness of citizens, through massive communication campaigns, to the importance of smart devices and of the digital skills and capabilities needed to improve the quality of live in several specific areas.	National communication authorities, Media, Providers (MNOs, manufacturers, and assemblers).	Transversal action
Massive Training of Users	Train users in the basic skills of using a smart device so that they can take full benefit of their use, thus promoting SD adoption and SD impact on daily life.	Service providers, schools, universities, SD providers, supported by DFIs and Government	Individual, group, project focused
Train the multipliers	Train service providers, content developers, software developers and advanced technologies experts.	Service providers, universities, SD providers, supported by DFIs and Government	Individual, group, project focused
Digitilize essential public services for SD	Expand public and private technology-based products and services that make the lives of citizens and consumers so much easier that they are strongly attracted to embrace the digital transformation journey	Governments with the support of DFI and large private providers	Structural action

Recommendation 2.1. - Raise Awareness of Smart Devices Impact

Objectives: Raise awareness of citizens, through massive communication campaigns, to the importance of smart devices and the digital skills and capabilities needed to improve the quality of life in several specific areas

Parties Involved: National communication authorities, Media, Providers (MNOs, manufacturers and assemblers)

This will involve broadcasting key-messages and personalized use cases on the main television channels, national and community radios and newspapers to make people who still do not use smart devices aware of their importance, through the sharing of success stories from their peers and lessons learned. These should relate to specific life activities and specific target groups, such as farmers and learners, in several national languages using clear and simple language. Annual campaigns over the next 5 years.

Main activities

1. Establish partnerships with media groups for the design and dissemination of communication and awareness materials to stimulate the adoption of smart devices
2. Design communication and awareness materials to stimulate the adoption of smart devices: a television spot; a radio spot; and an advertisement for the newspapers
3. Produce communication and awareness materials to stimulate the adoption of smart devices in all official languages of African countries

4. Translate television and radio spots into the main national languages of African countries
5. Develop and implement the communication plan to disseminate the communication materials
6. Carry out an annual survey to measure the impact of communication and awareness campaigns.

Recommendation 2.2. - Massive Training of SD Users

Objectives: Train users in the basic skills of using a smart device so that they can take full benefit of their use, thus promoting SD adoption and SD impact on daily life

Parties Involved: Service providers, schools, universities, TVET's, SD providers, supported by DFIs and Government

This strategic action involves massive national training programs over the next 5 years to uplift the skills of more than 200 million users in the use of smart devices: smartphones, tablets and PCs.

Relevant Case Study – (ECDL) - European Computer Driving License

European Union

In 1995, in order to raise digital literacy throughout Europe, the European Commission created a certification program for massive use, called European Computer Driving License (ECDL).

Outcome: ECDL quickly gained Europe-wide acceptance, requiring a central coordinating body to ensure consistently high standard of implementation in all European countries. The number of candidates reached 1 million in just one year. This success attracted the attention of countries outside of Europe who began to take a strong interest in the concept. ECDL was





subsequently introduced outside of Europe, where the certification became known as ICDL (International Computer Driving License). Computer societies and international organizations in Africa and South America began promoting ICDL, and a milestone was reached in 1999, when UNESCO, through its Cairo office, signed an agreement with ECDL Foundation to become the national operator for several Arab States. Shortly afterwards, ICDL was launched in the North American and Asian markets. The program reaches altogether more than 100 countries, through 24.000 test centers, in more than 40 languages worldwide, with more than 2.5 million ICDL tests taken annually.

Initiative 2.2.1. – Each country should design a National SD Skills Program

Without a well thought and well-designed strategy, and decisive action according to concrete quantitative and qualitative objectives, taking into consideration the context and conditions of each particular country, efforts and resources tend have little impact. Adapting from ITU's Digital Skills Toolkit the following framework should be followed by each country:

- i) Create a SD digital skills coalition or Task Force, with a defined governance model.
- ii) Define the main categories of digital skills that the strategy will develop, identify concrete user groups, conduct an assessment of the needs to be satisfied (no SD digital skills, limited SD digital skills, proficient SD skills and advanced SD Skills).
- iii) Quantify and qualify measurable objectives to be achieved.
- iv) Identify the capacity, recognizing of existing institutions, and define the players that will implement the strategy.
- v) Design the SD skills development strategy taking into consideration different skill levels and different contexts: work-related digital skills training programs for adults requiring up-skilling; work-related digital skills training programs for out-of-school

youth, including for freelancers, part-time workers and the unemployed; digital skills at different levels of formal education (primary, secondary, tertiary) for students, and digital technology development & design experts; digital skills for entrepreneurs; digital skills for vulnerable citizens such as girls, remote rural dwellers and the extremely poor; digital skills in integrated vertical programs in e-health, e-agriculture, e-education, e-finance and e-services.

- vi) Identify, evaluate, strengthen and support technically through training and funds all relevant civil society training providers that can implement the training programs, in addition to non-formal education institutions such as public libraries and community centers. Consider also certification rules of employer training programs and informal providers.
- vii) Consider all channels for training delivery physical and online platforms (lifelong learning channels).
- viii) Define a budget and grant awards to service providers, incentives to employers and subsidies to trainees.
- ix) Deliver, monitor, review and update the strategy regularly.

Relevant Case Study — Mobile Literacy Curriculum

GSMA developed the GSMA's Mobile Internet Skills Training Toolkit (MISTT) (1), which is a set of free resources to teach people the basic skills they need to access and use mobile internet that has reached over 21 million people. It uses a 'train the trainer' approach and consists of short lessons available in PDF and video format that can be easily adapted to local needs and languages. The toolkit addresses the following topics: Introduction to the internet, Online safety, Mobile Money, Accessibility Features, Whatsapp, Youtube, Facebook, Google, Wikipedia, Android, KaiOs, Ayoba.

Mozilla's Digital Skills Observatory curriculum focuses on: The smartphone ecosystem; Accounts; exploring, Searching and Downloading; Solving problems with the phone.

- (1) <https://www.gsma.com/mobilefordevelopment/mistt/#:~:text=The%20GSMA%20Mobile%20Internet%20Skills,access%20and%20use%20mobile%20internet.>

automatic feedback; benchmark comparison with a wide universe; more affordable or free learning; trust in a standard quality; networking opportunities with a vast audience; easier freedom from social stigma. The pan-Africa platform could also allow for country verticals.

Initiative 2.2.2. – Define a substantial budget to finance and provide incentives to all stakeholders of the National SD Skills Program

For this program to have an impact it needs to be massive, mobilizing all existing potential resources. This requires a considerable investment. The Broadband Commission's digital infrastructure moonshot strategy for Africa reserved around 17% of the 100 billion USD budget to build the user skills and local content foundation, a sum of 18 billion US\$. Some of which could be motivated to be used in smart device skills development.

Contributions from the private sector which stands to benefit directly from this national upskilling and from DFIs should be sought.

Initiative 2.2.3. – Establish Continental and National SD Skills Coalitions.

The unprecedented acceleration of digital technology in all spheres of life is a shared challenge. Governments need to place public investments in digital skills high in their priorities, but African business will not prosper without considerable upskilling, especially in the productive use of PCs. MNOs, manufacturers and distributors also stand to benefit from higher rates of adoption. Service providers also stand to gain in terms of customer capture.

Convene the top business leaders, large corporations and SME associations for a convention in order to get large scale engagement and a commitment to "digital

Flagship Project - P.2.1. - Platform for SD Digital Skills Online Learning

A Platform for SD Digital Skills Online Learning could allow Africa to deliver quality educational experiences at scale, with a low investment compared to the physical mode, within a short calendar and with a guaranteed standard quality, not dependent of teacher quality.

In addition to traditional course materials, this platform could provide interactive courses with user forums or social media discussions to support community interactions among students, professors, and teaching assistants (TAs), as well as immediate feedback to quick quizzes and assignments.

On the other hand, such a platform would also offer several advantages to users. Smart devices users tend to learn through experimentation, trial-and-error, and are self-driven in their learning process. The provision of an African MOOC (massive open online course) for Smart Device Up Skilling would offer several benefits: free of time-constraints; does not require travelling to a site; more diversity of courses; immediate and

equity at work” - a strategy that guarantees foundational SD digital skills for all, lifelong upskilling for current workers, and rapid re-skilling for those who’ve lost their job.

Main activities

1. Establish partnerships with technology and telecommunications companies and multilateral entities to subsidize smart devices and finance digital skills training
2. Select the formal and informal markets that will be integrated in the program’s pilot phase
3. Select the entities that will provide training on digital skills to formal and informal market vendors in the pilot phase
4. Prepare the necessary conditions to implement the pilot phase
5. Implement and evaluate the pilot phase
6. Implement the program, monitor and reinforce where needed.

Relevant Case Study

South Africa – City of Johannesburg

The City of Johannesburg is working with Microsoft South Africa to teach one million residents the basics of digital literacy through the city’s public libraries.¹ The free digital literacy training was forged under the city’s Vulindlele Jozi Youth Program, which aims to skill-up disadvantaged youth so that they can enter the workforce.

<http://www.itnewsafrika.com/2016/07/city-of-johannesburg-microsoft-partner-to-train-1-million-residents/>

Relevant Case Study — The Digital Skills and Jobs Coalition Initiative.

As part of the European Commission’s New Skills Agenda for Europe, this initiative has invited all types of organizations in the EU to become members as

long as the organizations advance the objectives and principles listed in the Coalition’s charter. Together, the Coalition will help drive progress on four goals to fill vacant digital jobs in Europe: to train one million young unemployed people; to upskill and retrain the workforce; to modernize education so that all students and teachers can use digital tools and materials and continue developing their skills; to “reorient and make use of available funding to support digital skills and carry out awareness-raising about the importance of digital skills for employability, competitiveness and participation in society.”

Flagship Project - P.2.2. - Foundation SD skills for informal market operators

The informal sector has a great weight in the African continent. With the Covid 19 pandemic, many formal and informal markets vendors in Africa were put in a high vulnerability situation due to health restrictions imposed by governments. In countries where smartphone adoption is higher, it was found that market vendors found new ways to sell their products, mostly using social media with their smartphones.

Considering the important contribution that the use of smartphones can provide in improving living conditions through access to a set of digital tools, it is recommended that a training program be established specifically for this target audience. This program should be tied to programs to bring informal workers to the formal market, registering a fiscal number and a social security number. It is proposed that this program incorporates a smartphone subsidy component for this target audience.

Recommendation 2.3. – Training the multipliers

Objectives: Train service providers, content developers, software developers and advanced technologies experts

Parties Involved: Service providers, schools, universities, TVET’s, SD providers, supported by DFIs and Government



Initiative 2.3.1. – Train and reinforce service providers.

Without a strong sector of training service providers, the capacity of a country to upskill its population will be limited. Government should stimulate and support training service providers at all levels, commercial and community, subsidizing completely the connectivity costs associated with their business and providing them with “train the trainer” upskill programs, certifications and other measures, given the very positive externalities of their activity to the economy and society.

Relevant Case Study

In Kenya, the Kenya National Library Service has collaborated with the Communications Authority of Kenya and a range of local and international partners to provide digital skills training through Kenya's public library network. Partners include UNESCO, Goethe Institute, EIFL (Electronic Information for Libraries), the Good Things Foundation, and the University of Washington.

Initiative 2.3.2. – Train content developers, software developers and advanced technology experts.

Content drives use of smart devices. Likewise, with services and apps relevant to the African context. More African and local content, services and apps will pull more Africans to adopt and use smart devices. Universities should be stimulated to develop more STEM courses – Science, Technology, Engineering and Mathematics – in order to feed the market with expertise that will drive forward African technological development that ultimately will create more jobs in the whole digital ecosystem. TVSD/TVET (Technical and Vocational Skills Development, and Technical and Vocational Education and Training) and

coding schools that train people with low skills should also be supported.

Recommendation 2.4. – Accelerate the digitalization of essential public services for smart devices

One way to create the need for the adoption of smart devices and the development of digital skills is the expansion of public and private technology-based products and services that make the lives of citizens and consumers so much easier that they are strongly attracted to embrace the digital transformation journey.

With the Covid 19 pandemic, it became evident that the lack of capacity to provide services online can have a high impact on the economies when there is a need to lift restrictions on the provision of face-to-face services.

Some examples of digital services that can be provided under this initiative for both businesses and citizens online and mobile are application and granting of licenses; electronic declarations and certificates from public and private services to citizens and companies; taxes and fees payments; request for information and clarifications in public services; employment services; tickets management systems for public and private services, among others.

In order to assess the impact of this strategic action, it is proposed that a survey be carried out annually, with a sample size enough to ensure results with a maximum margin of error of 3 percentage points.

Main activities

1. Identify public services that are only provided face to face at national and local levels



2. Identify private services that are only provided face to face at national and local levels
3. Prepare an action plan for the implementation of 50 online and mobile digital public services within 5 years
4. Prepare an action plan for the implementation of 100 online and mobile digital private services within 5 years
5. Develop the technological tools and applications to make public and private services available to citizens and consumers
6. Evaluate annually the satisfaction of users with the digital online and mobile public and private services provision
7. Improve technology platforms and applications based on assessment result

5.3. Pillar 3: Digital Entrepreneurship

5.3.1. Introduction

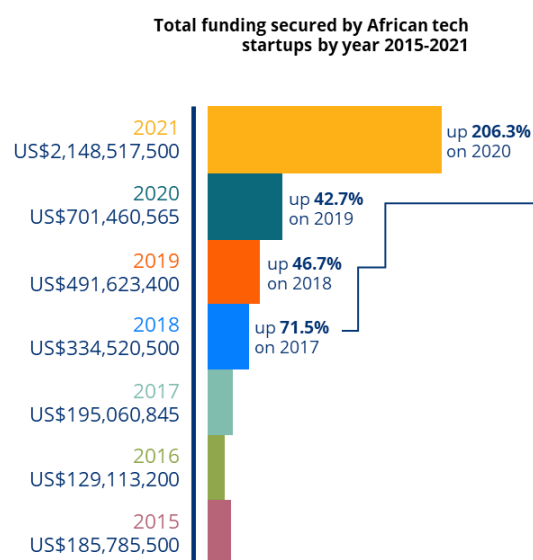
The shift of digital devices to become essentially data-enabled devices opened-up a brand-new world of possibilities to individuals, empowering them socially and economically. As smart devices grow in African society so does the emergence, funding and the success of tech startups grow.

ICT businesses, especially connected with start-ups, can be a considerable lever of development in African States, creating wealth and jobs, improving the efficiency and transparency of the public sector, and supporting the access to basic social services.

Bearing in mind the importance of ICT for the development of the economy in Africa, Smart Africa has already designed a Blueprint “For the Development of an ICT Start-ups and Innovation Ecosystem” in Africa with recommendations clear and objective.

Technological innovation associated with smart devices comes increasingly from individuals who engage in new start-ups, supported by a global venture capital industry and by start-up ecosystems, local and global. This reverses the trend of previous decades when technological

developments came essentially from government research agencies and the IT departments of large businesses. This has implications for the need to stimulate existing and new technological ecosystems in Africa should be stimulated to invest more in smart device technology and ecosystem.



5.3.2. Current Status

Digital entrepreneurship in Africa is very much around digital platforms and mobile businesses and its relation to the digital platforms that



meet the needs and aspirations of millions of Africans in several walks of life.

The growth witnessed over the course of 2021 has been extraordinary. New records were set in a manner never seen before. However, this ecosystem development has not reached all African nations in the same way, being concentrated in a few countries. Having not passed the 1 billion USD mark before, more than 2 billion USD were raised in 2021, by a larger number of startups in Africa than ever. In all, 564 startups raised a combined 2,1 billion USD in 2021⁴⁵. Total annual funding for African tech startups has increased by 1056.5% since 2015.

The average deal size more than doubled, increasing to 3,8 million USD from 1,7 million USD in 2020. A total of 205 startups raised 1 million USD or over in 2021, representing 36.3% of the total. This was up from 110 (27.7%) in 2020 and 81 (26%) in 2019.

More so than ever before, fintech is the most popular sector for investments in African tech. Fintech companies raised US\$1 billion up 547.7 per cent on US\$160 million in 2020. This took fintech's share of total funding close to the 50 per cent mark. Investments in agritech (22 companies), ed-tech (29 companies) and e-health (55 companies) are also very significative.

The blueprint "For the Development of an ICT Start-ups and Innovation Ecosystem" developed by Smart Africa included 27 recommendations, all of them totally applicable for the startup and innovation ecosystem that serves the Smart Devices value chain. Those recommendations are integrated into six pillars which include the impulse/ necessity to change, the connectivity improvement with the consequent market expansion, the skills development, the creation of a nurturing environment for startups, the financing mechanisms and the leverage of the ICT sector in the business and economic landscape.

The framework defined by Smart Africa in terms of the startup and innovative ecosystem is the following.

Startups	US\$	Sector
184	1,038,456,500	Fintech
70	326,156,000	E-commerce
55	122,542,000	E-health
43	86,751,000	Logistics
29	81,030,000	Ed-tech
22	104,118,000	Energy
22	95,101,000	Agri-tech
21	105,445,000	Transport

⁴⁵ The African Tech Startups Funding Report is the result of an open-sourcing initiative of Disrupt Africa

(<https://disruptafrica.gumroad.com>) in partnership with Novastar Ventures, MFS Africa, Quona Capital, 4Di Capital, MEST Africa and Future Africa

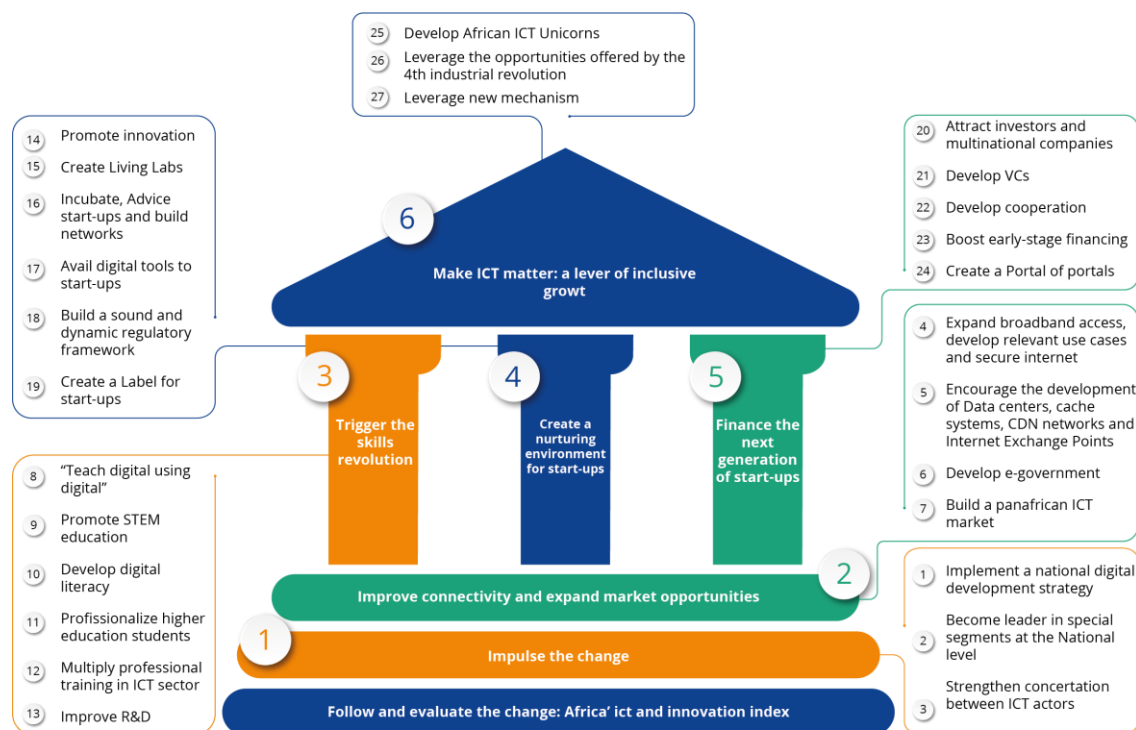


Figure 13. Recommendations of the Blueprint for Startups and Innovation. Source: Smart Africa

5.3.3. Goals

The main Goals in the digital entrepreneurship component are:

1. To activate and mobilize entrepreneurs and startups to the Smart Devices value chain, especially in the manufacturing and assembling component.
2. To guarantee that a significant amount of financing (private, public and development institutions) is funneled through the ecosystem for the Smart Devices Value Chain.
3. To ensure the alignment and involvement of the ecosystem as a whole, allowing startups to test their prototypes and developments in real business models, ensuring the acceleration of innovation in the value chain and the sustainable development of entrepreneurs.

5.3.4. Strategy for Action

The main approach for the innovation of the smart devices value chain is to “surf the wave” that is already in motion, using the innovative hubs that are already developed in Africa.

Recommendation 3.1. – Increase the capture of potential projects, investments and financing instruments by entrepreneurs whose aptitude is connected to the smart devices’ ecosystem, especially in the manufacturing and assembling component

Objectives: The objective of this recommendation is to ensure that the startup and innovation ecosystem in Africa is mobilized and connected with the huge market and business development opportunities of the smart device’s value chain.



Parties Involved: African countries, especially those more involved in the startups ecosystem, including the big four (Nigeria, Egypt, Kenya and South Africa) and others like Ghana and Tunisia that are growing in importance. Development agencies like the World Bank/ IFC, the African Development Bank, EU and others, to ensure the financial resources and also the institutional support. Finally, the private sector, including the main industry players where the entrepreneurs can test their solutions in real projects.

Initiative 3.1.1. – Conduct road shows/ webinars to activate the innovative community in Africa to the SD value chain

Introduce the innovative network and community in Africa into the SD challenges and opportunities. Conduct road shows/ webinars to present the challenges of the SD value chain to the community of startups and innovation hubs in Africa. In these road shows/ webinars the SD public and private players should present the value chain structure, the main activities and the most important industrial components that are needed to manufacture a smart device to the innovative community in Africa, attracting the attention of the entrepreneurs and generating new prospects.

Initiative 3.1.2. – Foster joint SD projects between universities and providers

Many of the most interesting technology development projects start at universities and research centers all over the world. In addition to the development of the technical and market solution, these initiatives can start to attract new entrepreneurs who, from the beginning of their career, start gaining a taste for the industry and invest their time and effort in it. All the projects developed at this level must then be cataloged and made available on a digital network so that they can be consulted by students in the future and used as a knowledge base for other projects.

Initiative 3.1.3. – Promote SD living labs with community involvement

A living lab is a research model defined as a user-centered, iterative, open-innovation ecosystem, concurrent research and innovation processes within a public-private-people partnership. It integrates the co-creation, exploration, experimentation and evaluation of innovative ideas, scenarios, concepts and related technological artefacts in real life use cases.

The implementation of SD living labs can increase the ability of entrepreneurs to test their ideas and solutions in a real or approximate context of reality, allowing them to be more easily implemented and financed. The SD living labs should be sponsored by the industry's main players, namely the main private sector actors and be part of startups and innovation hubs in Africa.

Initiative 3.1.4. – Finance AI startups in agritech, healthtech and edutech

Artificial intelligence (AI) is a technology that has been growing in importance on the world stage, so projects around these solutions have gained visibility and funding capacity. There are many companies working on artificial intelligence and many opportunities in the areas of agriculture, health and education, where smart devices are already one of the more fundamental elements for the development of the value chain.

Considering the investment already moving in AI, specific financing programs on AI should be implemented, involving startups and the SD value chain, through calls, hackathons, challenges or other instruments to encourage the participation of this technology in the value chain. The private players of the industry should follow these exercises to identify the most promising ideas/ solutions so as to incorporate them into their activities.

Initiative 3.1.5. – Finance investment in the production of smart devices

Making more finance available for investment in the production of SD components is important to attract entrepreneurs. The components industry is very important in industries where assembling is a key factor, because it enables specialization and cost effectiveness. This initiative must be linked to the entire topic of manufacturing as it can contribute to increasing the added value of African countries in the value chain.

For this increase in the added value in the value chain to take place, private actors in the manufacturing landscape must present to the market the areas where they are available to accept new companies that may be able to produce smart devices and components, in order to establish stable and long-term contracts with incentive models that allow new entrepreneurs to establish strong ties and invest in the value chain.

Recommendation 3.2. – Develop the entrepreneurs of the future, providing them with the skills, interest, and commitment so that they can make the smart device industry grow through projects of interest for the ecosystem

Objectives: To ensure that the new entrepreneurs in Africa have their attention on the smart devices value chain and can funnel their projects and competences to the area

Parties Involved: The main parties involved will be the universities and the research institutions in Africa that can support the training to the potential

entrepreneurs. Also, the tech hubs already working in Africa can be key players in this recommendation

Initiative 3.2.1. – Finance coding schools to feed start-ups and corporations

Funding coding schools to support the development of new technological ventures is a key step towards the growth of the startup and innovation ecosystem in Africa. It is essential that several teaching units for coding and technological development/ management skills are implemented for various levels of knowledge.

Technological skills and endogenous programming capacity in Africa, in terms of effective costs, are fundamental for the entrepreneurial ecosystem, since Africa does not have the ability to hire these skills abroad due to lack of financial resources and competitiveness in attracting new talent.

Initiative 3.2.2. – Finance a network of fab labs throughout Africa with 3-D printing directed at the SD industry

Fab labs serve at the same time as production, creation and prototyping workshops, hands-on training spaces and facilitators of social ties. They contribute to reducing the traditional head-on opposition between “knowing” and “doing”.

The investment in a network of fab labs with a vocation for the development of SD will allow the experimentation of more solutions in this area and also the eventual channeling of the efforts of entrepreneurs towards solutions that allow them to be incorporated in the value chain.





5.4. Pillar 4: Digital Regulation

5.4.1. Introduction

The projected increase in digital connectivity, the sharp increase of people going online via smart devices, the transformational impact of digital technology in all spheres of life, and the growing relevance of the digital economy in Africa, projected to represent 180 billion US of the economy by 2030, among other factors, all require a regulatory framework that protects citizens, businesses and investors and provides the right incentives for digital transformation to deliver on its promises of a better and more advanced society.

5.4.2. Current Status

Digital regulation is a fairly new concept worldwide and a challenge for every economy without exception. It is particularly challenging to socio-economic contexts which aim to integrate multiple markets and fiscal systems, such as the African continent, especially with regard to the African Continental Free Trade Agreement (AfCFTA).

Africa as a whole is making very fast developments in the field of digital regulation. However, the subject matter is vast and growing in complexity. Keeping pace with the rapid advances in digital technology is a demanding process, especially with regards to the unknown impacts of emerging technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), Machine to Machine communications (M2M) and 5G.

Of particular relevance to smart devices is PRIDA (Policy and Regulation Initiative for Digital Africa) an initiative which aims to promote universally accessible and affordable

broadband across the continent, unlocking the benefits of internet-based services for all. PRIDA is a joint initiative of the African Union (AU), the European Union (EU) and the International Telecommunication Union (ITU),

In particular, the program aims to create a more harmonized and enabling regulatory framework in Africa, building up the capacities of AU Member States in the Internet Governance space, for the use of Information and Communication Technology (ICT) for social and economic development. It includes digital strategies for areas such as health, education and agriculture.

PRIDA has three tracks: ITU is responsible for ensuring efficient and harmonized spectrum utilization across the continent (Track 1), the African Union Commission is responsible for the harmonization of measurable ICT/Telecommunications policy, legal and regulatory frameworks (Track 2) and for enhancing African stakeholders' active participation in the global Internet Governance debate (Track 3).

Regarding digital regulation, three areas have special impact in the smart devices ecosystem: 1) Digital Economy Legislation, 2) Conformance and Interoperability (C&I) Regulations and 3) Taxation of ICT.

The first two areas will be covered in this Pillar, while the third area will be addressed in Chapter 8.1. Smart Devices Affordability.

Digital Economy Legislation

Legislation surrounding the digital economy in Africa is at its infancy.



According to the UNCATD Global Cyberlaw Tracker⁴⁶, less than one third of African countries have laws regarding all four e-commerce legislative fields. As a consequence, over two thirds of African nations score on the bottom half of the ITU's Global Cyber Security Index⁴⁷.

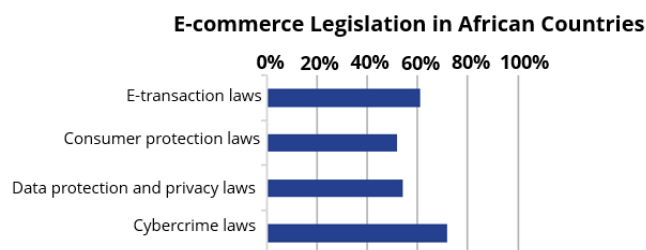


Figure 14. Share of African countries with e-commerce legislation (2021). Source: UNCTAD.

The four e-commerce legislative fields:

E-transactions laws — Recognize the legal equivalence between tangible and electronic money.

Consumer protection laws — Expand consumer right to the digital economy.

Data protection and privacy laws — Secure consumers information such as digital money balance.

Cybercrime laws — Establish legal mechanisms to prosecute online criminal activities.

The lack of legal frameworks is a deterrent for digital development. This is particularly evident in the e-commerce sector where mobile money legislation i) facilitates the collection and

transparency of taxes, ii) mitigates the risk of money fraud (thus protecting the most vulnerable), iii) creates mechanisms to prevent online black markets, money laundering and terrorism financing⁴⁸, and iv) protects individuals fundamental rights such as the right to privacy. All of which have an impact on government revenue, growth of the digital economy and protection of consumers. Furthermore, investors are also unwilling to invest in unregulated markets given their unpredictability — which adds another constraint to development.

As an example, Africa's data infrastructures (Data Centers) remain underdeveloped, in part due to unclear legal and regulatory regimes to support free flow, storage, and processing of data across borders, as well as data protection and privacy laws to ensure security of personal data.

On the 27th of June 2014, the African Union addressed this problem by adopting the Malabo Convention on Cyber Security and Personal Data Protection⁴⁹. At its core, the document established a legal framework for the regulation of e-commerce activities encompassing the four legislative fields previously mentioned.

This was an important step towards a harmonized digital economy policy at a continental level — akin to the adoption of the international Budapest Convention on Cybercrime (2001)⁵⁰ of which a number of

⁴⁶ UNCTAD, Adoption of E-Commerce Legislation Worldwide
<https://unctad.org/topic/ecommerce-and-digital-economy/ecommerce-law-reform/summary-adoption-e-commerce-legislation-worldwide>

⁴⁷ https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-GCI.01-2021-PDF-E.pdf

⁴⁸ GSMA, Mobile Money Policy Handbook (2018):
<https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/09/GSMA-Mobile-Money-Policy-Handbook-2018.pdf>

⁴⁹ AU, Malabo Convention :
<https://au.int/en/treaties/african-union-convention-cyber-security-and-personal-data-protection>

⁵⁰ <https://www.coe.int/en/web/cybercrime/the-budapest-convention>

African nations are signatories; and it followed the conception of several legal frameworks by regional unions (EAC — Framework for Cyberlaws⁵¹; ECOWAS — Cybersecurity Guidelines⁵²; ECCAS/ CEMAC — Directives on Cybersecurity; SADC — Model Laws on Cybersecurity). However, as of today, only 14 countries out of the 55 African Union member-states have signed the Malabo Convention and only 8 of them have ratified it into national law⁵³.

Conformance and Interoperability (C&I) Regulations

A second challenge to the digital economy lies in the Conformance and Interoperability (C&I) Regulations. In order to be imported or sold on a given market, telecommunication devices in most countries are required to obtain a certification/ homologation which ensures that they are conformant with the radio frequency, safety regulations or other requirements imposed by the laws or regulators. These certifications are typically called “Radio Type Approvals” or “Certificates of Conformity”.

In Africa, certification procedures are not particularly restrictive (according to stakeholder’s interviews), but they are also not uniform across all economies — a feature which may impose challenges to African enterprises and an African Single Market. Namely, different processing times and requirements for certification/ homologation requests may be time consuming, hinder the import or distribution of stock within an appropriate

timeframe and raise indirect expenses and uncertainty.

In order to standardize the C&I regulations, the two largest associations of accreditation bodies in Africa, the Southern African Development Community in Accreditation (SADCA) and the African Accreditation Cooperation (AFRAC), are as of 2015 “*in the process of developing their respective*” Mutual Recognition Agreements (MRAs)⁵⁴. Under these agreements, certifications emitted by different countries are to be recognized by all signatory parties — under the premise that regulations are standardized.

5.4.3. Goals

The first step in addressing the issue of regulation is to implement legislations when there is none. This is a step already taken by many African nations, which can be mimicked by those that still lack legal frameworks. The second step is to build upon existing frameworks and improve them. For example, several countries have legislations which addresses two to three e-commerce legislative fields, but not all of them. Finally, in order to establish a functioning Single Digital Market, African countries need to harmonize their digital policies.

5.4.4. Strategy for Action

The Digital Transformation Strategy for Africa (DTSA) (2020-2030) sets the foundation for action on the regulatory sphere in Africa. Of special relevance to smart devices are the following guidelines:

⁵¹ <https://unctad.org/press-material/east-african-community-adopts-framework-cyberlaws-foster-regional-trade-investment>

⁵² <https://www.itu.int/en/ITU-D/Projects/ITU-EC-ACP/HIPSSA/Pages/default.aspx>

⁵³ <https://au.int/sites/default/files/treaties/29560-sl-AFRICAN%20UNION%20CONVENTION%20ON%20CYBER%20SECURITY%20AND%20PERSONAL%20DATA%20PROTECTION.pdf>

⁵⁴ <https://ilac.org/ilac-mra-and-signatories/>

- Design policies based on a human-centered and holistic approach that takes into account the local context and cross-cutting issues relevant to all stages of policy design and implementation. Special attention should be given to women, people living in remote areas, people with disabilities, disadvantaged and marginalized communities through the establishment of a platform for dialogue and social cohesion and dialogue that involves these groups targets. The promotion of online cultural diversity must be supported to ensure that every person participates fully in society.
- Develop and implement strategies for optimal utilization of scarce critical resources such as spectrum and management of IP addresses including migration to IPV.
- Integrate the provision of e-services, developed by both the public and private sector, with adequate legal acts and regulation at all levels, ensuring that data needed to provide e-services for the community is hosted by countries in Africa and openly available upon request while fully respecting data protection principles.

Below are further recommendations relevant to smart devices in Africa. Recommendation regarding legislation requiring that mobile phones, tablets and PCs are designed to be resource efficient (circular) is inserted in Pillar 8. SD Disposal.

Recommendation 4.1. - Capacity building program on smart device legislation.

Establishing a capacity development program to support African policymakers, regulators and other public sector representatives in

legislation pertaining to smart devices, given its growing relevance and the fact that digital transformation challenges will be focusing more and more on digital end-use.

Recommendation 4.2. - Study and enact legislation concerning smart devices.

Objectives: The objective of this recommendation is to strengthen the smart devices ecosystem by establishing transparent legislation and to protect consumers and smart device users in the various aspects of their online experience.

Parties Involved: The implementation of the following initiatives is largely dependent on government bodies, however the research, coordination and enactment of legislation can be adjudicated to autonomous bodies or entities.

Initiative 4.2.1 Study and enact legislation on billing limits and billing practices of smart devices, especially regarding mobile roaming within Africa.

Affordability is one of the main limiting factors for adoption of smart devices. Providers need to be able to seek profitable returns on their business investments. However, government can study and limit practices that take advantage of asymmetric information between provider and customer. The customer must be given an opportunity to define a billing limit and be warned of that limit on reasonable notice. In addition, roaming prices within Africa must be agreeable with the objective of promoting a single digital market.

Initiative 4.2.2 - Study and enact legislation on cyber security of smart devices.

Regulation regarding cyber security of smart devices must be established within the scope of digital consumer protection laws. These





regulations are typically based on the *Secure by Design* principle, which sees security measures implemented as early as the design and manufacture phase of smart devices. There are several international standards which African nations can build upon in order to establish or improve their current regulatory frameworks, including the European Standards ETSI EN 303 645. Some examples of provisions found in this standard are the following:

- i) Smart devices must not have universal default passwords (e.g., 12345)
- ii) Smart devices should use best practice cryptography so that consumers can communicate privately and securely
- iii) Manufacturers must have a mechanism for reporting vulnerabilities
- iv) Manufacturers must develop and deploy security updates in a timely manner

Initiative 4.2.3 - Study and enact legislation regarding the manufacturing and disposal of smart devices in Africa.

Regulating the manufacturing and disposal phases of the smart devices value chain can increase the lifetime of products and minimize their environmental impacts, ultimately benefiting African consumers and citizens. Both topics will be further developed respectively in Pillar 5: Assembly and Production of Smart Devices and Pillar 8: Disposal of Smart Devices.

Initiative 4.2.4 - Study and enact legislation to protect lives on the road by limiting the use of hand-held mobile phones while driving.

In 2016, Africa reported over 250 thousand road traffic deaths — the highest traffic death rate per 100 thousand population in the

world⁵⁵. Although a general lack of road safety regulations such as speed limits is a major factor, mobile phone use while driving is also a contributor to traffic accidents and likely to become a bigger concern for African countries in the near future. Nations should therefore seek to impose legislation limiting the use of hand-held devices while driving and regulate the adoption of *hands-free* equipment — including, mobile phone holders which attach the device to the vehicle's dashboard in order to use services such as GPS applications on the road, and earphones that allow for hands-free calls.

Flagship Project - P.4.1. - Create a distinct continental entity in charge of the development of Africa's smart devices policies, within ITU or the Africa Union.

African nations should move towards the establishment and strengthening of relevant e-commerce legislation and C&I regulation of smart devices. This can be achieved by establishing a distinct continental entity with representatives from all countries or regional unions, which would be responsible for the development and harmonization of African smart devices policies.

Cross-border data transfer, data privacy, cybersecurity and smart devices taxation present an ever-shifting challenge to policymakers and require an expert understanding of international trends. Therefore, this body needs to have sufficient technical capacity to cope with the changes in international technologic and policy, and to understand their impact on national digital economy.

This body would have some tasks in common with the previously mentioned PRIDA initiative, such as developing guidelines for radio frequency spectrum coordination and type approval regulations.

⁵⁵ WHO, Global Status Report on Road Safety (2016):<https://www.who.int/publications/i/item/9789241565684>



However, it would be a long-term body without a termination date, able to build technical capacity and tackle future legislative challenges arising from AI and the IoT.

This concept builds upon the previously established African Union Cyber Security Expert Group (AUCSEG) — a body designed to assist and advise on all matters of cyber security on a national, regional and continental level. However, it would extend beyond cybersecurity policy encompassing for example the fields of C&I and taxation. Given

the important role that AUCSEG plays, it could be part of the support structure of this entity.

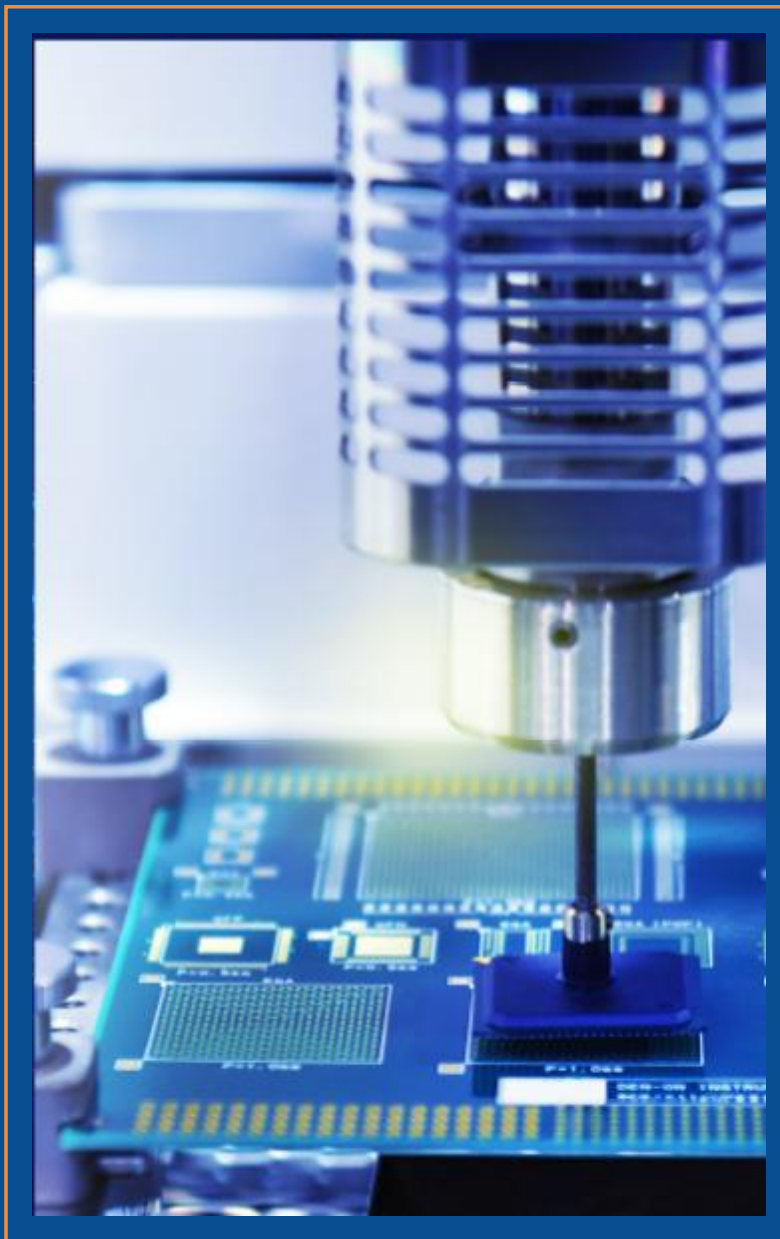
Monitoring implementation strategies and results (e.g., increased smart device adoption, digital empowerment of the population, etc.) is also a decisive procedure in verifying the efficiency of the policies implemented and provide each country with a sense of feasibility. This could also be guaranteed by the established entity or a specific branch of it, created specifically for that purpose.







6. SMART DEVICES VALUE CHAIN PILLARS





6. SMART DEVICES VALUE CHAIN PILLARS

An effective strategy approach must consider all the elements of a value chain, giving more or less emphasis to each component as relevant to the challenge at hand.

The value chain of smart devices (SD) is growing in complexity. This blueprint considers four main components: production, distribution, use and disposal.

In each pillar, the main challenges are presented, objectives are defined, and strategic actions are recommended.

6.1. Pillar 5: Assembly and Production of Smart Devices

6.1.1. Introduction

Among policymakers and scholars alike, a robust manufacturing sector is broadly understood as a fundamental path to economic growth and development.

The manufacturing potential of the African continent will grow in the coming years, supported by increasing adoption of technology and a growing internal market. By 2030, Africa will be home to more than a quarter of the world's population under 25. Africa will be a major consumption market over the next three decades.

To take full benefit of this potential Africa needs to strengthen its participation in global value chains, increase its value-added manufacturing portfolio, attract more investment and create more qualified work.

These challenges are key in the smart devices value chain, where innovation and competitiveness are key issues. Africa's low productivity and innovation are still inhibiting factors of Africa's growth in the manufacturing ecosystem.

Africa is not starting from scratch. Some manufacturing smart devices projects have already been developed in Africa. There are already a variety of producers with production lines, especially in laptop devices (and some trials in the smartphone market). However, for a variety of reasons they have not completely taken off yet, transforming themselves in a pan-African manufacturer with economies of scale and worldwide competitiveness.

Africa needs to invest on these projects because the continent is at the beginning of a learning curve that needs to be accelerated even if the initial steps do not deliver the profitability rates





that are comparable with benchmark mature projects developed in other parts of the world, namely China.

Africa has its own challenges regarding infrastructures, logistical and supply chains, electricity shortages and human resources productivity that prevent the continent to be globally competitive in the beginning. That is why Africa must accelerate the projects that are now on the ground to escalate quickly within the value chain.

The global production landscape of smart devices encloses five main opportunities for Africa:

- (i) The excessive dependence of the industrialized world on China.
- (ii) The need to rebalance global value chains following the COVID-19 pandemic and reduce.
- (iii) The evolving high specialization tendency opens up many opportunities for new niche players.
- (iv) The implementation of the African Continental Free Trade Area (AfCFTA).
- (v) Africa's innovative ecosystem is growing fast and creating new opportunities.

Opportunity 1: Excessive dependence of the industrialized world on China

The globalization processes that the world faced at the turn of the century particularly affected the electronics industry, in which the specialization level of individual companies began to rapidly increase.

The global market of the electronic industry in recent decades has been as follows: the most important achievements in electronics were concentrated in the USA, Japan, and several countries in Western Europe. China and many

Southeast Asian countries provided advanced manufacturing. As an example, the main market share of micro-components (61%) today is held by the Asia-Pacific region, followed by the United States and other countries of the Americas (19%), Japan (10%), and finally Europe (10%).

In recent years, enterprises in Asia have become increasingly competitive, scaling within the value chain of electronics development. With various competitive advantages (e.g. cheap labor, proprietary technological developments, the presence of large reserves of rare-earth metals used in the manufacturing of household appliances, smartphones, electric vehicles, etc.), Asia-Pacific companies are trying to take and achieving a strong position in the global electronics market.

China has for some time been recognized for its role as the assembly center of major global brands, prior to expanding its domain to other phases within the smart devices value chain. Before the emergence of smartphones, Motorola and Nokia relied on China as their major assembly base. Since the launch of the first-generation iPhone, China has been the exclusive assembler for Apple. At its peak, Samsung — the number one mobile phone maker in the world today, had 65% of its devices assembled in China.

It is estimated that China and India are now the two main producers (in a broad sense, including assembly) of smartphones for the consumers at a worldwide level. The two together account for 65%-80% of the market. On May 5th the EU presented its updated industrial strategy, including plans to reduce dependency on China and other foreign suppliers in strategic areas such as technology products and pharmaceutical ingredients.



Africa can reduce the world's dependency on China, rebalancing the value chains and the world trade balance, if it takes a long-term view and makes bold moves into manufacturing.

Opportunity 2: The Rebalance of The World Value Chains After the Pandemic

Shocks affecting the global production value chains are coming more frequently and more severely. Globalized flows and networks open more space for shocks to penetrate and damage in more extensive ways. Disruptions lasting a month or longer now occur every 3.7 years on average.

The interrelated nature of value chains limits the economic case for making large-scale changes especially in their physical location – one of the most difficult factors to change. Value chains often span thousands of companies, and their arrangements reflect specialization, access to the final markets around the world, established relationships and economies of scale.

However, considering both industry economics and national policy priorities, it is estimated that 16 to 26 percent of global goods exports, worth 2.9 trillion to 4.6 trillion USD, could conceivably move to new countries over the next five years if companies restructure their supplier networks⁵⁶. Computer and electronics and communication equipment are among the more exposed sectors to shocks and thus more exposed to potential changes. This is a huge opportunity to Africa, should African countries organize themselves in terms of productivity and competitiveness.

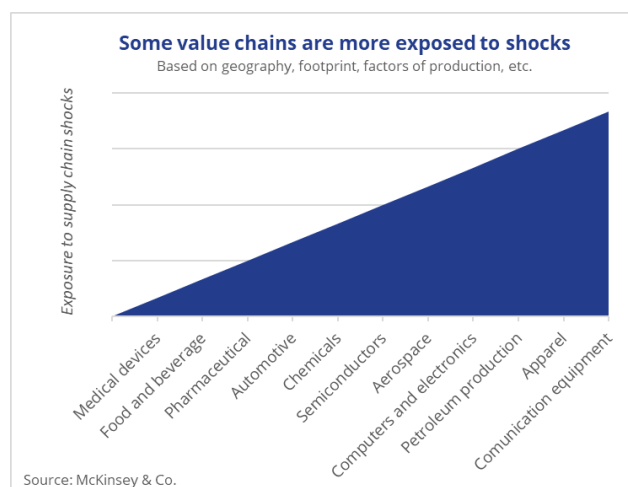


Figure 15. Supply chain shocks are becoming more frequent. Source: McKinsey.

Furthermore, value chains that are comprehensively traded relative to their output are more unprotected than those with lower trade intensity. Some of these include current heavy weight sectors in the world economy and even more important in the near future: communication equipment, computers and electronics, and semiconductors and components. Globalization has led to the diversification of production across countries in some sectors, but others have intensified their concentration.

Mobile communication equipment, computer and peripherals have been changing locations at very high speed.

With the COVID-19 pandemic disrupting supply chains, a lot of attention is on semiconductors, working behind the scenes to power everything from smartphones to cars and thermostats. The worldwide semiconductor market is expected to grow by 17.3 % in 2021, versus 10.8 % in 2020. According to IDC, dedicated

⁵⁶ Risk, resilience, and rebalancing in global – McKinsey Global Institute, August 2020

foundries are allocated with capacity utilization at nearly 100%. Many organizations are considering expanding production and governments share this interest and attempt to support their local semiconductor markets.

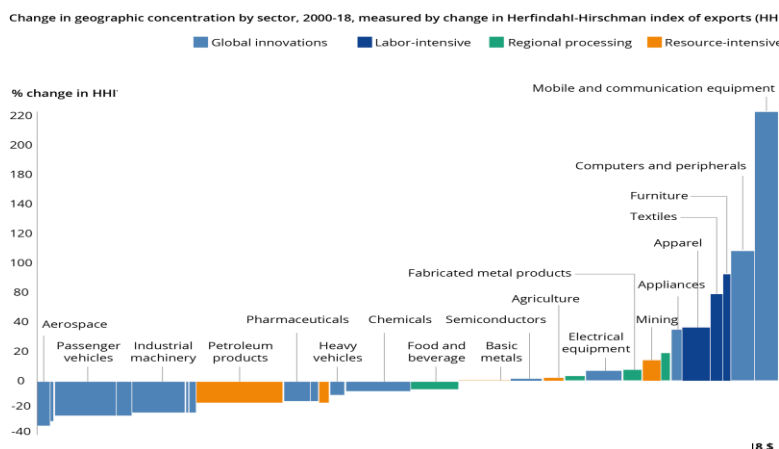


Figure 16. Sectors that have changed their geographical presence. Source: McKinsey.

Opportunity 3: Modern Products Require High Degrees of Specialization

It seems long past the days when a single vertically integrated company like Ford or General Motors could design and manufacture all or most of the sub-assemblies and components it needed to make a finished product. Technology is just too complex these days, and it is impossible to possess all the skills necessary concentrated in just one place. Consequently, manufacturers have turned to specialists and sub-contractors who narrowly focus on just one area — and even those specialists have to rely on many others. And just as the world has come to rely on different regions for natural resources like iron or lithium ore, so too has it become dependent on regions for specialized technological capacity. This offers new opportunities to new entrants.

Specialization – Case for a Notebook computer

The dependence on specialists is clear if we look at a typical notebook computer. Companies like Dell or HP rely on a handful of Taiwanese original design manufacturers (ODMs) to do the assembly work, but those assemblers, in turn, depend on multiple components manufacturers.

A notebook display has several components. At its heart is a thin-film transistor liquid crystal display (TFT-LCD) panel, which is mated with a backlight assembly and bezel. The TFT-LCD panels are made by a handful of Asian manufacturers in large, capital-intensive factories — the most recent of which cost more than 6 billion USD to build and equip. These panel makers, in turn, are dependent on others who supply essential raw materials such as optically flat glass sheets, polarizing films, flexible circuit connectors, display driver chips — made by semiconductor factories (*fabs*) spread around the world — and a host of other inputs.

Suppliers upon whom manufacturers depend for critical components are scattered around the world. Electronic companies are especially dependent on suppliers across Asia (primarily China, South Korea, and Japan). A consequence of these interdependencies, which become highly complex, is a deep tiering of supply chains, with manufacturers dependent on their first-tier suppliers, which, in turn, are dependent on a second tier, which are themselves dependent on a third tier, and so on. Visibility is challenging, making wholesale replacement of anyone in the chain, let alone the entire chain, extremely difficult.

It might be easier for Africa to explore a specialized close market, than to manufacture a totally finished product in the continent.

Opportunity 4: African Continental Free Trade Area (AfCFTA): a platform for manufacturing growth

The launch of the African Continental Free Trade Area (AfCFTA), a single market for goods and services in Africa, aims to unlock manufacturing potential and facilitate industrialization, driving sustainable growth and jobs among other objectives.

It is crucial to prepare and to put in place policies to adapt to the digital future, and the challenges the AfCFTA may bring, to create jobs

elsewhere, including in a more digitally oriented manufacturing sector. If African countries do not take appropriate actions and the digital divide persists in the context of growing global digitalization levels, then there will be an increased threat of re-shoring of manufacturing tasks from Africa or not re-shoring new ventures in Africa. The AfCFTA aims to boost intra-regional trade in manufactured goods and the development of regional value chains. Rising wages in China have created opportunities for African manufacturing firms to 'capture' some of the low-cost labor-intensive activities of Global Value Chains. This is already the case in Ethiopia, where rapid growth in exports has made it the largest sub-Saharan footwear supplier to the United States.

Opportunity 5: Africa Start-up Ecosystem – Innovative Grounds to Explore

Innovative disruptions create opportunities for new entrants. Africa's startup ecosystem is growing so fast it now has dozens of incubators and accelerators to choose from. Beyond funding, Africa's startup accelerators also offer founders incredible valuable support for product development, sales and marketing.

The startup and innovation culture is deepening in the continent and the larger countries, such as Nigeria, Kenya, Egypt and South Africa, have now a diversity of accelerators across several sectors. Many distinctive entrepreneurs are involved in the development of content, apps or software that is totally adapted to the African needs.

Considering the Global Start-up Ecosystem Report of 2021, Africa's startup ecosystems are worth a total of \$6.6 billion. Of this amount, \$6 billion is concentrated in five cities: Cape Town, Lagos, Johannesburg, Nairobi, and Accra.

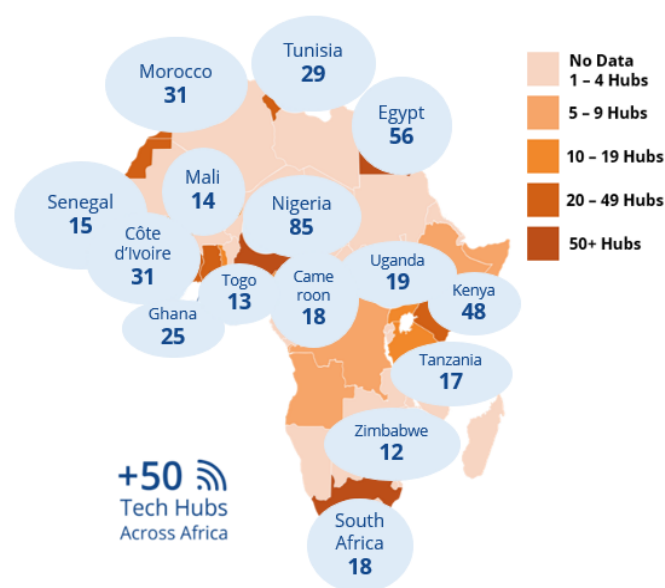


Figure 17. Tech Hubs Across Africa. Source: United Nations Industrial Development Organization (UNIDO).

6.1.2. Current Status

Positive Prospects

The market prospect for smart devices is huge and growing. According to the Gartner Group the installed base of devices is more than 6,4 billion units worldwide, and almost 70% of them are smartphones. In the 2019-2022 period, the market is growing at a pace of 1,4% a year (on a huge base), even considering that the Database PCs (desktops) are declining at a rate of 5,2% per year for the last 3 years. Tablets, with a growth of 10,4% a year, and Laptops, growing at 5,9% a year, are the fastest growing devices.



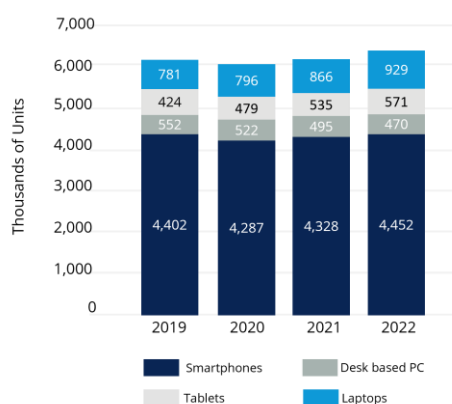


Figure 18. Evolution of the worldwide SD Demand

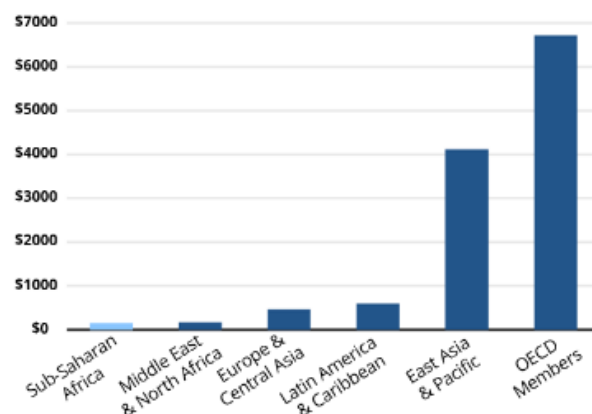
Evolution of Manufacturing in Africa – Significant Growth but Less Weight

Manufacturing in Africa has developed significantly in the last years. Also, the manufacturing value added (MVA) calculated by UNIDO has had a tremendous growth rate from the nineties, to the first decade of the 21st century and even in the more recent years. If we look a long trend from 1990 to 2016 the growth has been from 113 billion to 240 billion USD, representing a compounded annual growth rate (CAGR) of around 4,8% a year and a total growth rate of 112%, more than doubling the production.

Grouping	Manufacturing value added (billions, constant 2010 \$)			(percent)		
	1990	2000	2016 (est.)	1990	2000	2016 (est.)
World	5,643.0	7,535.0	12,316.0	100.0	100.0	100.0
By region (developing and emerging industrial economies)						
Africa	113.0	129.0	240.0	9.2	6.5	4.4
Asia and Pacific	474.0	1,085.0	4,177.0	38.6	54.3	76.0
Europe	196.0	197.0	365.0	16.0	9.9	6.6
Latin America	444.0	586.0	712.0	36.2	29.3	13.0

However, if we look at the representativeness of this manufacturing value added we can see that Africa still represents only 4,4% of the world total MVA – Manufacturing Value Added - and worse than that, weight has been coming down from 9,2% in 1990 to 4,4% in 2016.

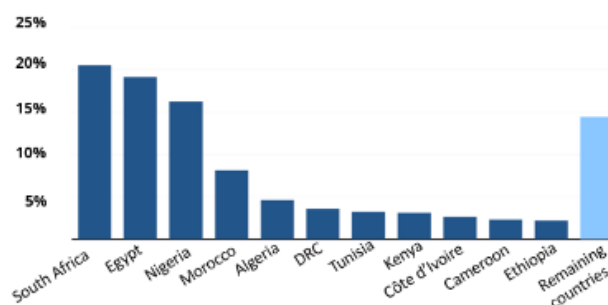
Almost 70% of the continent's manufacturing activities are concentrated in just four



Source: World Development Indicators. For comparative purposes, high-income countries are excluded from all regional aggregates other than OECD. OECD data are 2016. All data are current USD.

Figure 19. Regional comparison of manufacturing value added (2017).

countries. African governments are seeking innovative ways to attract investment and nurture its industries, involving strategies with targeted investment in infrastructure, improved regional integration, and the establishment of SEZs for priority subsectors.



Source: World Development Indicators. All data from 2017 except for Morocco, Tunisia, Cameroon, Swaziland, Mozambique, DRC, Lesotho, Chad, Mauritania, Burundi, Seychelles, and Liberia, which are 2016, and Gabon, Central African Republic, and Comoros, which are 2015. Angola, Eritrea, Madagascar, Mali, Somalia, South Sudan, Sudan, and Libya are omitted due to lack of recent data.

Figure 20. Share of manufacturing value added in selected African countries.

Due to natural resource wealth in Africa, much of the region's industrial production remains

centered on resource-based manufacturing. It accounts for approximately half of the total manufacturing value added (MVA) and exports — two indicators of industrial development where Africa lags the rest of the world.

Looking into the future of manufacturing of smart devices in Africa, three factors need to be taken into consideration: i) strong capital needs for R&D programs, ii) the relevance of raw materials and iii) the choice of the production model.

Strong Capital Needs for R&D Programs

Capital efficiency — that is, how much capital is deployed in a business — is another important topic for shareholders and stock markets analysts. It is not acceptable to make big investments for idle or underutilized capacity, and in sectors where the capital expenditures for plant and equipment are extraordinarily high (like semiconductors, flat panel displays, automotive assembly, materials processing), investors applaud the outsourcing or offshoring to entities willing to invest, or to a geography where they can receive subsidies.

The question is that new factories and extensive R&D programs, essential for producing leading-edge technologies at high volumes, require hundreds of million or billions in investment. As an example of capital requirements, the investment by Samsung on a new manufacturing smartphone plant in India, considering all the advantages of the organization conglomerate which hold several component production factories, was approximately 715 million USD. (Reference) A misstep in the field, lax cost control, or lower-than-expected demand can severely decrease or even eliminate a company's return on investment.

The Relevance of Raw Materials

Another important discussion in the production landscape is the origin of raw materials. At the bottom of the supply chain in smart devices is the raw materials extraction, such as metals and metal ores. The raw materials are used to make the basic components of mobile phones, tablets and PCs. Often the raw materials are from mines with poor environmental records, whose benefits and profits are huge questions marks. For instance, RDC is one of the most important sources of these raw materials that are sent to other markets (outside Africa) to be transformed in high value-added components.

Africa must leverage its incredible potential in the raw materials and climb up in the value chains, adding more value in the continent, creating more jobs and wealthier populations.

The Choice of the Production Model

The most important aspect that needs to be considered is the positioning on the manufacturing value chain – the production model. The new models for manufacturing, imported from the automotive industry, suggest different approaches starting from the completely build up smart device (the device is imported ready to be commercialized and will pay full taxes) and them different forms of manufacturing options.

CBU	SKD	CKD	PBP
Completely Build Up	Semi Knocked Down	Completely Knocked Down	Part-By-Part
			

Figure 21. Models for production in car manufacturing imported to the smart devices





The *Semi Knocked Down (SKD)* units or sometimes also known as semi-built units are partially assembled in some other country and then imported to the country where they will be sold after assembling them fully.

The *Completely Knocked Down (CKD)* units are the ones which have been locally assembled in the country. However, the parts, engine, electronics, and other major components were imported from the origin country. This means the company must put the parts together first and then sell it to the end consumer. The benefit of doing this is low taxes on the products. This way foreign manufacturers are encouraged to build plants and produce the devices locally.

On the *Part-by-part (PBP)* model, the requests and lots are based on items, having no need of fixed lots.

6.1.3. Goals

The global vision for Africa is to ensure productivity in a highly competitive world but also become a redundant platform to the production in China.

The main goals are:

- To identify, promote and develop African manufacturing projects for smart devices (at least 5-7 projects in the first five years) that can have a strong positive impact on the production of smart devices, capturing a significant market share, at least in the consumption market for smart devices in Africa. An intermediate goal is the completion of an African investment fund to invest in manufacturing projects for smart devices in Africa, that would be multi-site and where the integration of African components would be at least 40% (direct or indirectly in the project).

- To leverage the MVA (manufacturing value added) of smart devices in Africa, adding more value into the raw materials extraction and export (at least 2-3 projects).
- To launch a 5-year investment program in startups that create new innovative solutions that can foster the utilization and production of African smart devices. An intermediate goal should be the launch of two hackathons for smart devices applications and for smart devices solutions for manufacturing in Africa. Another intermediate goal could be the implementation of a smart devices specialized accelerator in Africa.
- To create a significant number of jobs in the manufacturing production market, including, production managers, quality control managers, production line managers and supervisors and other. An intermediate goal would be the creation of courses in manufacturing for electronics in at least 2-3 universities or research centers in African countries.

6.1.4. Country Experiences and Best Practices

The smartphone market in Africa is highly competitive, but few devices worldwide are designed with African customers in mind. The market is still completely dominated by the international brands especially mainland China, but also from Hong Kong, Taiwan and even Pakistan.

As an example, the Chinese company Transsion (which include Tecno, Infinix and Intel brands) recognized early this market's needs. Smartphones from this brand have the most important social media platforms in Africa pre-installed, they are robust, can hold multiple SIM



cards for better network coverage and the battery lasts several days in stand-by mode — features adequate for many African consumers. Transsion company continues to lead the smartphone space in the continent, with 36.2% of the African market share, followed by Samsung (23.9%), and Huawei (11.4%).

Localizing, designing, assembling or manufacturing devices, reflecting market demands: beyond access channels, offering affordable smartphones, tablets or notebooks that respond to the needs and value perceptions of the local consumers, ensuring that they are not paying for features that they will not use, could be an area to focus as important as industry efforts.

Starting from assembly units instead of manufacturing, will give some benefits and save on initial investment and costs. It is not necessary to invest in manufacturing instruments, operators, product designers, or plant/ warehouse maintenance. This keeps overhead costs low, leading to a higher return on investment (ROI). A complex procurement of raw material for products is also not required and on top of cost savings, assembly plants can react faster to market shifts — which is important in the electronic devices fast moving sector.

Some African Efforts

Africa is giving the first steps, with the Shenzhen-based company's handset manufacturer Transition mobile phone assembly and production plant in **Ethiopia** (9 years in operation), while Samsung has assembly lines in North Africa (Egypt, Algeria) and SICO Technology (Egypt), which makes its own Nile X brand of handsets, has begun to build smartphones for Indian and Chinese firms. Other initiatives including a new

manufacturing plant in South Africa and a television, laptop and printers' assembly plant in Kenya.

Rwanda has been quite active. Africa's first smartphone factory opened its doors in Kigali in October 2019 with the aim of becoming a leading brand across the continent. Pan-African conglomerate Mara Group opened its first smartphone factory in Rwanda with the aim of becoming a pioneer brand of African-made smartphones. Meanwhile, reports have said that Mara Phones currently runs at 20% capacity due to the slow market response during the pandemic and economy disruption in 2020 and 2021, expecting a resurgence of the markets for 2022.

AfriOne a **Nigerian** company aimed to deliver an innovative, sleek, and affordable smartphone, tablet and laptop that is accessible for everyone. Created in 2016, AfriOne wanted to generate employment opportunities for Nigerians and train Nigerian youth in technological skills. A state-of-the-art facility with over 20,000 sq.ft. based in Lagos state, tried to include research, development, and manufacturing divisions. Presented as pioneers in the making of mobile phones in Nigeria, the company looked forward to expanding its plan to other countries in Africa. Somehow it has gone silent, hardly to be found in the market.

More recently, following a recent report that Nigeria is on its way to producing its own mobile phone and sim cards, the president of the country, Muhammadu Buhari received the first made in Nigeria cell phone. The locally-made device is called ITF Mobile. The presentation of the cell phone to the president was made by the Minister of Industry, Trade and Investment. It was produced by the Electrical/ Electronics Technology Department of the Industrial



Training Fund's (ITF) Model Skills Training Centre, using locally sourced components.

Mara Group has noticed to have exported their phones to 76 Countries (Africa and the rest of the World) as the company grows steadily. The company plans to launch a Next Generation of Phones by Mid-Year 2022.

Egypt's first smartphone maker will assemble handsets for other companies as it seeks to become the main contract builder of electronics bound for the rest of Africa. SICO Technology, which makes its own Nile X brand of handsets has begun to build smartphones for Indian and Chinese firms. The vision of the firm is to focus on international companies that can benefit from the presence of a manufacturing center away from East Asia. The pandemic's disruption to supply chains proved that technological and industrial centers must be distributed around the world.

Before this, the Hong Kong-based smartphone company, Infinix, had already revealed that the company has started manufacturing its smartphones in Egypt. This ensured that Infinix was the first global manufacturer of smartphones to launch production lines for its products in Egypt.

In **South Africa**, Mecer & Proline are two local PC brands that have been around for several years and do have a reasonable market share in the South African market.

6.1.5. Strategy for Action

The strategy to make production grow and expand the added value of the SD value chain has three main recommendations:

1. Develop an attractive investment environment for manufacturing and

assembling projects in the SD Value chain in Africa

2. Promote investment in SD Value chain Manufacturing and Assembly projects, making sound feasibility studies, using locations with political and economic stability and gradually expanding the value added created
3. Bring in the innovative ecosystem and the entrepreneurs to support the expansion of SD Value chain

Recommendation 5.1. – Develop an attractive investment environment for manufacturing and assembling projects in the SD Value chain in Africa

Objectives: Support the increase in the investment in manufacturing and assembling projects by creating the conditions of stability and sustainability that the international and African private investors need in order to establish their projects

Parties Involved: Governments and international multilateral entities that can promote the reforms that the private investors need

Initiative 5.1.1 – Specialize some Special Economic Zones in Digital Technology and the SD Value Chain

Often, to attract foreign direct investment, special rules are needed. Special Economic Zones (SEZs) were created having that in mind, offering fiscal incentives, relief from customs duties and tariffs, business-friendly regulations with respect to land access, permits and licenses or employment rules, and administrative streamlining and facilitation. Purpose built Infrastructure is another important feature of SEZs, especially in developing countries where basic infrastructure for business outside these zones can be poor. These zones can help attract international investment, create jobs, and





boost exports – both directly and indirectly, where they succeed in building linkages with the broader economy. They can also support global value chain (GVC) integration as they have been a key component of export diversification efforts in developing countries and instrumental in improving participation in GVCs.

However, none of the potential economic contributions of SEZs and similar initiatives are guaranteed. In fact, the performance of many zones remains below expectations, not generating significant economic activities. In other cases, the stimulus tends to be temporary and after the build-up period, most zones grow at the same rate as the national economy.

Specialization of SEZs can create an added focus and a greater attraction power, namely with the purpose of growing the digital economy and the smart device ecosystem. Having identified this objective, the next step is to promote the necessary ecosystem by integrating universities, startups and local producers and producing specific policy for the SEZ. To be successful, the SEZ must inspire confidence that it will be different from other parts of the country. Some examples of policy innovations or liberalizations include tax benefits, exemption or reduction of import tariffs, flexible labor policies and financial flows in countries where there are foreign exchange and capital controls. SEZs may be locations where such restrictions can be lifted.

It is important to keep in mind that SEZ should last long, and its benefits may only be felt years after it is built. The long-term management of the SEZ therefore must be planned, efficient and effective. The management team needs to remain true to the vision of the SEZ, adhere to its masterplan and yet have the confidence and

flexibility to cater to changes in customer demands, demographics and technology advances. Increasingly, SEZs are managed on a PPP basis. This implies that the SEZ management may be a private sector company. The contractual agreement between the SEZ management company and the government, and the revenue model of the management are then important to ensure the long-term sustainability of the zone.

[Initiative 5.1.2 – Invest in Human Capital for the Production Value Chains](#)

The investment in human talent is fundamental for the sustainability of projects. It is essential to prepare highly qualified African resources to integrate the manufacturing development projects that are already running and others that will come in the future.

This initiative must consider the participation of the most important universities and research institutions on the African continent and start immediately (many projects are already running). Also, formal certifications could be created for the more technical roles, in order to ensure that operational processes are fulfilled. Some technical education and vocational training (TEVT) should also be fully involved.

First, the necessary skills needed in the management and operation of a production line must be defined and organized around a SD manufacturing skills catalog – and then identified the courses that enable human resources to achieve those skills.

The main functions that are needed for the SD value chain include production managers, quality managers, R&D/ application engineers, production line managers and supervisors, inbound and outbound logistic experts, and others.



Flagship Project - P.5.1. – Create a collaborative tool for training skills in the SD value chain.

At the end of the project, Smart Africa will have supported the development of a training platform for manufacturing and assembling in Africa, that can be used widely the value chain projects and recurrently, at no extra cost, by all the participating in the program.

Training in Africa needs to be at world level in terms of pedagogical models, training techniques and tools and technology used. This is not always guaranteed. A digital collaborative approach guarantees that the required training follows the latest and most advanced practices used.

Learning and teaching paradigms are rapidly evolving into being digitally supported and based on platforms that multiply the effects of training.

We recommend to apply this new paradigm to the SD value chain program, considering the following aspects: i) equitable and sustainable training; ii) ecosystem engagement; iii) trusted ecosystem development; and iv) training and ecosystem management. Techniques such as gamification can be used for further efficacy of the training. Individual customised path and evaluation is also possible. To be effective, this platform must be complemented by work on the factory floor, in fablabs created to complement the platform.

The use of this platform is a game-changer.

Initiative 5.1.3 – Continue to work on conditions that reduce production and trade costs

African regional bodies and governments also need to break down trade barriers, improve financial structures, and invest in public resources in much-needed infrastructure—especially transport and energy networks and the Internet.

Policy and research all too often focuses on export performance, while participation in GVCs mostly entails both export and import. The role of imports in production is particularly important for manufacturing firms in Africa. World Bank Enterprise Survey data and other research reveals that over 65 per cent of manufacturing firms in Botswana, Egypt,

Ethiopia, Lesotho, Madagascar, Malawi, Morocco, Namibia, and Zimbabwe participate in either direct or indirect importing. Access to imported inputs is crucial for firms that strive to participate in GVCs as exporters.

There are several measures that policymakers can implement to enhance this process, especially under the African Continental Free Trade Area (AfCFTA) agreement.

An industrial policy to facilitate participation in GVCs should not only look at industry-level aggregate data but also consider the diverse characteristics and needs of firms. For example, high trade costs associated with poor transport infrastructure and cumbersome importing and exporting procedures in many African countries are detrimental to GVC participation by manufacturing firms, irrespective of their industry classification.

Other policies that constrain access to imports such as tariffs, import permits and domestic content requirements can hamper export performance and firm productivity growth. Several measures can be implemented to address this problem. For example, high tariffs on intermediate inputs that raise costs for firms can be reduced. Smarter rules of origin could improve intra-African trade within the various existing Regional Economic Communities.

Recommendation 5.2. – Promote the investment in SD Value chain Manufacturing and Assembly projects, making sound feasibility projects, using locations with political and economic stability and gradually expand in the value added created

Objectives: Invest in projects that are needed to increase the participation of Africa in the manufacturing and assembling SD Value chain





Parties Involved: Private parties, international investors, multilateral entities to support the financing of the projects and governments (with only an institutional participation)

Initiative 5.2.1 – Establish an investment fund to create the African Smart Device Initiative

This initiative can have a high sustainable impact.

The African Smart Device Initiative would be an investment fund constituted by African and international investors specifically directed at the smart device – smartphones, tablets and PCs – value chain, focusing on production, distribution and disposal. This fund would benefit from its specialized nature, focusing on the top end of performance, and from its large dimension, capable of attracting expertise, support and of making things happen.

The fund could be constituted by: multilaterals entities (such as the African Development Bank, the International Finance Corporation, the Africa Finance Corporation and others), African companies (companies with efforts already in place, investment capacity, commitment and knowledge in the sector), entities with Intellectual Property (Universities and research centers), and foreign investors (e.g. manufacturers or other international investment funds in the sector), and a percentage for small shareholders from the local ecosystems where investments take place.

To attract foreign investments and knowledge – critical for this project – some basic conditions must be ensured in the economic and financial package: stable currency in terms of all the business economics, political stability in the production sites which ensures long term sustainability to the project, financial incentives – tax exemptions or others and a policy of

human resources continuous feeding into the project.

Production for Africa

Partnerships must be built with the smart device operators acting in the African continent (especially the African based ones). These companies are fundamental to ensure that the African smart devices – smartphones, tablets and PCs – can have an initial market to be channelled. Also, these operators are the ones that know the clients better, their needs and habits – they can interact with research institutions in order to adapt correctly the basic features to the African consumer.

The fund must also invest decisively in the research and development (R&D) component, for which the active forces of Africa must be called, including in the consortium a group of entities capable of mobilizing the ecosystem of the universities and research institutions, especially those who already have previous experience in this area and linkages to relevant international expertise entities.

This fund should aim at participating in all phases of the value chain promoting an integrated ecosystem that is needed to compete at an international level including: raw material extraction, some important component manufacture and final assembly of the product. In terms of positioning Complete Knocked down (CKD) Projects or at least Semi Knocked Down (SKD) projects should be targeted, as they are the ones with the most value-added and job creation.

Specialized Production for the Global Market

Manufacturing encompasses the process of production from raw or semi-raw materials through a finished product ready for sale. Manufactured projects often have numerous





individual components – sometimes in the order of hundreds or thousands – which need to be assembled into a final product. Specialization and productivity are the key issues in the globalized value chains. The fund must also evaluate projects focused in one specific component of the value chain with the aim of making it competitive at a global scale and not only focused in the comparatively smaller African market. The immediate opportunities are those related to adding value to the raw materials exported by Africa to production of smart devices internationally.

In the long term – Redundant Production Platform to China

Africa's manufacturing capabilities and competitiveness are still low compared to major manufacturing centres. However, Africa should have a long-term plan to become a manufacturing platform alternative to the dominant ones, namely China, benefiting of future opportunities relating to epidemics, geo-strategic instability or reduction of the competitiveness of existing platforms.

For this purpose, Africa must embark on a programed learning curve to improve knowledge and research, processes and functions, distribution channels and other value chain issues that are needed in order to be a global player.

This recommendation should consider that partnerships with international companies should continue to be supported and reinforced in order to find solutions that allow having viable projects, compared to other alternatives worldwide. It is in this context that solutions regarding the attraction of foreign investment, tax efficiency on capital gains and raising the best human capital must be found so that these units are more competitive with

time. It is very important that, at a political level Africa shows its stability in order to become in the future a redundant platform to China in the global value chains for smart devices.

Flagship Project - P.5.2. – Develop an economic feasibility study for SD manufacturing investment in a portfolio of locations

The first step to implement this recommendation is to develop Economic Feasibility study in a portfolio of potential locations (locations can apply and the fund can also identify attractive locations) that must consider:

- (i) Market analysis, considering growth along 20 years and also stability of consumption of the production (very important for feasibility), sensitivity analysis and special conditions for success.
- (ii) Context conditions, such as political, economic and social stability, as well as skilled labor and expertise available.
- (iii) Competitor analysis and supplier analysis.
- (iv) Project Costs, including but not limited to the cost of land acquisition, physical infrastructure (component-wise cost), environmental compliance fees, rehabilitation and resettlement, survey and investigation, etc.
- (v) Project Financial Viability, through a viability assessment explicitly stating the costs of capital considered and calculation methods implemented to deduce such costs. This includes detailed projections for the upcoming 20 years (of all the transactions carried out in the last 5 years for projects that bid for augmentation). The assumptions made in projections must also be included, as well key financial analytics like the break-even analysis, profitability analysis, net present value sensitivity analysis and both simple and internal rates of return.
- (vi) Project Financial Structuring, an assessment that involves a combination of equity, grant, debt, and finance from private participation or a public-private partnership (PPP). It also examines the sources of finance and analyzes



the amount that each phase of the project will require. Additionally, it throws light into the relationship between the different phases of the project and the expenditure required.

- (vii) Project Social Benefits, a list of benefits social and economic benefits that can be reaped from a project such as the job creation, technological innovation and economic development of a country.

Feasibility studies are very valuable to determine the viability, risks, and costs of a new product development effort. These studies provide confidence on a *Go/ No-Go* basis for moving forward with a new factory or product line.

The first step of such a study is a deep market research with key questions addressed: Present Demand and Supply, Demand Forecast, Export and Import Statistics, Competition (existing or building up manufacture units) and Pricing and Distribution of the target market. Topics which have been previously covered throughout this report. When considering the demographics and digital divide gap in Africa, both provide an optimistic outlook for the regional demand of smart devices several years ahead. Meanwhile, the competition mainly from Chinese manufactures is a considerable barrier to the production model in Africa.

A second step is the operational feasibility which should address key questions, namely the Availability and Source of Raw and Auxiliary Materials, Material Requirement and Cost, Infrastructure (as Electrification, Electric Load, Water and Connectivity), Location of Production Sites and related Logistics, Plant Capacity and Production Program. In terms of location a specific study should also be addressed considering the selection of three locations according to economic criteria and not political

criteria. Within 4 regions: North Africa, SADC, ECOWAS and EAC.

The third step of a feasibility plan is the technical study with key questions addressed such as Machinery and Equipment, Production Process and Human Resources with the right skillset needed for the venture.

Recommendation 5.3. – Bring in the innovative ecosystem and the entrepreneurs to support the expansion of SD Value chain

Objectives: Implement initiatives that call for the participation of entrepreneurs in the value chain

Parties Involved: African entrepreneurs, multilateral institutional entities and governments

Initiative 5.3.1 Create a 5-year investment program directed at the African Start Up Ecosystem to develop solutions for the Smart Devices Value Chain.

The fast-growing startup ecosystem in Africa is a fundamental asset for the smart device value chain. This program must:

- (i) Be focused on the smart devices with human interface, such as smartphones, tablets and PCs. It must be evaluated whether this should be extended to all smart devices, namely those related to the Internet of Things.
- (ii) Focus on specific subject areas, including the whole value chain: production, distribution, use and disposal.
 - a. In the production component it must include both manufacturing and app development.



- b. In the use area, it must include African content development in the different languages
 - c. In the disposal area it must support e-waste and circular economy solutions
- (iii) Involve semestral calls for submission.
 - (iv) Include Seed, Startup and Early stages.
 - (v) Obtain continuous involvement of existing African accelerators and technological hubs.

Flagship Project - P.5.3. – Hackathon for SD Value Chain Innovations

This Hackathon serves to gauge interest and evaluate the response capability of the ecosystem. The entire process of organizing a hackathon, marketing the event, driving registrations, ideating, and creating prototypes typically takes 30 to 40 days. An innovation program cannot get more agile than this.

Once decided the scope of the Hackathon, the next steps include deciding whom you want to engage and how you want to engage them, considering Africa's innovative hubs across the continent.

- Decide the purpose: Define the goal of organizing a hackathon, which is generally one of these—crowdsource ideas or solutions for innovation, increase product API adoption, testing, internal engagement, and marketing or branding.
- Set the theme: Based on your avenue and problem statement, define the specific theme that the participants should work with. Provide as much context and insights as possible for the participants.
- Engage people across all sectors. Ensure startups with different skills and from all levels to avoid groupthink and encourage networking and teamwork; diverse ideas spell quality

- Have a deployment process in place: An important metric to measure the success of a hackathon is that it gets deployed in working projects. It is a motivation factor for teams that their projects will be deployed and will be accessible for people. Judge ideas based on novelty, feasibility, simplicity, design, and business value.
- Decide on prizes or opportunities: Although the idea is to embed an innovation-driven culture in the organization, prizes (reward points, gift vouchers, incubation) always help.

Initiative 5.3.2 – Stimulate and support the creation of a smart device's accelerator in Africa.

Focused and specialized accelerators produce better results. This accelerator should be linked to world leading accelerators and to local operators and universities. Local operators should challenge the accelerator with specific requests desired by the market and also finance such developments.

Initiative 5.3.3 – Support innovative projects for the reuse of smart devices in disadvantaged rural areas

The startup ecosystem should also participate in the quest for supporting people in the rural areas, where smart devices are not only a social and entertainment device but a necessity to support many of the basic needs in life.

The multilateral African entities should support projects by startups that can reuse materials and other components from old devices and transform them into new devices. These small businesses can be a source of



entrepreneurship and self-work, reducing also the footprint of the smart devices' ecosystem.

This initiative is not aimed to create a huge market – and compete with the industrialized smart devices companies, but aimed at creating jobs, reduce waste and poverty, aligned with the UN Global Goals for Sustainable Development.

Relevant Case Study

Benin

BloLab, a startup in Benin is turning plastic jerrycans into computers using recycled components and distributing them to the public at a low cost. It is

made from a plastic jerrycan, recycled materials and parts from an old or broken computer to build what would become the computer's motherboard and hard drive. Locals call it "Jerry" after the name of the containers. With royalty-free software installed, it is as good as new. And most importantly, cheaper.

BloLab, is a digital innovation lab working in the fields of education and digital technology and regularly organizes workshops to teach people how to make their own computers for free. BloLab has been in operation for 4 years and founders say that hundreds of people have already taken advantage of the training sessions and built their computer. The startup is now working to make these self-built computers available to schools located in remote areas. With that, BloLab says, it would bridge the digital gap one "Jerry" at a time.

6.2. Pillar 6: Distribution and Retail of Smart Devices

6.2.1. Introduction

Strong distribution and retail networks are fundamental for trade. The rising adoption of smart devices and the digital economy in Africa has improved these networks across the continent and boosted trade. However, there are weaknesses within the African supply chain for which smart devices cannot compensate for and that stand in the way of digital development.

6.2.2. Current Status

Africa has made significant improvements to its transport infrastructures over the last years, which expanded access to international

markets. However, its road network remains largely underdeveloped, hindering intra-African trade as well as smart devices distribution.

African ports and railways are perhaps its strongest assets, supplying the major logistic trade corridors⁵⁷. Airports are also strong distribution hubs; however, air freights are more expensive than sea freights and preferably carry perishable goods as opposed to electronics. Meanwhile, the last mile of the supply chain — that is, getting products in the hands of local retailers and consumers — is the most challenging step due to an underdeveloped road system and low

⁵⁷ <https://lot.dhl.com/6-logistics-corridors-that-are-paving-the-way-for-intra-africa-trade/>

urbanization⁵⁸, which translates into a fragmented retail network.

Poor roads are particularly damaging for domestic trade and one of the biggest problems for SMSEs since they hinder the transport of goods and services within the supply chain. For example, transportation poses 14% of the value of African exports, compared to 8.6% for all developing countries. This will impact any future regional production and exportation of smart devices. According to NEPAD and OECD⁵⁹, it is crucial to raise investment in infrastructure through public-private partnerships in order to bring down such costs.

Road building is therefore imperative for Africa given the rapid urbanization it is undertaking and to fulfill its Agenda 2063 commitment to “*Connect Africa through world-class Infrastructure*”. A challenge also highlighted by a previous Smart Africa project (Smart Sustainable Cities: A Blueprint for Africa)⁶⁰.

One of the most recent efforts to solve this challenge is the ongoing development of a Trans-African Highway Network — a project led by the African Union (AU), the African Development Bank (AfDB), the United Nations Economic Commission for Africa (UNECA) and the Regional Economic Communities.

Border procedures are also an important step within intra-continental distribution, which often hinder the transport of products from one country to another. These procedures need to be made more efficient,

transparent and flexible in order for Africa to establish a Single Market.

According to the Global Enabling Trade Index, Botswana and Rwanda have made significant improvements to their border procedures in recent years, placing them as Africa's top performers in the field— followed by South Africa, Mauritius and Kenya. One of the key changes made was the adoption of electronic single-window systems which simplify custom procedures and help to streamline the process and reduce the costs of border clearance.

1.3.3. Goals

The main goal is to innovate in the smart device distribution channel, thus improving service and reducing costs to end consumers, especially in remote areas and also to continue improving Africa's logistic performance in trade through the adoption of smart devices.

Smart devices have been increasingly important in bridging some of Africa's supply chain gaps and increase logistic performance. For example, they have improved last mile delivery through mapping technologies and compensated for the low numbers of retail shops through e-commerce platforms.

1.3.4. Strategy for Action

Recommendation 6.1 – Digitize Africa's supply chains.

The adoption of smart devices and digital management systems in the distribution and retail sectors automates the sales process and improves supply chain efficiency. It also has the

⁵⁸ UN Population Division:
<https://ourworldindata.org/urbanization#share-of-populations-living-in-urban-areas>

⁵⁹

<https://www.oecd.org/investment/investmentfordevelopment/41865331.pdf>

⁶⁰ <https://smartafrica.org/knowledge/smart-sustainable-cities-a-blueprint-for-africa/>



added feature of increasing smart devices availability in a positive feedback loop, because, when applied to the smart devices supply chain, it will improve the efficiency of that value chain as well.

Initiative 6.1.1 – Increase the adoption of point-of-sale (POS) systems in SD retail stores and in general.

Point-of-sale (POS) systems are perhaps one of the most valuable systems for retailers. Stakeholders and governments should incentivize and facilitate the adoption of these systems through awareness campaigns, sponsorships and possibly financing.

POS are electronic systems composed by a computer (desktop, laptop or tablet) and a management software which automate purchases of physical goods. These systems are normally coupled to bar code and QR code scanners, receipt printers, debit and credit card readers, and cash registers. They are also customized according to the types of products the retail shop sells. For example, electronic goods such as smart devices need serial numbers to identify not just the model and manufacturer, but also the specific item within the store. Serial numbers are uploaded into the POS software and identified when the item is scanned.

Besides making the purchasing process as smooth and integrated as possible, POS systems also improve inventory management and can provide retailers with sales reports.

Furthermore, the added benefits of these systems are not limited to retail since an improved inventory management at the point of sale means that merchants are more apt to place order according to their needs, which in turn optimizes the distribution of products. With the integration of retail and distribution

systems, inventory can be managed at a larger scale and overall increase trade and logistic performance in the region. In addition the adoption of POS will also increase fiscal revenue by diminishing informal trade.

Kenya

Copia - Mobile Retail Platform - is a catalogue order and delivery company launched in 2013 to sell smartphones, feature and basic phones, through a sales agent. The platform offers lower prices than those offered by independent grey market vendors in rural and peri-urban areas and eliminates transportation costs associated with purchasing goods in those areas. The agents offer layaway plans, so customers can save in instalments until they accumulate enough money to purchase a handset. Some agents also provide short term loans to loyal customers.

Copia buys products from Kenyan suppliers and, when necessary, imports directly from manufacturers abroad, without using intermediaries, to guarantee Copia-branded products are quality products.

Outcome: Network of about 25,000 agents and more than 5 million orders (in 2021), including from smallholder farmers and commercial farm workers, that can use smartphones to promote their businesses or connect with distant family.



6.3. Pillar 7: Use of Smart Devices

6.3.1. Introduction

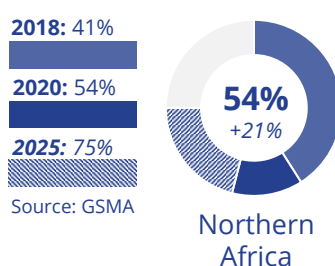
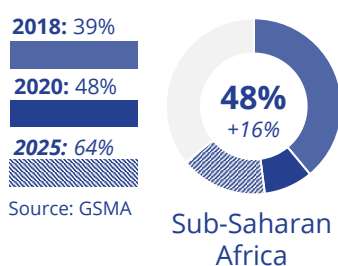
The value generated by smart devices does not end at purchase like many other products. The adoption of smart devices also generates revenue streams through data production, advertisement revenue and the sales of digital products and services. In fact, the software

market is expected to be one of the major sources of revenue within the smart devices value chain in the future, and it is intrinsically dependent on smart devices adoption⁶¹. With a growing need for mobile applications and digital services designed for the local context of Africa's different nations, the continent is in a good position to reap the benefits of the software industry.

6.3.2. Current Status

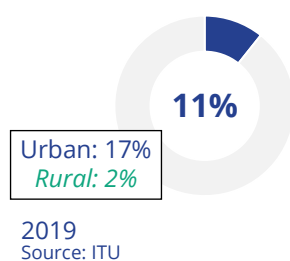
Smartphone Adoption

(% of mobile connections)



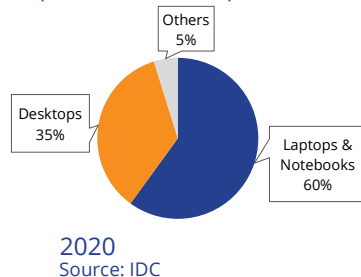
Computer Access

(Share of households)



Computer Typology

(% of market share)



Web Traffic by Device

(Average share in Africa)

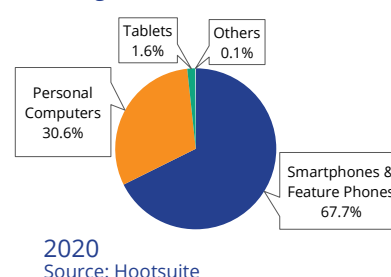


Figure 22. The current outlook on smart devices in Africa.

Sidenote: Android-based smartphones dominated the African market in 2020 due to their affordability, which makes them more competitive. When it comes

to brands, Transsion was the leading smartphone brand in Africa in 2020, followed by Samsung⁶².

⁶¹<https://www.analysismason.com/research/content/articles/iot-value-chain-rdme0/#:~:text=What%20is%20the%20IoT%20value%20chain%3F%20An%20IoT,solution%20and%2C%20in%20turn%2C%20for%20the%20end%20user>

⁶² IDC:
<https://www.idc.com/getdoc.jsp?containerId=prMETA47055320>

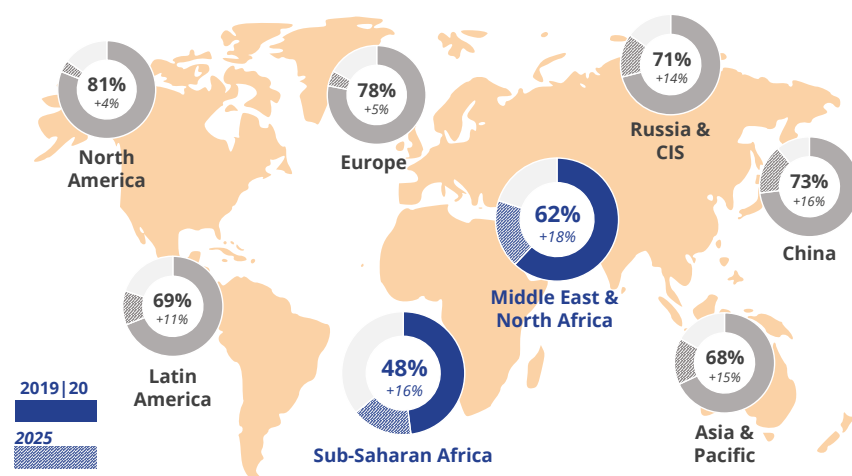
Smartphones comprise roughly half of all mobile connections in Sub-Saharan Africa (48%) according to GSMA⁶³, with adoption being slightly higher in Northern Africa (54%)⁶⁴.

The rapid expansion of mobile communication technologies and mobile broadband coverage, which jumpstarted Africa's digital economy, was prioritized over the development of landline communication infrastructures. This consequently led to a wider adoption of mobile devices as opposed to home-based personal computers⁶⁵, with the cost and power supply demands of computers also acting as a major constrain. For this reason, Africa has a low share of households with access to a computer, particularly so in the rural areas⁶⁶.

Within the personal computer market, there is a strong dominance of laptops in 2020, with 64% market share. This shows a preference towards laptops by the African people as a way to overcome the electricity supply challenges in Africa, with desktops being very dependent on available and reliable power, while laptops have higher autonomy due to their batteries.

Web traffic in Africa is largely driven by mobile devices (67.7%)⁶⁷, followed by personal computers (30.6%), and while information surrounding tablet adoption is limited, a parallel can be drawn between adoption and the web traffic generated by tablets, which is 1.6% of Africa's average web traffi

Smartphone Adoption



The **Middle East & North Africa** is the world region with the highest estimated growth in smartphone adoption by 2025 — according to GSMA. Followed by **Sub-Saharan Africa** and China.

Figure 23. Smartphone Adoption (% of mobile connections) by region (2019 | 20). Source: GSMA.

⁶³ GSMA, Sub-Saharan Africa Mobile Economy: <https://www.gsma.com/mobileeconomy/sub-saharan-africa/>

⁶⁴ GSMA, MENA Mobile Economy: <https://www.gsma.com/mobileeconomy/mena/>

⁶⁵ <https://www.pewresearch.org/global/2015/04/15/cell-phones-in-africa-communication-lifeline/#landline-penetration-near-zero>

⁶⁶ Measuring digital development: Facts and figures 2020: <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

⁶⁷ Hootsuite's Datereportal: <https://datereportal.com/>

Computer Access at Home

Africa is the world region with the lowest share of households with computer access according to ITU, and a potential market for expansion.

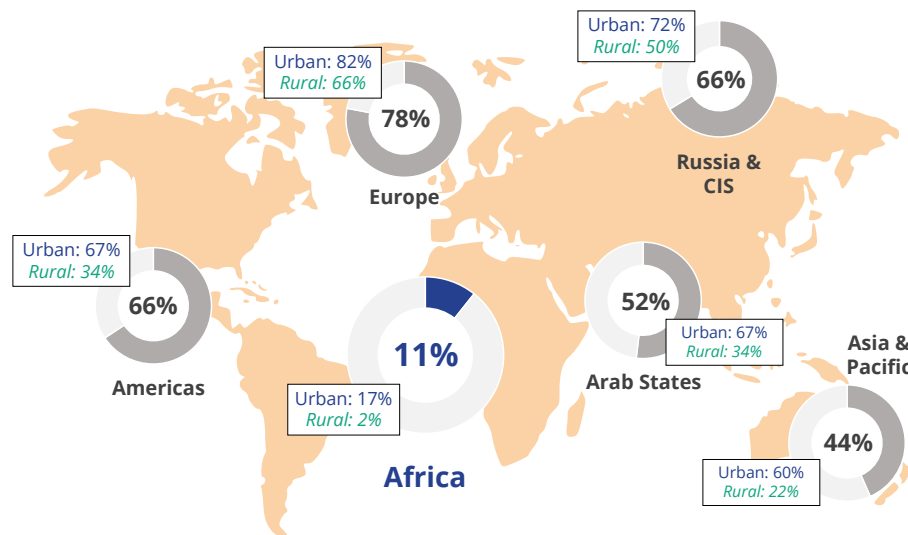


Figure 24. Share of households with computer access by region (2019). Source ITU.

6.3.3. Internet Activities Most Often Undertaken by Africans

According to the Pew Research Center, social engagement and entertainment are the most common online activities in Sub-Saharan Africa⁶⁸. After that, Africans use the internet to get their news, information on politics and government services as well as make and receive payments.

UNCTAD's detailed comparison between internet activities undertaken by individuals in different areas of the world (see annex 2 for full results) shows that the top three internet activities by Africans are:

- Participating in social networks.
- Downloading and playing images, movies, videos, music and games.
- Downloading software and applications.

Africans use the internet much less than the rest of the world in:

- Seeking health information (24.3% versus 62.4% in developed economies and 47.1% and 41.1% in Asia and Latin America, respectively).
- Uploading self/user created content to a web site to be shared (12.7% versus 38.8% in developed economies and 21.3% and 35.6% in Asia and Latin America, respectively).
- Getting information about goods and services (17.6% versus 55.1% in developed economies and 20.9% and 23.2% in Asia and Latin America, respectively).
- Purchasing goods and services (14.6% versus 53.9% in developed economies and 29.1% and 13.1% in Asia and Latin America, respectively).

Africans use the internet much more than the rest of the world in:

- Downloading software or applications (62.8% versus 19.0% in developed

68

<https://www.pewresearch.org/global/2018/10/09/internet>

[-use-is-growing-across-much-of-sub-saharan-africa-but-most-are-still-offline/](#)

economies and 41.0% and 20.7% in Asia and Latin America, respectively).

- Accessing and posting opinions on chat sites, blogs, newsgroups and online discussions (45.1% versus 13.9% in developed economies and 26.5% and 26.0% in Asia and Latin America, respectively).

provide the services needed given the local context. Transsion understood this need and adapted their software as well as their hardware early on and pre-installed popular apps in Africa in their phones, as previously mentioned. They have also adapted their camera settings for better exposure for darker skin tones and made available keyboards in

native Africa scripts such as Ethiopia's Amharic. As a result, their market penetration increased.

The following table illustrates a list of software services and mobile applications recommended in smart devices designed specifically for African audiences. Governmental entities should take this into account when considering bulk purchasing orders of smart devices.

Internet Activity (in percentage)	Developed economies	Transition economies	Developing economies - Africa	Developing countries - Asia	Developing economies – Latin America & Caribbean
1. Participating in social networks	70.4	70.7	86.3	87.2	79.0
2. Streaming or downloading images, movies, videos, music, games	67.4	52.9	64.2	66.4	50.8
3. Downloading software or apps	19.0	5.5	62.8	41.0	20.7
4. Making calls	56.9	71.0	47.6	63.2	73.4
5. Sending or receiving email	84.9	44.8	46.6	69.7	52.4
6. Accessing or posting opinions on chat, sites, blogs, newsgroups, etc.	13.9	11.6	45.1	26.6	26.0
7. Reading or downloading online newspapers or magazines, e-books	76.4	413.0	38.6	46.0	30.2
8. Getting information about goods and services	83.9	50.4	30.6	68.0	51.8
9. Watching web television	41.1	8.8	30.2	33.1	18.1
10. Seeking health information (on injury, disease, nutrition, etc.)	62.4	37.5	24.3	47.1	41.1

Table 25. Internet activities undertaken by individuals (2020). Source UNCTAD⁶⁹.

6.3.4. Relevant Services and Applications for Pre-Installation

The adoption of smart devices is highly dependent on whether or not devices reflect the local language and culture, and if they

Furthermore, establishing partnerships between smart device manufactures and software companies — whether they are social media platforms, mobile money services, streaming platforms or gaming companies — can lead to investment in the various online sectors and possibly bring in financial support by these enterprises for smart device adoption policies (e.g., subsidies, alternative payment methods, etc.

⁶⁹ Digital Economy Report, 0221, UNCTAD

Table 3. Relevant Services and Applications (that should be pre-installed).

	Social Media Platforms: Social media platforms are one of the most popular features of smart devices among users, allowing people to communicate between each other. Since social engagement through these platforms is the most common online activity for Africans, it is important that popular applications in the region (e.g., Facebook, WhatsApp, etc.) are pre-installed in smart devices — especially mobile devices.
	Entertainment and Gaming: Streaming services are becoming popular in Africa and smart devices should reflect this growing demand for content. Having popular platforms such as Netflix pre-installed can be an added feature of many devices. Games and game-related products are also a growing market worldwide and there is no reason the African youth should not participate in the global online gaming community. Popular online games can also be pre-installed within devices.
	E-Commerce and E-Payment: Many devices have e-commerce platforms pre-installed such as Amazon. However, African citizens are likely to benefit more from local platforms trading in their own currencies such as Jumia, Konga or Kilimall. The presence of a digital wallet app in mobile devices, for example M-Pesa, MTN or Orange Money is equally important (if not more), given Africa's extensive adoption of mobile money. QR code scanners are also relevant in the e-commerce sector.
	E-Agriculture: It is important to consider farmers' needs since they represent a large segment of the African economy, especially in countries with extensive rural areas. Services relevant in this field include weather forecasting apps and mapping services (e.g., Google Maps, Bing Maps, etc.).
	E-Health: Whenever available, national emergency hotlines and government e-health platforms should be pre-installed, especially in mobile devices. Allowing users to access their medical information or information regarding the nearest clinics and hospitals. Several devices also come with health tracking apps which should be considered.
	E-Education: Platforms with educational content (e.g., Youtube) and applications for reading PDF documents and e-books should come pre-installed. This is particularly relevant for initiatives which aim to increase adoption among students. In this case devices should also have services specific for each country, such as study aids for high school and college admission exams, etc.
	E-Government and E-Citizen: Mobile smart devices in countries with online identification platforms should have these platforms pre-installed allowing citizens to have their social identification wherever they go.

6.4. Pillar 8: Disposal of Smart Devices

6.4.1. Introduction

Africa, as many other continents, faces environmental challenges, including land degradation, deforestation, biodiversity loss and extreme vulnerability to climate changes⁷⁰.

Electronic waste (e-waste) is an additional existing environmental concern, which will grow with increased levels of smart device adoption. E-waste is now the fastest-growing waste stream in the world.⁷¹ The UN has called it a tsunami of e-waste.

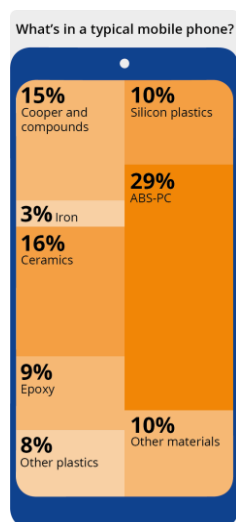


Figure 26. What are smartphones made of?

Sidenote: E-waste is anything with a plug, electric cord or battery (including electrical and electronic equipment) that has reached the end of its life, as well as the components that make up these end-of-life products. E-waste is also called waste electrical or electronic equipment, or WEEE for short.

The environmental and health concerns caused by smart device e-waste, in both rural and urban areas, constitute a major challenge for Africa.

Nowadays, a two-year old smartphone and a four-year old notebook/personal computer are

considered old, so the current short lifecycle of the devices has several negative environmental impacts. As stated in a World Economic Forum (WEF) report, the simplest way to reduce the environmental impact of the mobile industry and provide connectivity to the unconnected is to extend the lifecycle of existing devices as far as possible and to reuse and to recycle⁷².

6.4.2. Current Status

According to the WEF, each year, worldwide, approximately 50 million tons of electronic and electrical waste (e-waste) are produced, equivalent in weight to all commercial aircraft ever built. Only 20% is formally recycled. If nothing is done, the amount of waste will more than double by 2050, to 120 million tonnes annually.

That same e-waste represents a huge opportunity. The material value alone is worth 62.5 billion USD (55 billion EUR), three times more than the annual output of the world's silver mines and more than the GDP of most (123) countries. In fact, if e-waste was a single nation, its GDP would be on a par with that of Kenya.

There is 100 times more gold in a ton of mobile phones than in a ton of gold ore. Furthermore, harvesting the resources from used electronics produces substantially less carbon-dioxide emissions than mining in the earth's crust.

Working electronic goods and components are worth more than the materials they contain.

⁷⁰ <https://www.unep.org/regions/africa>

⁷¹ United Nations University, E-waste Rises 8% by Weight in 2 Years as Incomes Rise, [Press release], 14 December 2017, www.unu.edu/media-relations/releases/ewaste-rises-8-percent-by-weight-in-2-years.html

⁷² World Economic Forum (2020) – How to save the planet, one mobile device at a time: <https://www.weforum.org/agenda/2020/01/save-the-planet-one-mobile-device-at-a-time/>

Therefore, extending the life of products and re-using components brings an even larger economic benefit.

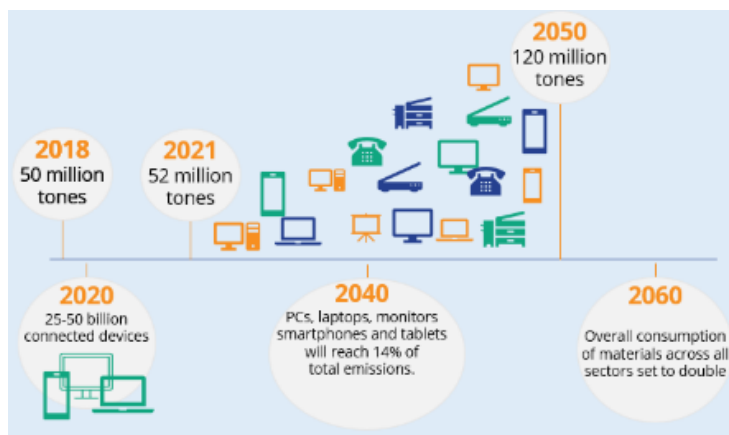


Figure 28 - Future of e-waste (source: UN, 2019)

African countries must account for all the consumption and electronic waste that is generated internally (presently, around 2.5kg per capita⁷³), which is bound to increase with the massification of adoption of smart devices. Nigeria produced 290,000 metric tonnes of e-waste in 2017.⁷⁴

In addition, Africa is recipient of huge amounts of electronic waste generated by developed countries dumping. While the Basel Convention⁷⁵ forbids developed countries from carrying out the unauthorized dumping of e-waste, it is possible to find millions of tons of

electronic waste that are illegally exported to several African countries, under the so-called “second-hand equipment” label. This situation is more challenging in some countries. For example, in Ghana, more than 150 000 second-hand electronics are imported each year⁷⁶. Nigeria receives more than 60 000 metric tons of used electronics and electrical equipment from other countries through Lagos ports.

Used and end-of-life electronic products and waste, either generated locally or imported from developed countries, are accumulating in open dumpsites in a number of African countries⁷⁷, being particularly dangerous due to toxic chemicals that naturally leach from the metals inside when buried.⁷⁸ In Africa, the potential release of harmful substances from

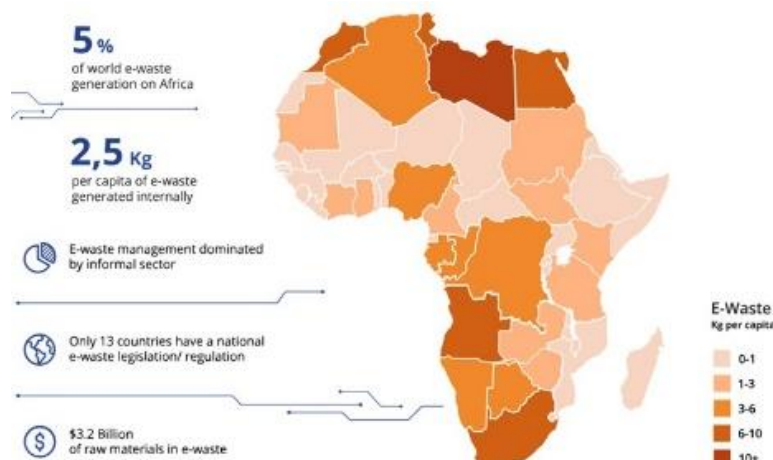


Figure 27. E-waste in Africa. Adapted from ITU

⁷³ <https://ellenmacarthurfoundation.org/circular-economy-in-africa-e-waste>

⁷⁴ UNEP, “Nigeria Turns the Tide on Electronic Waste”, 2019: <https://www.unep.org/news-and-stories/press-release/nigeriaturns-tide-electronic-waste> (link as of 31/3/2021)

⁷⁵ In 1989, the United Nations Environment Programme (UNEP) adopted the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. The Basel Convention is the first attempt to establish an agreement on global standards for hazardous

waste, including the trade and disposal of toxic waste. See on: <http://www.basel.int/>

⁷⁶ <https://www.bloomberg.com/news/articles/2019-05-29/the-rich-world-s-electronic-waste-dumped-in-ghana>

⁷⁷ Basel Convention, UNEP (2010) – Meeting the challenge of e-waste in Africa: <http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/leaflets/leaflet01012011-2.pdf>

⁷⁸ World Economic Forum (2020) – How to save the planet, one mobile device at a time: <https://www.weforum.org/agenda/2020/01/save-the-planet-one-mobile-device-at-a-time/>

undocumented disposal is estimated at 9.4 megatonnes of CO₂ GHG emissions, 0.01 kilotonnes of mercury and 5.6 kilotonnes of brominated flame retardants (BFR).⁷⁹

One particularly important challenge is the lack of specific e-waste legislation on management of e-waste in most African countries (only 13 countries have an e-waste management legislation published in Africa, which represents only 24% of the total countries – See ANNEX 4). Although implementing E-waste legislation is very challenging, improvements have been made in the past few years. For example, Uganda implemented an Electronic Waste Management Policy in 2012. In Ghana, technical guidelines on Environmentally Sound E-Waste Management have been developed and enforced for Collector, Collection centers, Transporters, Treatment facilities and Final Disposal).⁸⁰

It is necessary to create a whole system that makes the e-waste be applied in an efficient, sustainable and controlled way around the continent, with clear legislation and regulation, in order to turn the waste of smart devices into a sustainable business opportunity, and not a "serious environmental and health concern" as it has been. The prevailing "take, make and dispose" model has consequences for society. Durability and repair post-consumer recycling of Smart Devices will not be enough for environmental sustainability though. According to the UN, the World needs a

system that functions properly – in which the circular economy replaces the linear. Such models can also reduce the costs for consumers by 7% by 2030 and 14% by 2040.⁸¹

Sidenote: Circular Economy is a model of production and consumption, which involves sharing, recovering, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended⁸².



Making the circular economy of smart devices a reality will require long-term involvement at all levels from Member states, regions and cities and commitments by business and citizens. Member states should implement global

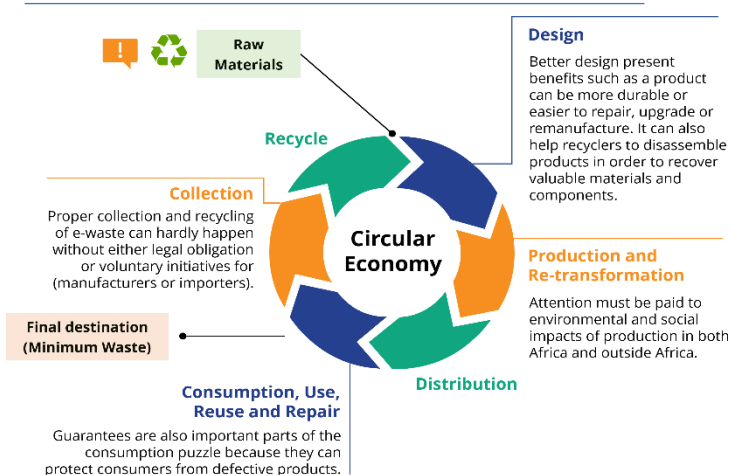


Figure 29. Framework for the circular economy of e-waste in Africa. Adapted from WEF

⁷⁹ Forti, Baldé, Kuehr and Bel, The Global E-waste Monitor, 2020

⁸⁰ The Global E-waste Monitor 2020. [The Global E-waste Monitor 2020. https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf](https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf)

⁸¹ World Economic Forum (2019) - A New Circular Vision for Electronics:

https://www3.weforum.org/docs/WEF_A_New_Circular_Vision_for_Electronics.pdf

⁸² <https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits>

commitments they adhered to, notably the U.N. 2030 Agenda for Sustainable Development, in particular Goal 12 relative to ensuring sustainable consumption and production patterns.

There is already an African Circular Economy Alliance, that was founded in 2016 by three countries, Rwanda, Nigeria and South Africa, along with UN Environment and the World Economic Forum. It was conceived at the World Economic Forum on Africa in Kigali, Rwanda, in 2016 and launched at COP 23 in Bonn. The main objectives of the Alliance are to share best practices for the creation of legal and regulatory frameworks, the building of partnerships and the financing and creation of circular economy projects, advocate for and raise awareness of the circular economy at a national, regional, and global level and bringing about new projects and partnerships within individual or multiple countries.

A scoping exercise of some of the main formal e-waste recyclers in Africa that can handle e-waste resulting from smart devices are presented below:

Enviroserve (Rwanda)	It is a pioneering e-waste management company in East Africa operating the region's only state-of-the-art e-waste dismantling and recycling facility, for example by extending batteries lifespan.
Hinckley Recycling (Nigeria)	It is the most advanced e-waste recycler licensed by the Nigerian Government, recovering redundant electronic items, securely destroying all confidential and protected data and manages the recycling of Waste Electronic and Electrical Equipment (WEEE).
City Waste Recycling (Ghana)	It is an enterprise that handles e-waste, lead-acid batteries, catalytic converters, recycles plastics, pressing metals, degassing cooling aggregates and recycles sawdust, working closely to the informal sector.

⁸³ World Economic Forum (2021) – The Five Big Bets for the Circular Economy in Africa:

https://pacecircular.org/sites/default/files/2021-04/WEF_Five_Big_Bets_for_the_Circular_Economy_in_Africa_2021.pdf

⁸⁴ World Economic Forum (2021) – The Five Big Bets for the Circular Economy in Africa:

[https://pacecircular.org/sites/default/files/2021-](https://pacecircular.org/sites/default/files/2021-04/WEF_Five_Big_Bets_for_the_Circular_Economy_in_Africa_2021.pdf)

TCH (Zambia)	Zambia's first legally compliant e-waste collector and processor, that is currently investing in a fully formalized and compliant e-waste recycling facility, ensuring continued growth and development.
AST Recycling (SA)	AST Recycling provides e-waste management solutions that help companies and consumers responsibly dispose of electronics at their end-of-life.

Besides the companies that formally and contractually recycle electronic waste, the e-waste management is dominated by the informal sector⁸³.

Included in one of the five big bets for the Circular Economy⁸⁴, the Electronics Circular Economy, employing a circular economy for the electronics and e-waste sector could create millions of jobs worldwide.

Some might be in low-paid and low-skilled work as more e-waste is reclaimed into the system, but over time, this will change with a wide range of job opportunities emerging (e.g., designers and circular economists, urban mine specialists and electronic-as-a-service officers). On the other side, as mentioned before, it stimulates positive environmental outcomes at the national, regional, and continental levels.

Fact: The recycling and dismantling facility in Rwanda has been able to create 300 green jobs, while the collection centers have created more than 1.000 jobs.⁸⁵

African countries with their vast unexploited natural resources and fast-growing population have the chance to jump to a low-emission and climate-resilient development model by

[04/WEF_Five_Big_Bets_for_the_Circular_Economy_in_Africa_2021.pdf](https://pacecircular.org/sites/default/files/2021-04/WEF_Five_Big_Bets_for_the_Circular_Economy_in_Africa_2021.pdf)

⁸⁵ World Economic Forum (2021) – The Five Big Bets for the Circular Economy in Africa:

https://pacecircular.org/sites/default/files/2021-04/WEF_Five_Big_Bets_for_the_Circular_Economy_in_Africa_2021.pdf



adopting circular economy principles for Africa, that also enhance social inclusivity, emphasize green innovations and job creation to grab local and cross-border market opportunities, as well as enhancing climate resilience through economic diversification and increase the affordability by the entire population.

6.4.3. Goals

As stated in the World Economic Forum Annual Meeting, there is an opportunity to convert an e-waste challenge into an economic opportunity using a three-step approach: i) enforce legislation on limiting amount of foreign e-waste, ii) achieve a zero-e-waste circular economy through EPR (Extended Producer Responsibility) principles, iii) Establish proper recycling and collection facilities for current and domestic e-waste that incorporate both formal and informal operators.

Taking into consideration the current situation and international frameworks regarding e-waste, the following objectives are proposed.

The objectives to be reached by 2025:

- (i) All members of Smart Africa approve legislation regarding managing e-waste
- (ii) Raise Awareness of the Circular Economy, by reinforcing the African Circular Economy Alliance within all countries
- (iii) Create a Circular Economy Ecosystem of Smart Devices, by sharing the best practices between countries and the Alliance
- (iv) Reduce the amounts of illegal e-waste import
- (v) Stimulate new projects and partnerships within individual or multiple countries

The objectives to be reached by 2030:

- (i) Achieve a zero-e-waste circular economy through Extended Producer Responsibility (EPR) principles
- (ii) Encourage the emergence of 50.000 new green jobs related to Electronics Circular Economy, for example, designers and circular economists (pedagogical perspective)
- (iii) Rank Africa as a strong and dynamic market for Circular Economy and a reference of environmental e-waste practices

6.4.4. Strategy for Action

In order to reduce the various environmental and health concerns caused by e-waste from Smart Devices on the continent, the following recommendations are transversal to all devices (mainly Smartphones and PC's), since the focus is to make sure that they don't leave negative environmental footprints and to take advantage of used smart devices, turning it into an opportunity (both from the environmental side, as well as for the massification of the use of devices by the population and income), always ensuring an engagement of all relevant stakeholders.

The proposed actions support the circular economy in each item of the value chain from production to consumption, repair and remanufacturing, waste management and secondary raw materials that are fed back into the economy.

Recommendation 8.1. – Design an Action Plan for Smart Device e-waste disposal in each country and at Continental level

Objectives: Evaluate needs and design the operational capacity to treat e-waste relating to smartphones and tablets/PCs.





Parties Involved: Governments and providers (MNOs, retailers, manufacturers), with the assistance of DFI and E-waste international forums

Initiative 8.1.1. – Conduct and assessment of Circular Economy (CE) opportunities in each African country and region.

This CE assessment will identify needs, opportunities and help define priorities of action for the Continent and for each country and region. The model followed by the African Circular Economy Alliance is recommended, (which evaluates circularity potential, economic significance, transformative impact potential and momentum) applying to each SD value chain (smartphone, other phones, tablets and PCs) in each country.

Initiative 8.1.2. – Design a Continental Plan and National Plans for e-waste treatment of smart devices.

Without a roadmap, e-waste will always be part of an environmental discourse with no consequence. Both smartphones and tablets/PCS have specialized supply chains that can be adapted to respond to a circular economy context, given a proper plan that identifies objectives to be achieved, defines keys actions, mobilizes the right financial resources and the necessary expertise to make it happen.

Recommendation 8.2. – Analyze and enact legislation on SD e-waste treatment

Objectives: Ensure that all African countries have legislation on SD e-waste treatment by 2025

⁸⁶ https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf

Parties Involved: Governments and providers (MNOs, retailers, manufacturers), with the assistance of DFI and E-waste international forums

Initiative 8.2.1. – Evaluate the existing legal and institutional infrastructure to manage e-waste and SD e-waste at continental and country level

Several African countries already have legislation regarding e-waste and also some learning experiences regarding e-waste and SD e-waste. The exchange of best practices and the classification of the exact status and the needs of each country can accelerate the enactment of legislation in all African countries. All African countries should have e-waste legislation and regulation by 2025.

Encourage countries to create legislation and regulation limiting the high amount of foreign e-waste that is dumped in Africa every year.

See Annex 5 for African Countries that have already established a national e-waste legislation, policy or regulation.⁸⁶

Flagship Project - P.8.1. - Continental Platform for sharing data and best practices of e-waste management

Build a continental digital platform for sharing data by countries and by environmental associations, working like an observatory of e-waste management and with best practices, use cases, success stories and opportunities for e-waste treatment in Africa. This public-private platform would provide advocacy, but also tools and guidelines on moving forward.

Initiative 8.2.2. – Evaluate and enact legislation requiring that mobile phones, tablets and PCs are designed to be resource efficient (circular).

Following efforts by other major consumer markets, such as the European Union, this initiative aims to ensure that:

- Smart devices are designed to be energy efficient and durable
- Consumers can easily repair, upgrade and maintain them
- Consumers are able to reuse and recycle the devices
- Consumers are informed on how sustainable the products they intend to purchase are in the long-term (empowering consumers)
- Public procurement of smart devices is contingent on a life-cycle assessment of the product

The estimated impact on cost and affordability must be evaluated. Africa cannot afford to take the lead on this initiative and impose higher device costs on its citizens. However, it should accompany and take advantage of efforts by stronger economic blocks such as Europe's efforts in this regard, as Africa would be one of the main beneficiaries.

Relevant Case Study

European Union

Lawmakers in Europe unveiled in September 2021 a proposal to force smartphone makers to adopt a universal, brand-agnostic charging cable in an effort to reduce electronic waste.

The plans call for a USB-C cable to become the universal standard for all smartphones, tablets and other mobile devices. It is estimated that disposed of and unused chargers pile up to some 11,000 metric tons of waste each year in Europe.

The Commission also seeks to unbundle the sale of chargers from the sale of electronic devices in order

to reduce the environmental footprint associated with the production and disposal of chargers. It also is asking producers to provide clearer information about charging performance, including how much power is required by a device for charging.

The lawmakers estimate that all together the new measures will help consumers in Europe limit the number of new chargers purchased and save nearly \$294 million (€250 million) per year on unnecessary charger purchases.

Relevant Case Study

Germany

While the European Commission (EC) proposes that manufacturers offer software updates and spare parts for smartphones for five years (and spare parts for tablets for an extra year), the German federal government wants to take this further

The German federal government is looking at putting an end to the view that a smartphone has a lifespan of a few years and is looking at pursuing strict environmental regulations so that manufacturers have to offer spare parts and security updates for seven years.

Germany wants the EC to take support up to seven years for both updates and spare parts, both smartphones and tablets. Furthermore, these spare parts should be available at "a reasonable price," force manufacturers to publish the prices of spare parts and not increase that price, and make sure that spares are available quickly.

Germany also supports the EC's plan for stringent eco-design rules that would include long-lasting batteries, along with energy labels and a reparability score for smartphones and tablets.

Flagship Project - P.8.2. - Continental Eco-design Directive for Smart Devices

Define a Continental Eco-design Directive for Smart Devices, with specific recommendations and regulations to guarantee that the devices are re-designed and remanufactured for energy efficiency and durability, reparability, upgradability, maintenance, reuse and recycle



Relevant Case Study India

In May 2021, India's Ministry of Electronics and Information Technology published a policy paper Circular Economy in Electronics and Electrical Sector, presenting the ambition to ensure products' longer use-life and tackle challenges of products' end of life (e-waste). It draws upon existing regulations and policies to facilitate a smooth transition to the circular economy, provides a roadmap for strategies that can be approached across the lifecycle of the products, and also indicates plans to draft the action plan with key measures across the value chain.¹

Outcome: Businesses could achieve material cost savings and increase their profits and significantly mitigate negative environmental externalities.

Initiative 8.2.3. – Adopt a Pan-African SD Marking Framework

Develop an improved Pan-African SD Marking Framework for the durability and energy performance of smart devices, which will help buyers pick the most efficient products. The proposed framework will likewise oblige equipment to show data on the environmental performance to buyers.

Initiative 8.2.4. – Adopt green procurement standards

Design and set up green procurement standards for smart devices at continental and country level emphasizing aspects such as durability and reparability and the circular economy in general.

Initiative 8.2.5. – Stimulate smart device trade-in programs

Every device that can have another life means one less device being manufactured, less damage caused to our planet, and a device put in the hands of someone who otherwise would

simply not be able to afford it. Mobile smart device trade-in programs are one way to reduce e-waste and make affordable devices reach more people. By offering consumers money for their pre-owned devices, mobile operators, retailers and manufacturers not only ensure devices are recycled responsibly, they can make devices more affordable for consumers, reselling them at a lower price. The WEF is promoting a campaign "Saving the planet one device at a time"⁸⁷.

The Olympic Committee has been accepting donations of old devices to make medals made entirely from recycled materials. From 6.21 million devices, the Olympic Committee was able to extract 32kg of gold, 3.5 tonnes of silver and 2.2 tonnes of bronze from unwanted devices.

Recommendation 8.3. – Develop competences and promote jobs in e-waste circular economy

Objectives: Advanced SD Competences drive new solutions, new companies and economic growth that generates jobs

Parties Involved: Governments and providers (MNOs, retailers, manufacturers), with the assistance of foreign universities, DFI and E-waste international forums

Designers, manufacturers, investors, traders, miners, raw material producers, consumers, policymakers and others have a crucial role to play in reducing waste, retaining value within the system, extending the economic and physical life of an item, as well as its ability to be repaired, recycled and reused. The possibilities are endless.

⁸⁷ <https://www.weforum.org/agenda/2020/01/save-the-planet-one-mobile-device-at-a-time>



Managed efficiently and effectively, e-waste management, especially with the spread of the Circular Economy of Smart Devices, could, even if indirectly, contribute to further development of the following digital sectors:

E-Waste Treatment of Smart Devices and other electric equipment: both formal and informal operators.

E-Waste ecosystem of equipment, factory and waste treatment designers, insurance providers, equipment providers, maintenance specialists, legislators, traders, among others.

E-Commerce: as it may further boost the sale of devices on Marketplaces and even on the websites of stores and MNO's (as refurbished, or as 2nd hand items), which may lead to more massification of devices and a further stimulation of e-commerce (especially in Marketplaces, where Africa already has a strong and possible market for e-commerce) on the continent.

E-Agriculture: because farmers with less purchasing power can turn to purchasing devices (mainly smartphones) that have already undergone the circular economy, therefore they are ready to be reused, and are sold for a lower price than a brand-new device would be.

Initiative 8.3.1. – Promote and finance SD STEM competences at university-level

Without a strong advanced skills reinforcement at the highest levels, in partnership with foreign universities and SD providers it will not be possible to develop a sustainable e-waste industry in Africa.

Provide a Circular Economy relevant training in some programs at schools and universities, in order to raise awareness related to environmental matters of the electronics (Smart Devices) and develop skills related to Circular Economy of the devices (manufacturing, design, financing models, etc.).

Flagship Project - P.8.3. - Bursaries for professors and students in top international universities in the field of smart devices

Rather than long term engagements that lead to a brain drain from Africa, short international engagements (between one to six months) are recommended, complementary to courses in African Universities for university researchers, professors and students, within five-year programs of interchange of professors and students, that involve also the tenure of foreign professors in African universities for short, specialized courses and in support.

Relevant Case Study Brazil

The University of São Paulo and Ellen MacArthur Foundation established a partnership that objects to provide circular economy through research, education and extension within the society, by developing programs on life cycle management and engineering innovation for circular economy business processes and models, research about the social-environmental subjects and the integration of circular economy. It also stimulates the integration of circular economy content on graduate and undergraduate courses within the university and circular economy education programs for the society.

Outcome: Aside from working towards a more circular economy, the program also is addressed to support organizations and the government in embedding circular principles and tools to a circular economy.

Initiative 8.3.2. – Tax-Incentives to the e-waste economic activities





Provide tax incentives and/or financial support for companies that support startups in this area and that recycle and repair smart devices and companies that invest in e-waste management and the other Circular Economy procedures (collection, distribution, etc.)

Recommendation 8.4. – Promote awareness of the relevance of e-waste treatment

Objectives: Without awareness and education about the perils and the opportunities around e-waste it will not be possible to change behaviors

Parties Involved: Governments and providers (MNOs, retailers, manufacturers), with the assistance of DFI and E-waste international forums.

Initiative 8.4.1. – Implement an awareness campaign for SD consumer environmental behavior

Consumers have a very user-oriented view of smart devices, not concerned with what happens with its after life. Awareness campaigns aligned with deposit and collection points and financial incentives for trade-in programs are essential to create the necessary impact in consumer.

Recommendation 8.5. – Finance and build e-waste repair and recycle hubs in each African region and the countries with the SD markets

Objectives: Build operational capacity all across the continent to treat and repair all present use and future growth of smart device use in Africa

Parties Involved: Governments and investors, with the assistance of DFI and E-waste international forums

Initiative 8.5.1. – Develop SD e-waste repair and recycle facilities all across Africa, according to market studies of present and future e-waste

It will be important to build deposit and collection points all across Africa, mainly in retail stores which should have the obligation of returning them to the market or to e-waste facilities. The involvement of informal operators in the recovery of abandoned e-waste is also important as a source of remuneration to the population and to reinforce the capacity to recover dispersed e-waste.

Relevant Case Study — Nigeria

There is an organization called EPRON that plays the role of an intermediate between the regulator and the Electrical and Electronic Equipment sector (EEE), by collecting appropriate fees from producers to adequately finance the collection and treatment of product waste streams on behalf of producers and all parties involved in the e-waste value chain are also required to register under EPRON, which also supports e-waste data collection around the country.







7. CRITICAL ISSUES PILLARS





7. CRITICAL ISSUES PILLARS

This blueprint addresses four critical issues relating to different challenges:

- Limitation challenge: the issue of affordability of smart devices
- Aspiration challenge: the issue of the contribution of smart devices to a single digital market
- Relevance challenge: the issue of direct socio-economic impact in key activities
- Equity challenge: the issue of digital inclusion.

In each pillar, the main challenges are present, objectives are defined, and strategic actions are recommended.

7.1. Pillar 9: Smart Devices Affordability

7.1.1. Introduction

Affordability refers to people's ability to purchase a smart device and it is measured by the ratio of the smart device total cost - cost of purchase plus cost of use during device life cycle - to the person's income.

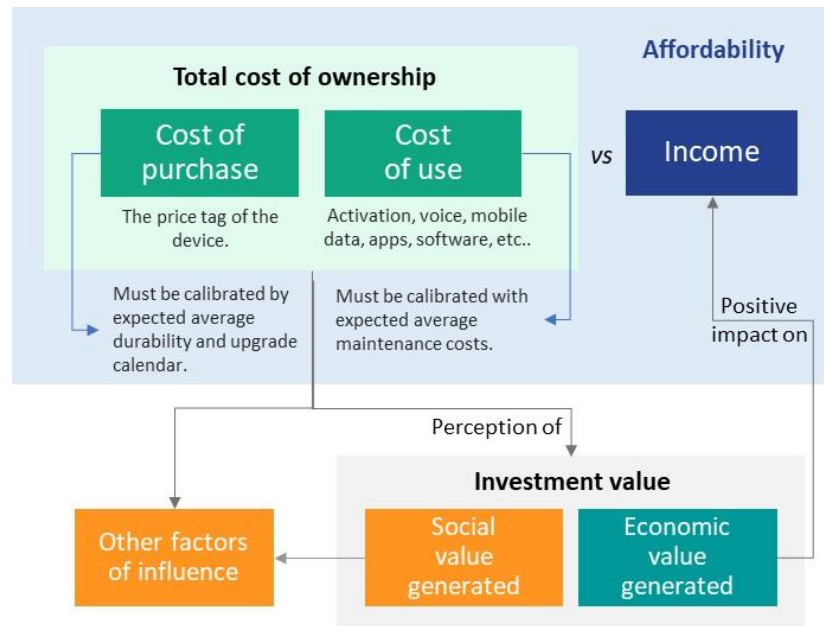
The price of a device cannot be analyzed separated from a person's income. For example, in Mozambique, the average low-cost

smartphone costs 42.27 USD⁸⁸. In South Africa, it costs more – 66.21 USD⁸⁹ - however, because the average monthly income (2020 GNI per capita)⁹⁰ in South Africa is 28 times higher than in Mozambique (1094.16 USD to 38.3 USD), smartphones are considerably more affordable in South Africa, even though they are more expensive.

⁸⁸ Smartphone - Morep Smart V1 Plus Single SIM 16GB - December 2021

⁸⁹ Vodacom MOBICEL X1 – December 2021

⁹⁰ World Bank - GNI per capita, PPP (current international \$) - Sub-Saharan Africa



Two other factors influencing the decision to adopt and use SD are the perception of the social value generated and the perception of the economic value generated, which are dependent of the awareness of the benefits or perceived relevance of owning a smart device (“Why should I buy the device? What will it do for me?”). This investment analysis belongs to the realm of each individual.

Social value generated has to do with the satisfaction of social need and aspiration and relates mainly to the communication features of smart devices. For example, farm workers that live away from their families and friends, might want to buy a smartphone to communicate with them. As for economic value generated, farm owners can check local market prices before deciding to travel to the market or find clients online saving on transport costs. They can make and receive payments without having to hold a bank account. This better

access to information, in turn, tends to increase their income.

In addition to these, there are still other factors of influence, such as skills and social stigma.

With regards to citizens, African countries are mobile-first economies⁹¹, therefore the affordability analysis is more important regarding mainly smartphones. Within the perspective of business and of government, the more relevant smart devices are personal computers, as they are essential work tools.

The Impact of the Lifespan of Smart Devices

Different smart devices serve different functions and activities and have different utility value for each situation and individual. Nevertheless, the comparative cost of each is relevant for public policy.

⁹¹ Market share in January 2022 was 60,78% for mobile, 37,09% for desktops and 2,12% for tablets, according to Statcounter (Feb. 2022)

The average lifespan of a device should be considered in the affordability challenge. If one considers an average price of acquisition of 100 USD per smartphone with an average lifespan of 1,5 to 2 years, an average price of acquisition 200 of USD per tablet with an average lifespan of 2 to 3 years and an average price of acquisition of 400 USD per portable computer (considering price bands from \$249 – 599) with an average lifespan of 4 to 5 years, the cost per year of each type of smart device becomes more similar than the acquisition price considered on its own.

In addition, cost of use tends to be higher with smartphones relative to tablets and PCs, which brings the relative cost per year of each smart device closer to each other.

7.1.2. Goals

Increase total connections of smart phones (excluding licensed cellular IoT) in Sub-Saharan Africa and Northern Africa from 48% and 54% respectively, in 2019, to 70% in 2027.

Increase computer penetration in Africa from 11% in 2020 to 22% in 2030 and reduce disparities between countries by half.

7.1.3. Current Status

Smartphones

The dominant strategic interest of manufactures is to produce high-end features smartphones, which have a higher profit margin, since operating costs (including human

resources) of a factory remain the same if they are producing a high-end smartphone or a low-end device.

However, mobile manufacturers and mobile operators have been adapting their supply to the income profile of the African population, as shown by the high percentage (around 50%) of smart phones shipped to Africa below the \$100 price band.

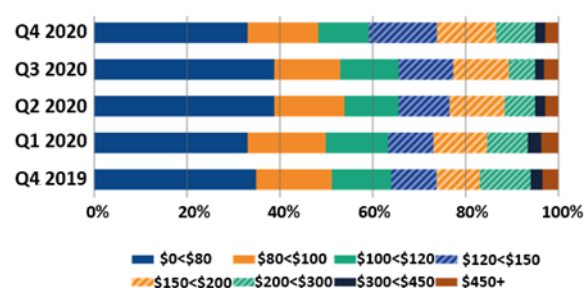


Figure 33. Africa's Smartphone Shipments by price band (Q4 2019-Q4 2020).

Nevertheless, African countries still have among the highest total cost of mobile ownership as a proportion of income.⁹²

Several studies show how Africa is still far from the target for 2025 set by the Broadband Commission for Sustainable Development's, according to which entry-level broadband services should be made affordable in developing countries at a level corresponding to less than 2 per cent of monthly GNI per capita. These figures are still further from the 2 per cent objective if the bottom 40% and bottom 20% of earners are considered.

⁹² GSMA The Mobile Economy Sub-Saharan Africa (2021): <https://www.gsma.com/mobileeconomy/sub-saharan-africa/>



The latest study found on the total cost of mobile ownership (TCMO)⁹³ – *i.e.*, the sum of the cost of purchasing the cheapest device (with internet browsing capability), cost of activation or connection with the cheapest tariff price, and cost of usage (voice, data and SMS) – considering different usage profiles and the different products available in the market, shows that a basic basket (of 100 MB) and a low basket case (500 MB), represented a very high percentage of income of the low-income groups, limiting severely their disposable income to everything else they need in life.

⁹³ GSMA Taxing mobile connectivity in Sub-Saharan Africa – A Review of mobile sector taxation and its impact on digital inclusion (2017)

https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/07/Taxing-mobile-connectivity-in-Sub-Saharan-Africa_July-2017.pdf

Smartphone affordability across African Countries

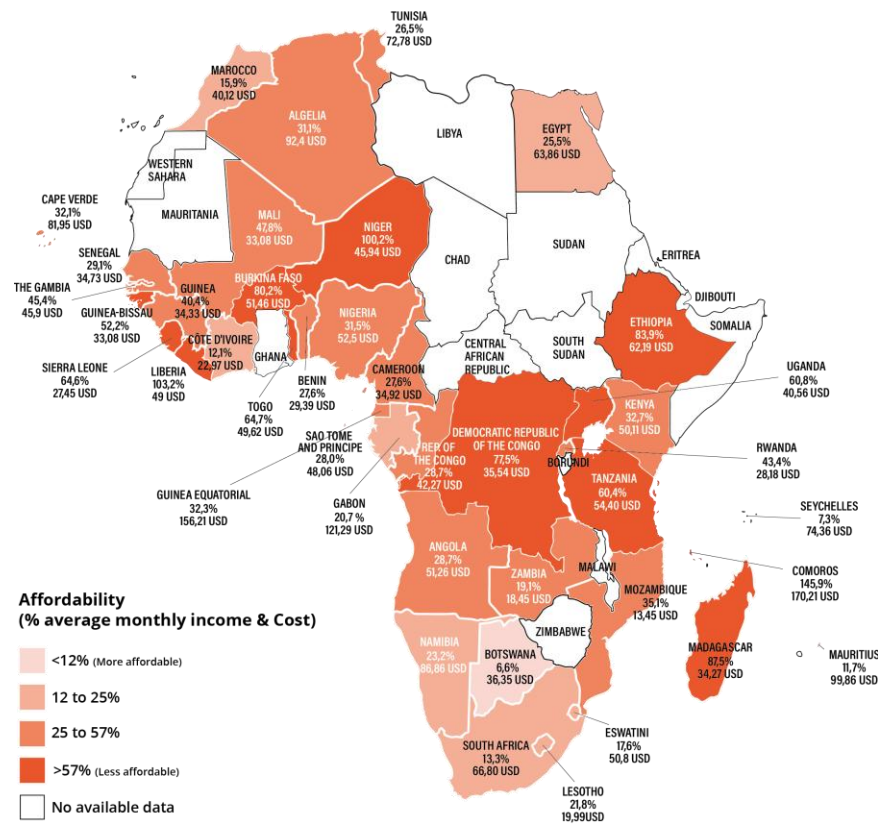


Figure 30. Heatmap of Smartphones' Affordability Across African Countries (2021). Adapted from A4AI.

The region with more affordability to smartphones, when analyzing price vs. income, is Southern Africa (16,7% of affordability), followed by Northern Africa (24,8% of affordability). The region where it is more difficult to buy a smartphone is Western Africa (52,1% of affordability). This is caused mainly by lower average monthly incomes, since smartphone costs in this region are the lowest from all regions.

Cost of Purchase

According to GSMA, in Sub-Saharan Africa, the average entry-level, internet-enabled handset costs more than 120% of the monthly earnings

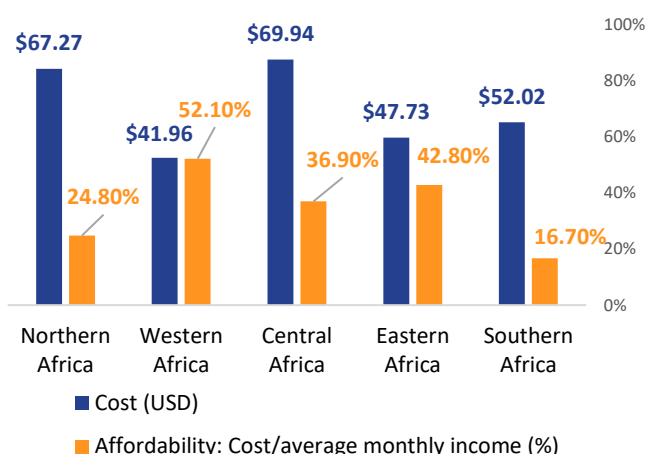
of the poorest 20% in the region. Low-income users are the most affected, in Chad and Niger, for example, monthly broadband costs represent around 200% of the annual income of the bottom 20% of the population. In the Democratic Republic of Congo, Mozambique, Senegal, Mali and Tanzania, however, the reality is different - the cost of mobile ownership, is just above 5% of personal income.

Bringing down the cost of purchase of mobile devices is essential to get more people online. There are multiple supply and demand side factors influencing the costs of purchase of smartphones. On the supply side, the manufacturing costs of the device itself are largely dictated by prices of key components including the screen, chipset, memory, and battery, all of which fluctuate in line with higher specification requirements, limited availability, demand and regulations⁹⁴.

The COVID-19 pandemic brought cost increases on several components. In 2021, memory chipsets saw a 20% increase in cost, battery packs prices rose by 10% and others, including camera modules and sensors, are also costlier by 5%. Several vendors warned that smartphone cost increased in 2021. Before that, the average selling price (ASP) for smartphones had already increased: in the fourth quarter of 2020, prices grew 5,6% compared to the same period of 2019⁹⁵.

In the inbound supply chain, import duties and taxes imposed on smartphones are significant contributors to total costs, as well as transportation charges that can be particularly high in emerging markets. Inefficiencies in the in-country retail drive up the costs too, as devices often pass through a number of supply chain players before reaching end consumers.

To understand the current status of the affordability of smart devices in Africa, data for smartphones was collected from the Alliance



USD and percentage. Source: LBC, with data from the Alliance for Affordable Internet (2020).

for Affordable Internet⁹⁶ and partially updated by the working team for the purpose of this blueprint – please see annex 4. In general, there is a high weight of smartphones' cost in the individual average income (percentages of affordability above 25%), meaning, less ability to pay.

Tablets

For pcs and tablets data was collected from online stores and from the countries marketplaces when prices were not available in the first source. Average monthly income was collected from the World Bank (2019). Costs used to calculate affordability can be consulted in detail in Annex 4.

The factors influencing the cost of tablets are similar to those relating to smartphones: prices of key components, marketing and strategy of the vendors and operational costs. Tablet costs are superior to smartphone costs. Therefore, there is even lesser ability by the average African citizen to buy tablets.

Figure 31. Average price of the cheapest smartphones in Africa and affordability index, by region (December 2021), in

⁹⁴ Insights from Huawei and Samsung vendors interviews

⁹⁵ IDC Press note 2021 - Africa's Mobile Phone Market Performs Well in Q4 2020

⁹⁶ Alliance for Affordable Internet (2020). From luxury to lifeline: Reducing the cost of mobile devices to reach universal internet access. Web Foundation.

Tablets affordability across African Countries

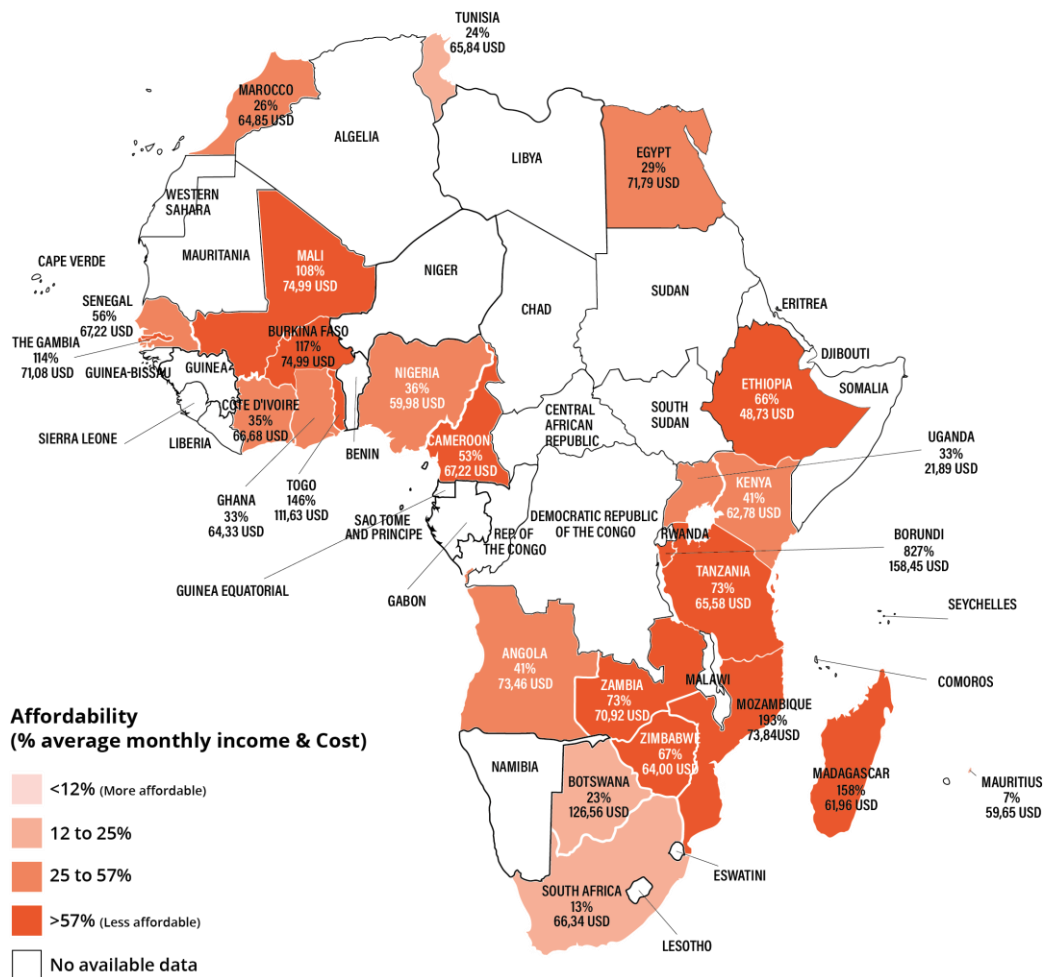


Figure 32. Heatmap of Tablets' Affordability Across African Countries (2021). Source: LBC, 2022.

Eastern Africa is the region where tablets are less affordable (214.29% of affordability),

followed by Western Africa (144.68% of affordability). The region where tablets are more affordable is Southern Africa (24.43% of affordability).



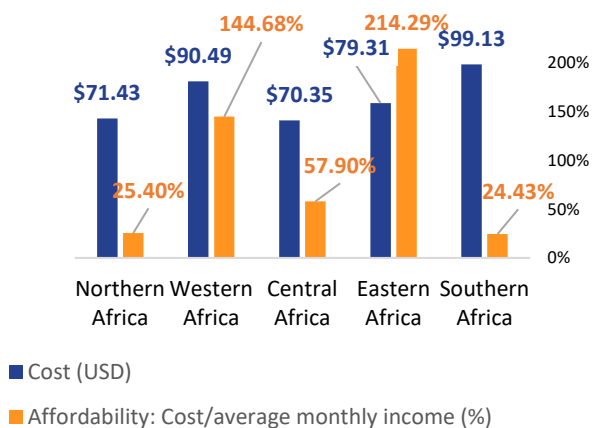


Figure 33. Average price of the cheapest tablets in Africa and affordability index, by region (December 2021), in USD and percentage. Source: LBC, 2022.

Personal Computers

While smartphones and tablets enable widespread access to content and task management tools, personal computers are a necessary tool for true productivity in the digital economy, offering access to e-education, digital skill-building, and work.

In the case of computers, besides import duties, the transportation charges are higher when compared to smartphones, due to the bigger size of computers that mainly use maritime transportation to Africa and then are redistributed in several countries by air or road transportation.

Laptops and Notebooks affordability across African Countries

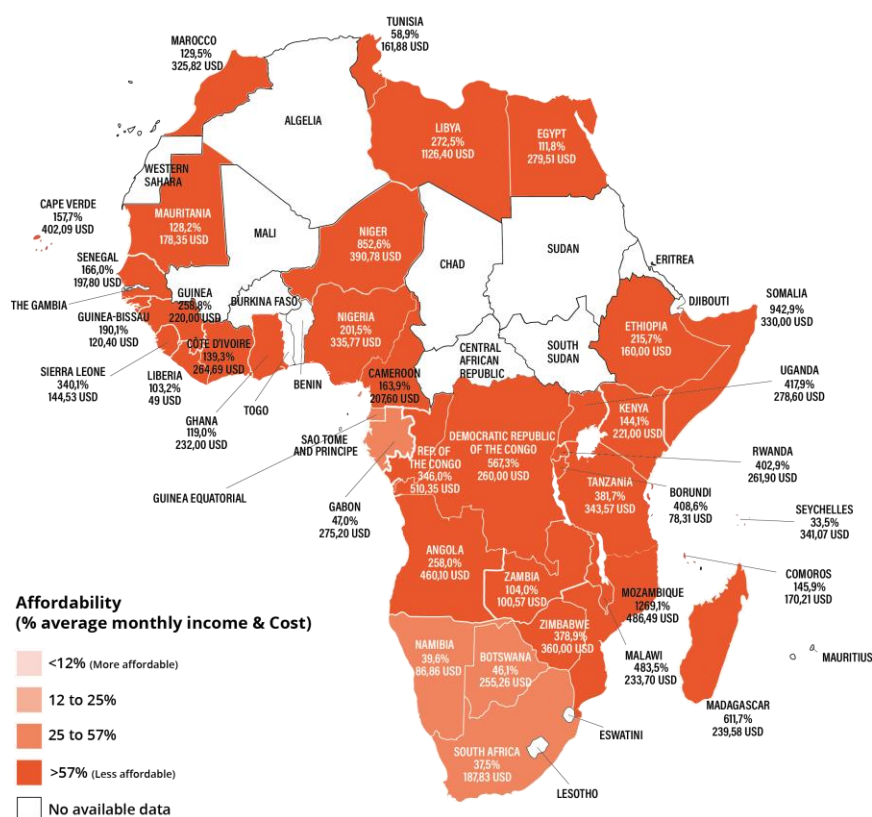


Figure 34. Heatmap of Laptops and Notebooks' Affordability Across African Countries (2021). Source: LBC, 2022.

The region where computers are less affordable is Eastern Africa (471,69% of affordability), which is the region where costs are also the highest. Behind comes Central Africa (355.73% of affordability). Southern Africa is the region where people have more accessibility to computers, regarding price vs. income.

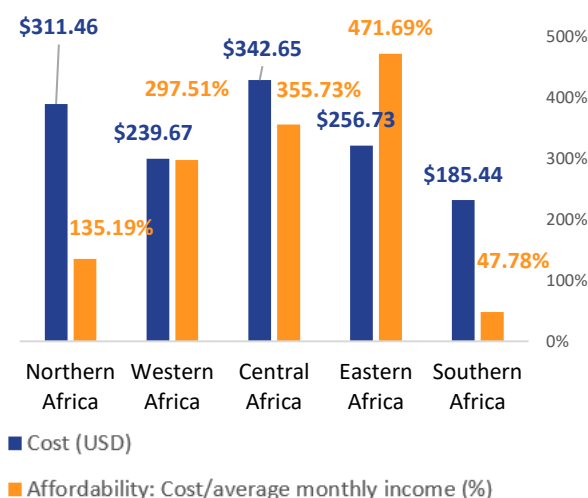


Figure 35. Average price of Cheapest Notebooks in Africa and affordability index, by region (December 2021), in USD and percentage. Source: LBC, 2022.

Interactive whiteboards

A vast majority of interactive whiteboards will cost between 1.500 and 15.000 USD, depending on a number of factors such as size, brand, resolution, features, and accessories. Buying them in large quantities will usually result in a lower price per-unit.

Table 4. Interactive whiteboard pricing by Edu Touch LED, in South Africa. Source: LBC, 2022.

Models	Cost (USD)
65" Edu Touch Elite	3,225.26
75" Edu Touch Elite	4,293.91
86" Edu Touch Elite	5,668.02
65" Edu Touch Elite Pro	3,538.53
75" Edu Touch Elite Pro	4,807.48
86" Edu Touch Elite Pro	6,059.45
65" Edu Touch Elite Science Package	3,614.19
75" Edu Touch Elite Science Package	4,882.63
86" Edu Touch Elite Science Package	6,134.61
65" Edu Touch Corporate Package	3,131.50
75" Edu Touch Corporate Package	4,916.46
86" Edu Touch Corporate Package	6,241.08

Regarding whiteboards, since its sales are on a B2B model, to assess the prices of this device, it was used an example of the price points set by a manufacturer and assembler Edu Touch LED from South Africa.

The effect of taxation

VAT is, on average, the most important tax revenue source for African economies — representing 51.9% of the average total tax revenues in 2018. VAT contributed on average 29.7%, making it the most important tax on goods and services⁹⁷. But smartphone users are also subject, among others, to taxes and fees on usage, namely, voice, SMS and data.

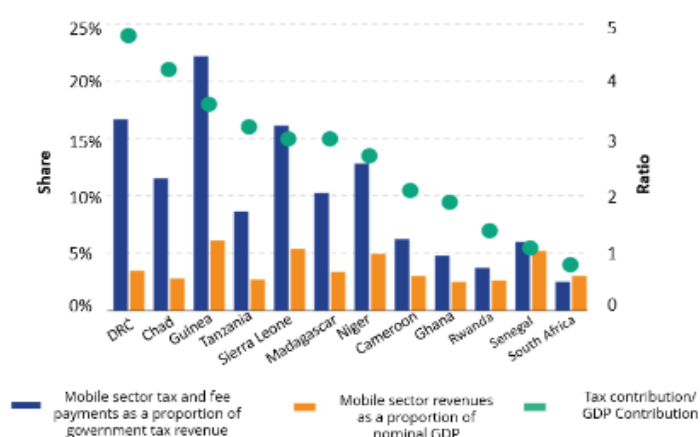


Figure 36. Mobile sector tax and fee payments in government tax revenue versus the share of mobile sector revenues in nominal GDP in 2015, GSMA (2017).

However, Africa cannot be singled out for having the highest tax burden when compared to the rest of the world. The tax burden on the Sub-Saharan Africa mobile market is on average 26% of its revenue⁹⁸, followed by the Middle East and North Africa (MENA) market at 24%.

The creation of sector-specific taxes on mobile services and digital devices as a means to obtain additional revenue is understandable in Africa, given the ease of tax collection on the

transparent billing systems of equipment providers and mobile services and mobile operators, in contrast to the difficulty in collecting taxes in the high incidence of informal activity which makes it difficult to tax consumption of goods and services, personal income and the activity of small firms.

Nevertheless, this much needed short-term fiscal revenue, has a trade-off with the limiting effects it has on lower adoption of smart devices and on the corresponding opportunity cost regarding productivity and economic growth that arises from the use of digital technology, which is increasingly the major force of economic development and is also changing the competitive factors of the economy.

Taxation of smart devices is one reason behind the high total costs of ownership in Africa, thus hindering smart device adoption, especially smartphones. The contribution of the mobile sector to government tax revenue is estimated to be 2.7x the industry's revenue share of GDP on average in Sub-Saharan Africa. In Democratic Republic of Congo, the ratio was 4.8x in 2015, where the total taxes and fees paid by the mobile sector amounted to almost 630 million USD⁹⁹.

In addition, all these taxes and fees together impact the price paid by the users and can be regressive, in that the tax burden falls unduly on lower income users. Higher taxes on mobile technologies makes devices unaffordable to lower income earners and holds back progress towards digital inclusion as a small increase in

⁹⁷ LAC and OECD (2020)

⁹⁸ GSMA Rethinking Mobile Taxation 2019 Report: <https://www.gsma.com/publicpolicy/resources/rethinking-mobile-taxation-to-improve-connectivity>

⁹⁹ GSMA Taxing mobile connectivity in Sub-Saharan Africa – A Review of mobile sector taxation and its impact on digital inclusion (2017)

the price may have a high impact on the purchase decisions. To this population segment in particular, smartphones are often a lifeline that helps people move out of poverty. Furthermore, the lost revenue due to a slower digital growth has been estimated to surpass the revenue gains from ICT taxes within several years¹⁰⁰ making them counterproductive. High taxes can be seen as pushing citizens to buy feature phones instead of smart phones, limiting their empowerment to take full benefit and contribute much more to the digital economy.

Cost of use

The UN's Broadband Commission established its affordability target in 2018. This requires that entry-level broadband should cost no more than 2% of monthly income per capita, to ensure that, by 2025, the remaining 55% of the global population that is offline becomes connected.

According to the Alliance for Affordable Internet (A4AI), the average cost for 1GB data across Africa is 3.3% of the average monthly salary and 1GB costs as much as 2% of the average salary in some countries. Total costs of ownership are generally too high among African countries¹⁰¹.

Connectivity Price Baskets (%GNI per capita, per month)	World	Africa	LDC	Diff. to World
Data-only broadband (2GB)	1.9%	6.5%	7.4%	4.6%
Fixed broadband basket (5GB)	3.5%	18.3%	19.8%	14.8%
Mobile data and voice high usage basket (140min+70SMS+2GB)	2.8%	12.9%	14.7%	10.1%
Mobile data and voice low usage basket (70min+20SMS+500MB)	2.0%	7.0%	9.6%	5.0%
Mobile Cellular low usage basket (70min+20SMS)	1.3%	4.6%	5.6%	3.3%

Table 5 - Connectivity Price Baskets as a percentage of GNI per capita. Source: ITU & A4AI ICT Price Baskets, 2021

Data-only mobile-broadband basket (2GB) across the region was 6,5% of the monthly GNI per capita, in 2021¹⁰². Three times as high as the *Affordability Target* of 2% set by the UN Broadband Commission.

ITU-A4AI declares that while the global average price of 2GB mobile data packages dropped to 6.4 USD in 2021, African countries are still paying three times more than users in other regions relative to average income.

In the region, Central African Republic had the most expensive mobile internet in the world as of 2021 (on average, 1 GB cost 64.33 USD).

Overall, cost of mobile data differed greatly across the continent.

¹⁰⁰ ITIF Digital Drag: Ranking 125 Nations by Taxes and Tariffs on ICT Goods and Services
<https://www2.itif.org/2014-ict-taxes-tariffs.pdf>

¹⁰¹ Alliance for Affordable Internet (A4AI) 2019 Affordability Report

<https://a4ai.org/mobile-data-cost-have-increased-making-internet-connectivity-unaffordable-for-many/>

¹⁰² ITU & A4AI, Policy brief: Affordability of ICT Services (2021):
<https://www.itu.int/en/ITU-D/Statistics/Pages/ICTprices/default.aspx>

Connectivity Baskets (%GNI per capita, per month)	Price	World	Africa	LDC	Diff. to World
Data-only broadband (1.5GB)	mobile-basket	1,2%	4.4%	6.1%	3.2%
Fixed broadband basket (5GB)		2.8%	18.6%	20.1%	15.8%
Mobile data and voice high usage basket (140min+70SMS+1.5GB)		2.6%	14.4%	16.6%	11.8%
Mobile data and voice low usage basket (70min+20SMS+500MB)		1.9%	8.9	9.6%	7%
Mobile cellular low usage basket (70 min + 20 SMS)		1.1%	4.5%	5%	3.4%

Table 6b. Connectivity Price Baskets as percentage of GNIpc. Source: ITU ICT Price

An analysis of the ITU ICT Price Baskets of 2020 in terms of GNIpc show that Africa is generally better than the average of the Less Developed Countries but distant to the world average and the UN Broadband Commission objective of 2%. The most dramatic differences are in fixed broadband and in mobile voice usage. These are priority areas for action in terms of improving affordability.

Connectivity Price Baskets (USD)	World	Africa	LDC	Diff. to World
Data-only broadband (2GB)	9.8	6.4	5.3	-3.4
Fixed broadband basket (5GB)	27.2	26.9	20.2	-0.3
Mobile data and voice high usage basket (140min+70SMS+2GB)	16.5	14.0	13.1	-2.5
Mobile data and voice low usage basket (70min+20SMS+500MB)	11.4	9.2	6.7	-2.2
Mobile Cellular low usage basket (70min+20SMS)	7.8	5.6	4.6	-2.2

Table 6. Connectivity Price Baskets in USD. Source: ITU & A4AI ICT Price Baskets, 2021

However, when costs are analyzed not relative to income, the reality is starkly different, with Africa having prices much lower than the World average, except for fixed broadband basket, where prices are very much aligned. Africa has an income challenge above all, more than a smart device high-cost structure.

While measures are still necessary to provide cheaper devices and lower costs of connectivity as well as other costs, the massification of adoption of smart devices require subsidization of users, especially low-income users.



Figure 37. Data-only mobile-broadband basket (1.5GB) as percentage of GNI per capita. ITU, 2020

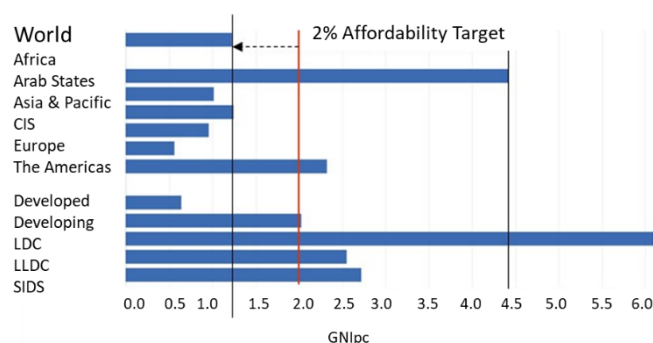


Figure 38. Data-only mobile-broadband basket (1.5GB) in USD. ITU, 2020

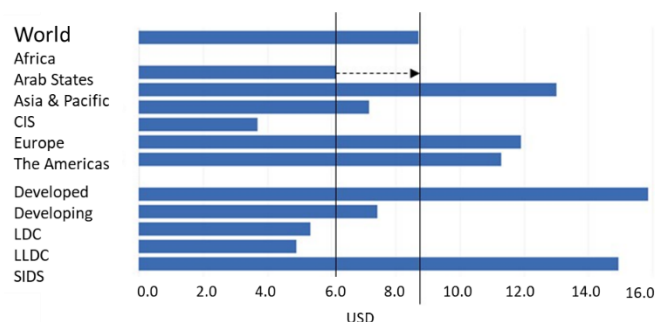


Figure 39. Fixed broadband basket (5GB) as percentage of GNI per capita. ITU, 2020

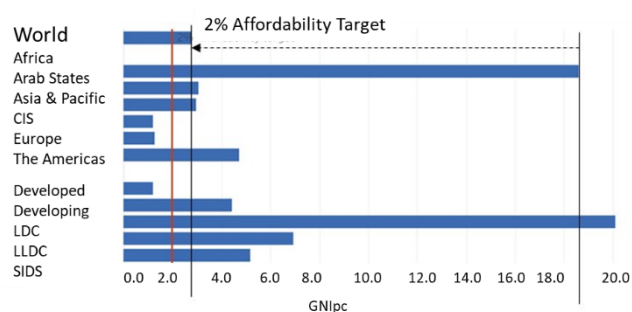
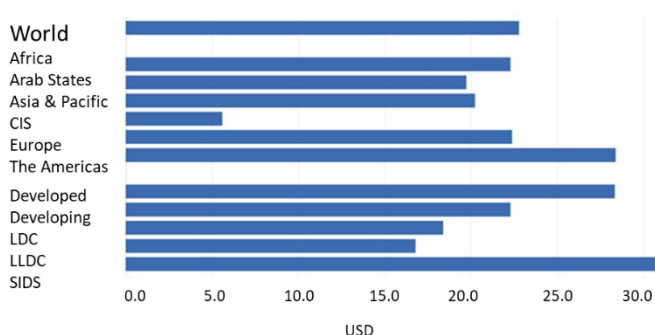


Figure 40. Fixed broadband basket (5GB) in USD. ITU, 2020



7.1.4. Strategies for Action

As shown in the current status analysis, adoption of smart devices and affordability of smart devices has been improving in African countries over the years as the economy grows, income levels increase, poverty is reduced, and the ICT sector matures. This positive tendency will continue in the future, especially with smart phones.

However, ownership and usage levels of smart devices in Africa are still very low comparative to the rest of the World, especially regarding adoption and use of PCs. The growth of feature phones relative to smart phones, with far greater functionalities, limit the empowerment of individuals in the new digital economy and reduce their economic and social impact. In

addition, structural barriers of weak infrastructure and the large proportion of the population with low-income levels create challenges that require forceful action.

The affordability of smart devices will naturally increase with continued expected improvements of incomes in Africa, which is the major limiting factor. But this will take time. Additionally, smart device ownership and relevant use are also important conditions for improvement of economic conditions and of incomes. High cost of use, namely regarding fixed broadband and also packages of combined mobile data and voice, will also slow down adoption. Therefore, decisive and targeted action is necessary to improve the affordability challenge at a much faster rate



than present market and economic conditions allow.

To improve affordability, two complementary set of actions are necessary:

- (i) To act on the whole value chain involving smart devices.
- (ii) To promote affordability measures specifically related to smart devices.

Regarding the value chain involving smart devices, a whole set of measures are necessary to lower costs of electricity, of broadband, of financing, of distribution costs relating to transport, efficiency of harbors, insurance, among others. Those actions are mostly outside the scope of this blueprint. Nevertheless, the pillars on Digital Infrastructure and SD Distribution address some of these challenges. The measures to produce cheaper devices in Africa are detailed within Pillar 5.

The recommendations below focus on measures specific to smart device affordability.

Looking for Impact

In order to have a significant impact on affordability and achieve the objective of every African citizen having a smart device that fits their needs, a coalition between all key stakeholders – governments, private sector, providers (MNOs, manufacturers and assemblers), finance sector and multilaterals,

among others - is needed to implement a comprehensive, complementary and integrated set of actions. This alignment is possible since all stand to benefit directly and indirectly from the sharp increase in adoption of smart devices. Actions for improved alignment are presented in the Pillar Stakeholder Alignment and Engagement. The various recommendations for collective action are presented below.

Nine types of strategy actions are recommended, of different nature: direct support to individuals, groups and projects; initiatives that are transversal to the whole society and structural transformation of the market and of operations.

Given that income is the major limitation, actions regarding direct support to individuals, groups and projects might have higher impact, especially 3rd Party Payment and Asset Financing.

All actions need a lag period to have effect in smart device adoption and to impact in the economy and in providing gains for all involved. The sooner these measures are taken, the faster the gain to all, being citizens, business or institutions.

Table 6. Recommended strategy actions for impact on affordability.

Strategy	Short Description	Main Entities Involved	Type of Strategy
Direct Payment Actions	Devices with a lower price of acquisition, spreading the cost to installments associated with data content bundle. Consumers can use their own income and/or savings to purchase new or second-hand devices. Extend to tablets and PCs.	Mainly Providers (MNOs, manufacturers and assemblers).	Individual focused
Asset Financing	Consumers access third party financing and credit to support lump sum acquisitions or instalments.	Mainly DFI, commercial banks, MNO, especially if supported by public-private warranties and reinsurance schemes.	Individual focused
3rd Party Payment	A third party other than the individual user assumes the cost (total or partially) or the full ownership of the SD used by individuals.	Mainly government and multilateral entities, also corporations and MNO within a market extension strategy.	Target group focused
Public Internet Access Points and Collective use	Free access is provided to individuals to access broadband or use of devices	Paid mainly by government and multilateral entities, with implementation and management by MNO and telecom companies	Transversal initiative
Tax restructuring and fiscal incentives	Taxes and fiscal rules are changed to reduce costs of SD acquisition and use and / or to provide incentives for adoption	Government	Transversal initiative
Strategic Procurement	Sourcing and procurement of SD are used in order to achieve established means, which contribute directly to the cost and durability of SD	Government, supported by multilateral institutions	Transversal initiative
Competitive structure	Market rules create conditions for healthy competition which benefits the end consumer in terms of cost, service and variety of options	Government, supported by multilateral institutions	Structural action
Supply chain improvement	Improvements in the supply chain reduces costs to the end consumer	Mainly Providers (MNOs, manufacturers and assemblers) and supply chain players, with government intervention	Structural action
Combat counterfeit and parallel informal markets	Parallel informal markets reduce government fiscal capacity to reduce taxes or intervene with proactive measures and eat up profit levels of providers which could be used for cheaper prices.	Mainly government	Structural action

One Size does not Fit All

These strategy actions impact citizens differently, according to their level of income. Some countries will need more or less of each strategy action depending on their specific condition and prevalence of each user group.

Four groups of citizens can be defined, according to level of affordability ¹⁰³ as per table below. High-income citizens are not targeted in

these recommendations, responding only to market incentives for greater adoption of smart devices.

Recommendations regarding target groups such as people in extreme poverty, young women, remote rural dwellers and citizens with special needs, are addressed in Pillar 12: Digital Inclusion.

User Groups	Beyond their means	Lower income level	Lower middle-income level	Middle income level
Characteristics (income level depends on cost of living; rural-urban dimension; family size; and other factors; rather than a fixed value)	No reliable income sources. Smartphones are not affordable. Tablets and PCs are not affordable.	Reliable income source, but difficulty in saving. Can afford smart phones through instalments. Great difficulty in affording Tablets and PCs.	Reliable income source, with ability to save. Can afford payment of smart phones through savings made. Limited capacity to buy Tablets and PCs.	Reliable income source. Can afford lump sum payment of smart phones. Can afford Tablets and PCs either in lump-sum or through instalments.
Impact on SD adoption	Will not buy and use any SD, unless other entities pay for it or if smart devices become a means of income. Will more readily acquire basic or feature phone, in second-hand. Tablets and PCs are out of reach and largely less relevant to life activities.	Will buy smart phone if paid through instalments, or if SD becomes a means of income, irregular use. Comparative cost of use might push for or divert from feature phone acquisition relative to smartphone. Will buy and use tablets or PCs if paid by other entities. Will use if owned by others and use costs are paid by others.	High elasticity to pricing: will buy smartphones more and use more if prices are low, highly responsive to discounts, installments and bundling. Will consider buying a Tablet or PC if more educated and if it impacts strongly on immediate income or very directly on life prospects for self or children and subject to discounts and installments.	Will buy more or less all smart devices according to price levels. Will use more or less intensively according to price levels, discounts and bundling.

¹⁰³ Adapted and complemented by LBC from GSMA "Accelerating affordable smartphone ownership in emerging markets 2017; 9"

Table 7. The Relevance and Impact of the Different Strategy Actions Relative to User Groups.

	Vulnerable Groups	Beyond Their Means	Lower Income	Lower-Middle Income	Middle Income	Public Sector Users	Others
Structural Strategic Actions	🕒	🕒	●	●	●	●	●
Tax Restructuring	🕒	🕒	●	●	●	●	●
Fiscal Incentives	○	○	●	●	●	●	●
Strategic Procurement	🕒	🕒	○	○	○	●	○
Public Access Points	●	●	🕒	🕒	🕒	🕒	🕒
3rd Party Payments	●	●	🕒	🕒	○	○	○
Asset Financing	●	●	●	●	●	●	●
Direct Payment Actions	🕒	🕒	●	●	●	●	●

Table 8. The relevance and impact of the different strategy action relative to user group — explained.

Strategy	User Groups			
	Beyond their means	Lower income level	Lower middle-income level	Middle income level
	Relevant to all user groups, but with different relevance.			
Direct Payment Actions	Not much impact in this user group with no reliable income.	Especially relevant for these two user groups, which are very sensitive to acquisition price and cost of use.		Can have a positive impact on more acquisitions and more intensive use, especially on more acquisitions of SD with a higher price of acquisition, especially tablets and PCs.
Asset Financing	Detrimental to this user group, as it will burden the already vulnerable individual with commitments difficult to fulfil.	Extremely relevant and impactful for this user group, with difficulty to save.	Relevant and impactful in this user group, especially with higher acquisition prices, such as tablets and PCs.	Can have a positive impact on more acquisitions of SD with a higher price of acquisition especially tablets and PCs
3rd Party Payment	Especially adequate for this user group. Should be the major form of affordability support of this user group creating future possibilities	Can also be extremely relevant for this large user group in Africa, thus accelerating broader social and economic impact.	Not to be neglected in this group either.	Brings benefits, no doubt, but is not an efficient use of public resources for this user group that is not vulnerable.

	and income, social deprivation alleviation and economic impact.			
Public Internet Access Points and Collective use	With very high impact	Very high impact	Convenient but not decisive for adoption	Convenient but not determinant of adoption behavior
	Relevant to all user groups, with different relevance.			
Tax restructuring and fiscal incentives	Almost no impact	Very high impact directly and if applied to SME businesses programs for employees	High impact directly and if applied to SME businesses programs for employees	Convenient and with positive impact in acquisition of SD with higher cost of acquisition
Strategic Procurement	Benefits specially institutions and programs which serve this user group.	Serves all of those in government programs, namely in education or users of SD in the public sector.		
Competitive structure	Not very relevant to this user group, until it moves up in the income level	Very relevant for price sensitive buyer, namely in the lower income user group. It impacts the whole market with purchasing capacity, incrementing users and usage.		
Supply chain improvement	Benefits specially institutions and programs which serve this user group.	Very relevant for adoption by this user group if it reduces acquisition prices and makes service cheaper	Very relevant for adoption by this user group if it reduces acquisition prices and makes service cheaper	Positive for SD acquisition by this user group, but not determinant.
Combat counterfeit and parallel informal markets	Very relevant. Deficient and low-grade SD occupy the space of SD with boarder socio-economic impact. Reduce fiscal power of the government to assist this user group.	Relevant in so far as it saves fiscal power to implement fiscal incentives for these user groups.		Low relevance for this user group



Table 9 - The most relevant strategies of action per user group

User Groups			
Beyond their means	Lower income level	Lower middle-income level	Middle income level
3rd party finance Public access points Strategic procurement Combat counterfeit SD and parallel informal markets	3rd party finance Direct payment Asset financing Public access points Tax restructuring and fiscal incentives	Direct payment Asset financing Tax restructuring and fiscal incentives	Asset financing Tax restructuring and fiscal incentives

Compounded Effect

The proposed strategic actions can have a compounded effect. A country can opt to enact structural Strategic Actions or not, introducing a first lever for a general % price decrease in the market for smart devices. Likewise, Transversal

Strategic Actions can be further implemented or not, with more or less impetus, before Individual and Target Group Strategic Actions are implemented. A compounded approach is best, the implementation of which does not oblige starting at any one level.

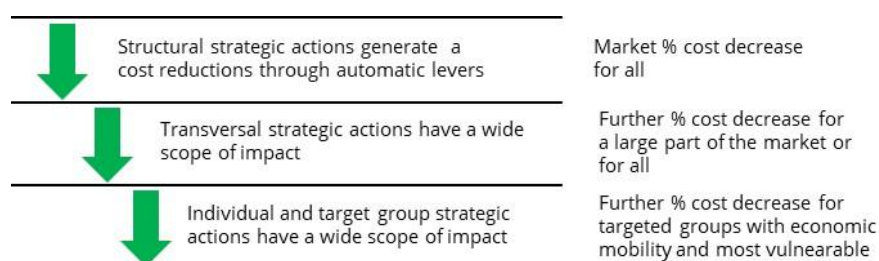


Figure 41 – Compound effect of relevant strategies.

Recommendation 9.1. – Promote direct payment actions

Objectives: Lower the price of acquisition of smart devices spreading the cost through a regular payment of use over time, allowing more consumers to adopt smart devices, especially those with the lowest incomes (lower income and lower-middle income level)

Parties Involved: Mainly providers (MNOs, retailers, manufacturers)

Initiative 9.1.1. – Stimulate Voice and Data Bundles.

Governments should stimulate MNOs to recover smartphone cost through sale of voice and data bundles or other revenue streams, reducing acquisition costs as much as possible. On the consumers side, such plans will improve their affordability in both short and long term. Bundles also add value for Mobile Network Operators allowing them to lock consumers into their networks, increasing ARPU (Average Revenue per Use).

MNO profit constrains with business margin because of regular Capex investments (mainly in USD currency) to adopt new telecommunications network technologies of



4G and 5G and new IT OSS systems might be a limitation.

Relevant Case Study

South Africa

Three of the main providers in South Africa offer contract subscribers free or heavily discounted devices to stay competitive and attract new customers. These subsidies make market entry more difficult and were used to attract high-end subscribers as ARPU (Average Revenue per User) decreased with increased penetration amongst all socioeconomic classes. Customers were also able to acquire

Outcome: Increase mobile phone penetration and higher profit margins in South Africa.

Governments could evaluate adopting selective corporate tax incidence to nudge MNO to shift their revenue stream from acquisition to a more stable revenue stream.

Initiative 9.1.2. – Stimulate Intercompany benefits/loyalty incentives to reduce acquisition cost. MNOs and other service providers, by themselves, should promote loyalty incentives jointly to reduce acquisition costs, as this benefits their businesses in terms of customer capture.

This intercompany loyalty scheme can also be applied to tablets and PCs.

Relevant Case Study

Rwanda

In 2017, a solar energy company called Mobisol partnered with MTN Rwanda and Tecno Mobile in a pilot that gives existing customers the option of purchasing a Tecno W2 smartphone (a smartphone designed for low- and middle-income consumers in emerging markets). MTN supported acquisition of new customers by providing free data bundles over the period of the loan (18 or 36 months) to

customers that are registered on their network through Mobisol. The company also offered a low interest rate (15%) for low-income populations.

Outcome: Customers were able to pay above the minimum required amount when they had higher disposable income and, therefore, providing some level of relief in months when they may earn less

Recommendation 9.2. – Promote Financing of Smart Device Acquisition

Objectives: Promote the development of financing models to reduce the capital needed upfront to purchase a device, by bringing together public and private sectors and civil society to support projects to make such financing available

Parties Involved: Governments, financial institutions, providers (MNOs, retailers, manufacturers)

One important way to make devices more affordable for users is to develop innovative financing models to reduce the capital people need upfront to purchase a device. Consumers can access financing through financial institutions, MNOs, or alternative credit providers that seek to reach low and middle-income populations that cannot afford a lump sum payment but can, instead, afford instalments spread out over several months. Furthermore, access to credit can help the middle-income segment to afford better performant smartphones and tablets and PCs, giving them access to these devices earlier than they would otherwise have had them.

Financing models are particularly important for tablets and PCs, which penetration is very low in Africa.

The following initiatives can be carried out.

Initiative 9.2.1. – Government led programs to encourage MNOs, retailers, banks, start-ups and fintech's to finance acquisition and use of Smart Devices.

Programs enabling the group of people who cannot afford the upfront cost of a device, but could afford to pay in installments, can help millions of people in Africa buy smartphones, tablets, and notebooks.

Relevant Case Study

Argentina

The national program “Plan Mobile Internet Access” was launched in 2016 in order to provide asset financing for 8 million people to move from 2G to 4G smartphones costing ~138 USD, connecting 1,600 municipalities across the country. Citizens were able to purchase those smartphones on a 12-month instalment plan provided by the government.

Outcome: Economic growth through increased access for marginalized groups.

To achieve this, governments should encourage financial institutions to provide microfinancing for smart devices, by securing credit guarantees and training programs, as well as corporate tax incentives.

Providers and retailers can also partner with governments and financial institutions, making it possible to offer credits at lower interest rates than those on the market. These credits should allow flexible payment conditions, for people to be able to reinforce payments in the months of higher income.

PayJoy is digital platform that enables customers with little or no access to conventional loans to buy a smartphone on credit and pay back in several instalments. Even with no bank account or formal

credit history, PayJoy users can, therefore, access financial services and the app offers loans between \$50 and \$245. In the end, customers can choose from several smartphones' brands and price points.

In the case of smart phones, to mitigate the risk of nonpayment of the loans, it is possible to upload mobile locking technology software that remotely locks the devices that are leased to the consumers in the event of failure in EMI payments or if the devices are reported stolen (geolocation). This ensures reduced collection costs and timely EMI payments. The same applies to tablets and PCs, with software that is automatically renewed on set dates, which can be suspended in case of default.

Aim at specific target groups and activities

In order to optimize impact, support should be focused on specific target groups and target smart devices, according to the evaluation to be done in each country and each financial institution. As a starting point of departure, the following guidelines could be considered.

- Smartphones acquisition for personal use up to 100 USD with loans for acquisition and for initial use cost of 40 USD with a credit spread over a period of between 6 and 18 months (associated with the expected lifespan of the device).
- Acquisition up to the value of 200 USD for tablets and up to 400 USD for PCs for the following: MSMEs and individuals working in the following sectors: agriculture and fisheries, commerce, import/export, health, education, finance, any type of manufacture activity with a credit spread over a period between 6 months and 24 months for tablets and 36 months for PCs.



- Efforts should be made by governments to create protocols or memos of understanding with international and national manufacturers and retailers to stimulate the growth of computer or tablet acquisition by schools, students and teachers, as addressed in the Digital Skills Pillar.

Flagship Project - P.9.1. - Government backed Commercial Bank's SD Credit Programs

Established commercial banks in particular can be faster in adapting to the new digital economy and to microfinancing acquisition of smart devices, regarded as having a high default risk. Governments can mobilize the massive impact that commercial banks can have by promoting joint meetings with banks and MNO and tablet and PC providers to promote massive national credit finance programs for smart devices. Governments could use its own or private reinsurance institutions for partial credit guarantees to share credit risk with commercial banks.

Banks should be supported in developing and implementing these new forms of credit finance through programs for the development of new credit products supported and financed by multilateral institutions focused at: raising awareness of the need to service this market with new credit products and new services; develop awareness of the importance of commercial banks in the digital transformation of the economy and of the importance of access to credit for the acquisition of smart devices and the economic benefits it can generate to the economy and the business opportunities for banks. This type of programs must be targeted to professionals of commercial, credit and marketing departments of the banks. The programs must consist in technical assistance packages, involving training, recommendations on new credit packages, interest rates, payment conditions, recommendations on monitoring mechanisms and prevention of non-compliance and other relevant elements, such as the creation on-the-job of marketing plans for credit to SD purchasing.

- These programs should aim specifically at tablets and PCs, given the lag of Africa in relation to the rest of the World.

Recommendation 9.3. – 3rd Party Finance

Objectives: Create programs or policies, such as subsidized purchases, reviewed tax policies or direct funding, to allow individuals and groups with no reliable income source or low income to buy and use smart devices

Parties Involved: Multilateral Developments Banks, Governments, NPOs, MNOs, Retailers and Commercial Banks

Given the income constraint in Africa this is the model with potential higher impact in smart device adoption. It is also the more costly to implement. For this reason, 3rd Party support programs with significant impact need to have several sources of finance, several complementary partners and strong project management. 3rd Party Finance can be total or partial, focused on specific gaps.

Five types of 3rd party programs can be identified:

- i) Direct subsidy programs for acquisition and use of smart devices.
- ii) Programs aimed at income and economic growth, which are further presented below.
- iii) Programs aimed at e-Education, addressed in the Digital Skills Pillar.
- iv) Programs aimed at social improvement, namely in the areas of e-Health and e-Government, addressed in the Digital Vertical Strategies Pillar.
- v) Programs aimed at special population groups and at those most vulnerable and in extreme situations of poverty, addressed in the Digital Inclusion Pillar.





Direct Subsidy Programs

These are wide scope programs that subsidize acquisition costs and use costs broadly to consumers, according to some form of criteria – age, gender, income level, social condition (single family parent, abandoned kids, citizens with special needs/deficiencies, among others). Contrary to the financing model, there are no installments. The beneficiary does not have to pay back any of the support received.

For example, subsidized acquisition of smart devices and free or subsidized costs of fixed broadband in partnership with internet service providers (ISPs) to provide service at free or reduced costs.

Programs Aimed at Income and Economic Growth

These programs are particularly important because low-income levels are a source of a trap situation. Smart devices empower citizen participation in digital transformation and the 4th Industrial Revolution thus raising incomes and economic competitiveness. However, those below a certain income threshold are not able to participate, being trapped in a vicious circle. Programs expressly focused at income generation can be a gordian knot in many local economies, which can accumulate positively to a wider economic impact.

In many cases, money alone is not sufficient to have an impact on income generation. Integrated programs based on change theory focused on income generation on the short-term, rather than finance-only programs, will have a higher impact on adoption and on income generation. To be more impactful, 3rd Party programs need to be associated with an economic activity, specialized training associated, technical assistance and strong monitoring of results.

Each local economy will best define the most adequate economic needs and opportunities on which these programs must be focused, according to their particularities. Nevertheless, as a general guideline, priority should be given to people in:

- Agriculture and fisheries
- Any type of manufacturing
- E-commerce and e-services
- MSMEs and start-ups
- Self-employed, individual entrepreneurs and transition programs from the informal sector to the formal sector.

The Challenge of Financing 3rd Party Finance Programs

African governments have limited fiscal resources for 3rd Party Finance Programs.

It should be possible to build coalitions with private companies, non-profit organizations, and governments for such programs because all can derive value from higher adoption levels. The more people can access smart devices, the faster incomes and the economy will grow. For example, advertising companies often see an opportunity to capture revenues from customers who own smartphones once the content reach a higher volume of people due to the more devices being used. In addition, business enterprises also take advantage of this increase in affordability due to easier communication when workers have access to phones. Lastly, government also benefits from it, raising total revenues from the telecommunications sector through such policy interventions.

Financing for these programs could come from:

- Multilateral Developments Banks, like the World Bank, AfDB, IFC and others.



- A complementary and specialized approach by these institutions in terms of finance, economic sectors and target groups could increase efficacy
- Governments, using resources from universal service and access funds (USAFs)¹⁰⁴, from fiscal policy and from more rigorous management of spectrum using with the right spectrum management software (which sometimes does not happen).
 - Universal service and access funds in all African countries should be evaluated in terms of their past efficacy and their attention to smart device financing.
 - There is evidence suggesting that many USFs are not administered effectively and are underutilized. For instance, the ITU and GSMA found that, across the world, more than half of the sums collected were never utilized and over a third of the USFs were never used at all. The underutilization of USFs represents missed opportunities that can be used to reinforce the virtual circle of promoting smart device adoption via 3rd party finance in order to collect later improved incomes and larger fiscal base to reinforce again the USFs and also the Government tax base.
 - Fiscal incidence in the digital value chain must studied in each country so that tax policy works both as an incentive to economic growth and

to further growth of fiscal income, as more explained in the next strategy of action recommendation.

- Providers (MNO, Manufacturers and Assemblers) as part of their market expansion strategies.
- Commercial Financial institutions should provide bridge finance up to 3 years and long-term financing to all other entities
- Combined approaches with all these entities, tend to be larger, more impactful, and less burdensome for each entity individually considered.
-

Malaysia

In 2010, the government of Malaysia bet on a broadband tax relief, offering a 100% capital expenditure tax allowance to operators investing in last-mile broadband equipment. Consumer access devices are also covered for import duty and sales tax exemption. Besides this, the government offered a tax relief on broadband subscription fee up to 165 USD. In 2011, the tax benefit was extended to smartphone broadband use. This incentive was maintained until 2012. In the country, the cost of a personal computer up to 1,000 USD is deductible.

- **Outcome:** Penetration rate in Malaysia was about 26% and broadband became more accessible for 100,000 local university students, who qualified for laptops with free broadband for 16 USD per month for 2 years. This was made possible thanks to a partnership with Telekom Malaysia.

¹⁰⁴ Note: Universal Service and Access Funds (USAFs) are public funds — financed primarily through contributions made by mobile network operators and other

telecommunications companies — intended to expand communications services to underserved areas and populations. A total of 37 countries in Africa (68%) have USAFs; 23 of these funds are active.

Flagship Project - P.9.2. - Coalition for 3rd Party SD Finance for Africa

A large-scale effort with the involvement of the majority of the relevant stakeholders is likely to have a higher impact on smart device adoption and short-term income generation than isolated, non-complementary and non-synergetic smaller-scale efforts. Implementation can still be locally focused and in specific sectors, local economies, user groups and integrated projects.

Given that a Coalition for 3rd Party SD Finance for Africa is advisable, smart device adoption is indeed a gateway to more empowered individuals and businesses in the 4th Industrial Revolution that is changing economic structures, thus dictating winners and losers, and if low-income levels are in fact the major stumbling block for smart device adoption in Africa, that also feeds other stumbling blocks, then

This coalition should:

- Articulate with government, implementing agencies and local stakeholders to guide their implementation of the 3rd Party SD Finance Program.
- Monitor, evaluate and nudge implementation and finance to the most efficient models.
- The program should start mobilizing and applying funds still in 2022 to gather the momentum of post COVID-19 pandemic world economic recovery.

Recommendation 9.4. – Public Internet Access Points and Collective Use

Objectives: To address the high cost of fixed broadband in Africa, which is the most expensive connectivity in Africa thus reducing substantially the cost of use, especially for those with lowest incomes

Parties Involved: Governments, Multilateral Developments Banks, Suppliers and NGOs

One particular form of 3rd Party finance is the provision of public access points to connectivity

by people using their own devices. It is a one-to-many (1:many) rather than one-to-one (1:1) thus involving less expense and less coordination and project management. It is also more democratic in a sense that citizens individually decide by themselves if, when and how much to use this facility.

This strategy action is highly recommended as it addresses the most expensive type of connectivity in Africa, fixed broadband, which reduces substantially the capacity of individuals to take full benefit of their investment in smart devices, especially tablets and PCs which full potential use implies exchange of large amounts of data, and smartphones with regards to video content, which is relevant for free access to a large set of information and world knowledge freely available in the internet and for educational purposes.

At the same time, this support at the use phase can reduce the need for 3rd Party finance in the acquisition phase, which might require bigger amounts of funding.

All stakeholders benefit from this strategic action. Citizens and small informal and formal operators gain free access to the internet. Internet service providers get paid to provide broadband to these spots, get consumer market information and speed up adoption by individual consumers through the demonstration effect of these public spots, which have by nature limited broadband width. Infrastructure companies get paid for their installation and maintenance services. Local, regional and central governments accelerate smart device adoption, economic growth and future fiscal income through a cheaper and low-management intensive model. Governments also get internet service providers to manage public access to the internet, reducing



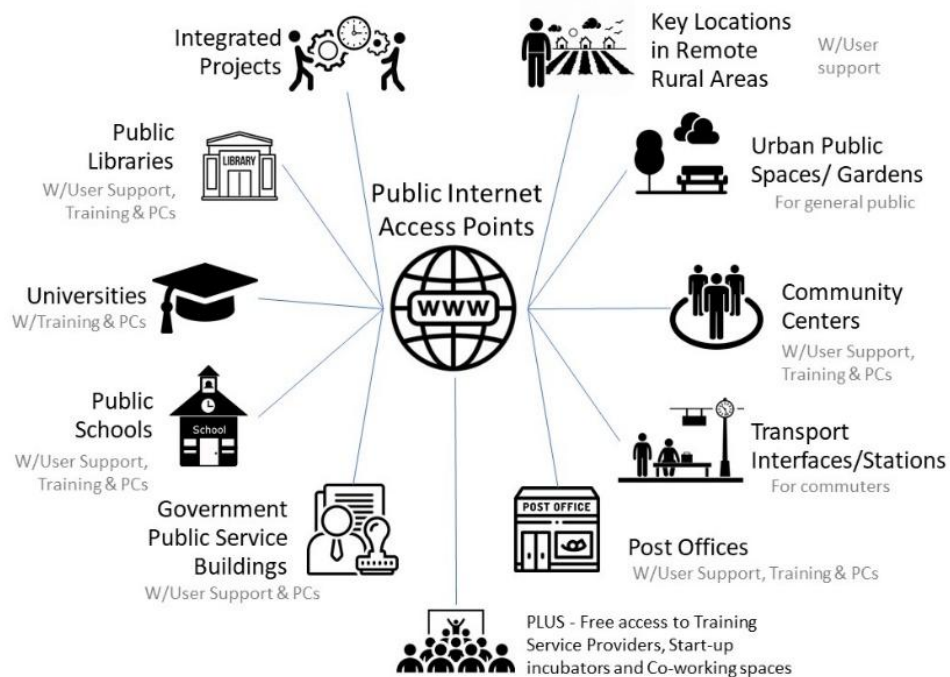
government costs. Commercial banks could also derive benefit from financing local, regional and central governments in providing this infrastructure that will pay off later in terms of greater economic activity.

In order to have an impact on adoption it is recommended:

- A pan-African program, with national implementation and greater focus on

countries with the most expensive broadband access.

- The program must be massive and pervasive, reaching people at their activities as much as possible, using all types of physical and institutional structures where people conduct their lives. In some cases, the public internet access point must operate as a Collective Use Service Center with user support, training and PCs available.



India

The Third Pillar of Digital India is totally focused on Public Internet Access Points directed at remote rural areas in all India. This program involves: i) the construction of 250.000 Common Service Centers to support the delivery of Government and Business Services and ii) the conversion of 150.000 post office stations into Multi-service Centers providing public

utility, social welfare, finance and agricultural services.

Five types of initiatives are recommended.

Initiative 9.4.1 – Deploy public wi-fi hotspots in public space areas, public buildings with services to citizens and business and low-income high density residential neighborhoods.





In alignment with internet service providers and infrastructure companies, central, regional and local governments should commission, contract and fully finance, wi-fi hotspots in public spaces such as public squares, public buildings and also in densely populated low-income neighborhoods. This can be a very cost-efficient way of allowing people to take full use of internet access already available and underutilized, benefiting all stakeholders.

- Public squares are areas of free movement and convenient access and freer of crime, because of high visibility and ease to policing.
- Public institution buildings require broadband access for the public service to be digitally connected. With an incremental investment, wi-fi can be provided to spaces surrounding public buildings, allowing for free access and also for citizens to interact digitally with the public service.
- Free access to densely populated low-income neighborhoods have a transversal and widespread impact on informal workers, small business, coffee shops, cooperatives, community centers, children/student access to education contents and general access to information. It also allows for intermediaries such as NGOs, community centers or individual entrepreneurs to freely assist the less skilled citizens to use the internet.

South Africa

In 2016, to improve the broadband penetration of the country, Galela Telecommunications Holdings deployed a Wifi hotspot network in Dr. Kenneth Kaunda District Municipality, one of the largest district municipalities of the country, as a part of the national broadband policy to improve broadband penetration in South Africa. The hotspots provide free Wifi connectivity to residents.

Outcome: The Wifi hotspots covers a total of 225 areas such as government buildings, schools, taxi ranks, clinics, police stations, internet cafes, etc. At peak hours, there are over 1,000 simultaneous users

Initiative 9.4.2. – Partner with schools and universities, TVET's, libraries, post offices and municipalities to ensure public access to computers and tablets with internet connection, for free or at a reduced price.

As institutions that already prioritize access to information and learning, schools, universities, TVET's, and public libraries can constitute key players in providing access to wifi-connected devices.

Municipalities are places where citizens should be able to go and have access to online public services (social security, finances, making hospital appointments, etc.), so governments should equip municipalities with computers and internet, for free use. The number of devices can vary according to the population of each municipality and the already existing networks and levels of adoption of smart devices.

Governments should also create partnerships with the national post agencies to install kiosks in the post-offices, especially in more remote areas, to provide access to smart devices. An arrangement for delivery of ICT through post offices becomes important where the post office is the only mode of communication that connects remote areas, according to Vishnu-





Mohan Calindi, coordinator of development study groups at the International Telecommunication Union.

South Africa

In 2017, the Eduroam Wifi service (Wireless roaming service that provides free internet access to the research and education community globally) became available in 57 public libraries in Cape Town. This created alternative spots for students living in different areas to access online learning materials without travelling to campus or paying high data costs.

This initiative was promoted by the Tertiary Education and Research Network of South Africa, the Cape Higher Education Consortium, the four Western Cape universities, and the City of Cape Town.

Outcome: In the first week, over 15,000 authentications from 121 institutions were registered.

Initiative 9.4.3. – Increase support and investment in telecenters, especially in rural areas.

Telecenters, or community centers, are public places where citizens can use computers and access the internet. These are present in almost all countries in Africa, with reasonable success, only with different names, such as village knowledge centers, info-centers, and others. Governments should continue to promote these spaces, by opening new ones where access to smart devices is still lacking, and by renewing devices where necessary, assuring they have the needed maintenance and are still in conditions of use. In order to develop these new telecenters, governments must stimulate private involvement and investment.

Initiative 9.4.4. – Provide free broadband access to multipliers: accelerators, training centers, fab labs, and the like.

Multipliers such as accelerators, training centers and fab labs are different to community centers in that they are solely focused on

providing support to digital development. Many of these places struggle to be sustainable, especially in low-income areas. Provision of free broadband is later recovered in new jobs created and VAT on economic activity, while at the same time upgrading the digital skills, and engagement of citizens and small business.

Initiative 9.4.5 – Deploy public wi-fi hotspots, supported by satellite or FWA coverage in unserved areas, especially in rural areas.

Public Wifi Hotspots can act as catalysts for rural economy. When choosing the partners to deploy the hotspots, governments need to take in consideration that total cost of ownership to allow for updates, upgrades, and subscriber sustainability. Total cost of ownership can be highly influenced by deployment and management complexity, hardware costs and lack of upgrade capabilities.

Flagship Project - P.9.3. - 5-year National Roadmap for Public Internet Access Points to the Internet

To accomplish this measure, it should be created, as a first step, a 5-year National Roadmap for Public Access Points in each country, especially those where broadband costs are higher, prioritizing most densely populated areas for impact on smart device adoption and areas of the country with the most need, where implementation is feasible.

An internet site must show all the places where there is free public access to broadband. momentum of post COVID-19 pandemic world economic recovery.

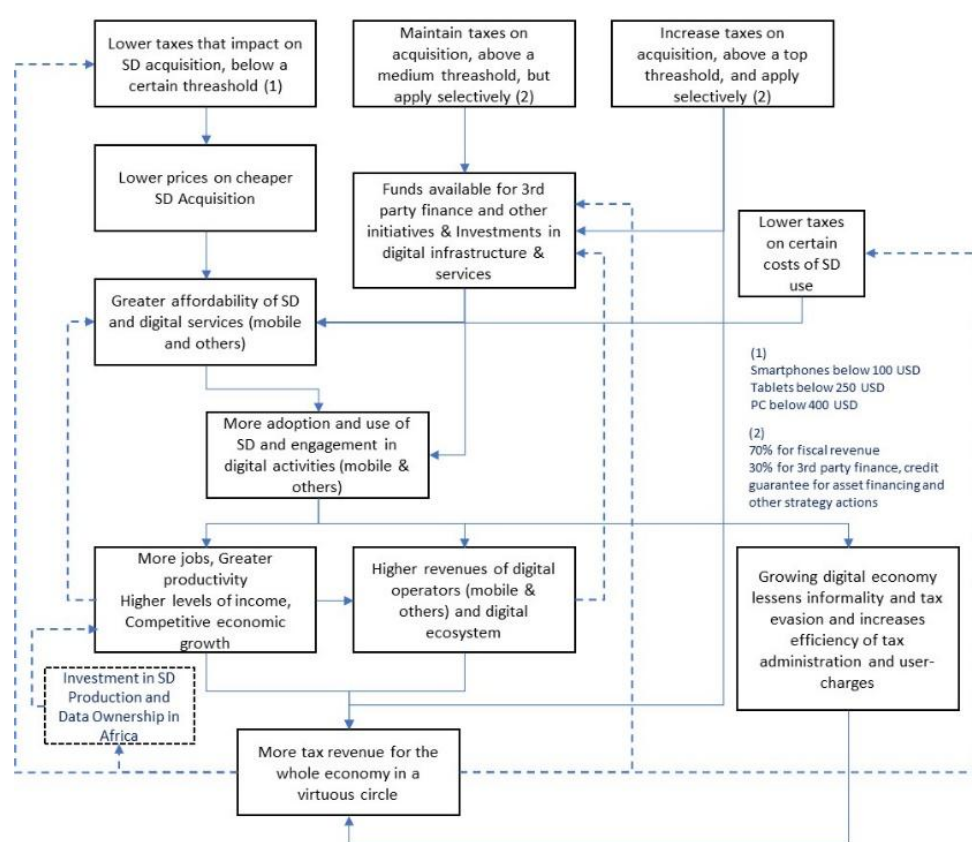
Recommendation 9.5. – Tax Restructuring and Fiscal Incentives

All African countries should evaluate and rebalance their digital sector-specific taxes and regulatory fees in 2022 so as to maximize promotion of smart device adoption and use and connectivity and consequently maximize economic growth, investment and fiscal revenue.



Short-term tax maximization in the digital sector can be detrimental to economic growth. On the other hand, reductions in some targeted sector-specific taxes can increase the affordability of smart services and boost demand, which adds value to the economy through increased productivity, more jobs, higher incomes and higher tax revenues. In addition, greater digitalization of the economy will serve to combat informality and tax evasion.

However, it must be taken into account that African governments have limited fiscal space available because of a low tax base and because of the extra costs incurred during the covid-19 pandemic. The average tax-to-GDP ratio in Africa increased 1.8 percentage points between 2010 and 2019. However, the rising costs of servicing debts offset two-thirds of this increase in revenues¹⁰⁵



Pakistan

Handset VAT exemptions in Pakistan

Cost of access is widely recognized as a key barrier to the adoption of mobile technology, particularly in developing markets. With a view to reduce the tax

burden on consumers and improve the affordability of devices, some governments have introduced VAT exemptions. As of 2017, these countries included Colombia, Côte d'Ivoire, Fiji, Kenya, Pakistan, Rwanda and Senegal and Ghana since March 2018. In the period from 2013 to 2016, Pakistan saw declining growth in handset sales, aligned with a broader

¹⁰⁵ "Africa's development dynamics", AU/OECD, 2022

stagnation of sales experienced in India and Bangladesh, with similar development levels. Pakistan removed the 16% VAT rate on mobile handsets in 2016. Market data suggests the VAT exemption contributed to a significant boost in handset sales thereafter. Following the introduction of the VAT exemption, Pakistan saw handset sales increase by 25%, compared to 3% on average in India and Bangladesh. (GSMA, Rethinking Mobile Taxation, 2019)

Governments should lower the tax burden on the acquisition, activation and use of low-grade devices. Such policies have been previously applied in Kenya, leading to an increase in handset purchases of 200% between 2009 and 2011, and more recently in several African states amidst the COVID-19 pandemic generating a spike in mobile money transfers.

Alternatively, governments might opt to allocate a part of the tax collected from smart devices to cooperate with digital equipment suppliers, ISPs and mobile operators to reach the poorest set of the population, financing two types of initiatives:

- i) simply subsidizing acquisition and usage by the poorest and disadvantaged groups: citizens with special needs, young women, remote rural dwellers
- ii) integrated projects focused on increasing income comprising acquisition, usage, training and social and economic engagement in areas such as e-agriculture, e-health and e-education.

African Governments should also align their tax policies with the WTO's Information Technology Agreement, aimed at eliminating import duties on technology products.

Three specific actions can be implemented in the short term.

Initiative 9.5.1 - Reduce import fees and VAT of all smartphones under 100 USD of retail cost, to a minimum level (5%).

It is important that this type of action to be adopted by all Africa countries, especially border countries to avoid unbalanced ICT trade between regions and economies.

To implement this action, three steps must be performed:

- Governments should, instead of changing the current import tariff of the country, publish an exceptional act, or equivalent legal instruments, for 3 to 5 years, applying the new reduced tax or discount on the actual tax for smartphones, tablets or PCs.
- African countries and their respective ICT regulators must subject all importations of electronic goods to an approval process, and in this process emit a document which will be used to classify the type of device. Only low-cost smartphone, tablets or PCs will be considered for this policy (basic and feature phones, high-cost smartphones and other electronic devices are excluded).
- The sale of these devices must be made by formal MNOs and retailers and be communicated in detail to regulators, to ensure that retailers do not increase their profit margin on the discounted items. It must not be sold above the 100 USD price point (in local currency).

Zambia

The impact of the proposed policy can be exemplified to the case of Zambia, where the import of IT and consumers electronics is equivalent to a share of import items of 2.4%, with estimated value of circa 23 million USD163. Mobile phones will represent almost 80% of that, therefore 18.4 million USD in import items. Considering that only 20% of the mobile phone market is comprised by



smartphones, there is a total value of 3.68 million USD.

Since the shipment and sales of smartphone with a price point below 100 USD represents 60% of the total for Sub-Saharan Africa smartphone market share, that means that the target of this action represents circa 2.2 million USD (9.5% of total revenue of import of IT and electronics consumer).

The reduction of Zambia's current import tax from 16% to 5% will have a relatively small impact in short term tax collection (approximately -0.7 million USD) and could have a quick compensation from increasing smartphone adoption that will benefit all associates, in particular bringing more people from informal businesses to electronic and formal trade, easier to tax in the future.

Initiative 9.5.2. - Reduce VAT for all personal computers bought by MSMEs under 400 USD retail cost to a minimum level (5%).

Reducing taxes on PCs has been shown to lead to a net tax revenue benefit for governments, sales growth for local ICT providers, and greater consumer demand for PCs as well as complementary products and services. Therefore, these devices should also benefit from tax incentives. Again, when governments lower taxes on PCs, they lose one source of direct tax revenue in the short-term, but the resulting loss can be more than offset through the multiplier effect, as more taxes are collected in medium-term from increased sales of complementary goods and services. Furthermore, lowering taxes on notebooks and laptops can lead to the many established economic benefits of ICT growth, including job creation and worker productivity, as well as improvements for African MSME.

In the short-term, tax reductions should aim to cover only PCs within the price tier below 400 USD. This should be done through government reimbursement requests from importers of goods or if purchased by government entities. This eliminates the need for granular sales category data and associated tax data sources, which are not available for custom of all countries.

A one-step tax reduction is preferred over a series of smaller, periodic reductions. Small changes can get lost in the noise of normal market fluctuations, economic change, interest rates and currency fluctuations, which complicates the benefit analysis. Governments must ensure that the tax reduction is not used to pad the profits of sellers and intermediate markets, rather than passing the tax reduction on to consumers. The proposed action must be equal for all African countries.

A GSMA study¹⁰⁶ on the effects of reforms to sector-specific tax and fees shows increases in mobile adoption and GDP growth in 2020, relative to a scenario with no tax reform.

Country	Mobile-specific tax reform	Impact
Democratic Republic of Congo (DRC)	Abolition of excise tax of 10% on mobile services	3.2 million connections (+5%) \$970 million in GDP (+2%) \$28 million in tax revenue
Ghana	Reduction in service tax on voice services and abolition on data	1.3 million connections (+3%) \$598 million in GDP (+1%) \$0.67 million in tax revenue
Tanzania	Reduction in the excise of mobile services from 17% to 10%	2 million connections (+5%) \$549 million in GDP (+1%) \$11 million in tax revenue
Tunisia	Abolition of the 5% industry fee on mobile services	0.4 million connections (+2%) \$314 million in GDP (+1%) \$28 million in tax revenue

Table 10. Estimated impact of mobile tax reforms across selected countries. Source: GSMA.

Recommendation 9.6.– Strategic Procurement

Objectives: To benefit from specialized sourcing and procurement regarding SD acquisition by public

¹⁰⁶ GSMA and Deloitte country studies



entities to have better specifications, namely on lifespan and maintenance and cost gains from benchmarking, aggregation, and other policies

Parties Involved: Governments, Multilateral and Developments Banks

Procurement by government entities should aim to obtain gains in cost and in adequacy of the smart device. Planned aggregated purchasing (instead of piecemeal, occasional buying), of a limited set of smart devices that

have been previously defined (instead of a proliferation of different technologies that later make maintenance more complicated and disperse), taking into comparison internal benchmarks in each country or in other countries (to obtain immediate price gains), obtaining the advantage of bulk buying to obtain better prices, according to specifications that are more adequate, such as longer life span and easier maintenance model, can make a big difference to the cost of smart devices.

This type of strategic procurement is adequate for smart devices for the use of public administration, for 3rd party finance projects and for joint projects of government with other partners.

In addition, public procurement can also be put to the service of a structured program for the benefit of public servants who want to buy a smart device at cheaper prices via a bulk government negotiation.

Three initiatives are recommended to promote more affordable smart devices, especially PCs which have longer lifespans, have a higher purchase price of acquisition and support more complex functions by users.

Initiative 9.6.1. - Contract an SD expert procurement officer.

Presently, according to best practices, sourcing and procurement processes should be conducted under the decision of a sector specialist who knows the supplier market and has mastery over user requirements, acquisition planning, specs definition and negotiation. It is recommended that each government contract product specialists for smart devices acquisition.

Several public administrations have been making continuous savings under management of product specialists.

Initiative 9.6.2. - Centralize the public procurement of Smart Devices.

Smart devices bought by central, regional and local government must be centralized as far as possible to allow for management under product specialist, aggregate and strategic buying, following best practices and reducing informal and maverick buying practices.

Initiative 9.6.3. - Use digital platforms to support procurement processes.

Several countries are developing digital platforms to support the whole procurement process, including auctions. This allows for a more transparent buying processes and management of the procurement process backed by structured data, which over time will work towards more affordable smart devices.

Recommendation 9.7. - Competitive Sector Structure

Since the costs of building networks are generally too high, African governments grant licenses to telecom companies, MNOs, Internet Service Providers and other providers. Costs to end-users tend to be too high when competition is low in the sector. The increase in





the number of operators (licenses) heightens competition and tends to bring prices down significantly and introduce innovation in the offering, having a very strong impact on adoption and use of smart device. As part of the critical affordability challenge African countries should monitor constantly when the entrance of new operators can have an impact on the competitive landscape and prices.

In addition, the compensations for the attribution of licenses should be steered to include policies for massification of adoption of smart devices, especially for groups marginalized by market forces, for women, students, health professionals, farmers, or other groups of low and middle-income. Such benefits can be, for example, free internet to the students of the primary school of a given number of rural areas during a set number of years, or mobile data at certain discount for all the health professionals of a set of hospitals during a period of time.

Operators also benefit in the long run, as these actions also accelerate the growth of their future market, since the population that used free services for a period will most probably become a paying customer after the free period.

Recommendation 9.8. – Supply Chain Improvement

In developing markets, devices usually pass through numerous supply chain players before reaching end consumers, which make it costlier for them. So, to reduce inbound costs,

providers try to reduce the number of players in the supply chain by using, for example, a Vertical Integration strategy. This allows for greater flexibility in adapting to changes in demand, which improves the elasticity of supply.

The increase in affordability through supply chain strategic actions is addressed in Pillar 6.

Recommendation 9.9. - Combat counterfeit and parallel informal markets in SD

Low-income users are especially vulnerable to informal operators promoting counterfeit products that have a short lifespan and absence of maintenance. What appears to be more affordable is in fact more costly to the user.

The existence of parallel informal markets also reduces profitability of official operators and suppliers, thus reducing the possibility of reducing prices in the future and making investments to better serve all customers, inclusively the low-income market.

Government also loses fiscal revenue and the reduces its ability to support 3rd party finance of smart devices.

A concerted effort to combat counterfeit and parallel informal markets can therefore be an important to have a significant impact on the affordability of smart devices.



7.2. Pillar 10: Smart Devices Single Market

7.2.1. Introduction

The African Continental Free Trade Agreement (AfCFTA), which entered into force in May 2019, is the main political and juridic instrument driving the creation of a single market in Africa.

Additionally, Smart Africa has been driving a vision to transform Africa into a single digital market, harnessing the power of digital technology and its transformative impact in all spheres of life, to substantially uplift the quality of life in Africa. This vision has been adopted by African Heads of State and is a leading objective of the Digital Transformation Strategy for Africa (2020–2030)¹⁰⁷, DTSA, approved in 2019 by the African Union. Indeed, the first stated objective of DTSA is precisely to “Build a secured Digital Single Market in Africa by 2030 where free movement of persons, services and capital is ensured and individuals and businesses can seamlessly access and engage in online activities in line with Africa’s Continental Free Trade Area (AfCFTA)”

Smart Africa’s vision to transform Africa into a single digital market focuses on a number of interventions in three main areas¹⁰⁸:

- (i) Develop affordable digital infrastructure across the continent.
- (ii) Promote and facilitate framework conditions for doing business and investing across Africa.

- (iii) Accelerate the birth and development of a truly digital society including boosting the entrepreneurship ecosystem to promote economic growth and job creation.

This chapter focuses on recommendations regarding the contribution of smart devices to the creation of a Digital Single Market in Africa.

7.2.2. Goals

To promote the creation of a single market of smart devices in Africa, within the objective of the creation of a Digital Single Market in Africa in line with Africa’s Continental Free Trade Area (AfCFTA).

7.2.3. Strategy for Action and Measures

The recommendations below address two different, although complementary and interrelated dimensions: i) smart device equipment and services and ii) data.

[Recommendations for a single market for SD equipment and services](#)

A previous note must be made regarding the need to further develop Africa’s regional internet infrastructure and providing accommodative regulations for cross-border data flows. In 2020, only 16% of total bandwidth in Africa was intra-regional, compared to 20% in Latin America and the Caribbean, 56% in Asia and 75% in Europe¹⁰⁹. In a digital economy, the

¹⁰⁷ AU, *Digital Transformation Strategy for Africa* <https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030>

¹⁰⁸ Transforming Africa into a single digital market, Lacina Koné, Director General, Smart Africa, 2020,

<https://www.broadbandcommission.org/insight/transform-africa-into-a-single-digital-market/>

¹⁰⁹ “Africa’s Development Dynamics”, AU/OECD, 2022



ease, speed, capacity and low cost of information flow between buyers and sellers is a value-added differentiator. So, investment in intra-Africa Internet bandwidth must be a priority.

Recommendation 10.1. – Negotiate a Trade Protocol for Smart Devices Under AfCFTA

Objectives: To ensure that smart devices are not neglected over the multitude of protocol areas under negotiation, so that a political priority, shared commitments and a legal umbrella framework is provided. AfCFTA Protocol on -Ecommerce could be a base.

Parties Involved: Member States

Depending on the political dynamics of implementation, this protocol could be complemented with protocols by the existing regional trade areas.

Recommendation 10.2. – Study the challenges and opportunities of a SD Single Market and produce continental, regional and country SD Single Market Roadmaps

Objectives: Introduce information, judgement and priorities to the integration process, avoiding foreseeable problems, accelerating processes and maximizing gains.

Parties Involved: Member States

Market integration brings a lot of complex issues. Gains will not happen automatically. It is important to map SD value chains in Africa, identify potential opportunities and potential challenges in each geography and design roadmaps to promote complementary African value chains that are competitive globally, inclusive regionally and sustainable over time

socially and environmentally. It is also necessary to identify long term gains and temporary losses for each geography and country so that balancing policies are developed and real progress to a SD single market can take place.

Flagship Project - P.10.1.– Create a SD Single Market Digital Platform

This would be an open digital platform, built with stakeholders, to provide information and services such as:

- promote the benefits and present the roadmap for a SD single market
- give information to individuals and businesses about the progress and the impacts of the SD single market
- provide African SD open data which can be used by innovators to explore and build new business offers provide a SD crowdsourcing platform for ideas and collection of investment
- Provide services that facilitate and help implement all actions relating to the single market: such as finding a job in any African country; apply for special SD visas. Provide pan-African business-matching of investors, innovators, experts, companies and the like; apply for skills courses in SD in Africa and online; allow citizens and companies to present their ideas for pushing the SD single market forward or to present complains and denounce infringements

Recommendation 10.3. – Introduce mechanisms that will accelerate a SD Single Market

Objectives: Eliminate barriers, create favorable conditions, support local investment and maximize return on investment.

Parties Involved: Member States

The following initiatives should be considered:



Initiative 10.3.1. – Define rules of origin and industry standards.

Define rules of origin to make possible the definition of incentives targeted to African manufacturing and services. Define a set of standards and technical specifications that must be adhered to in Africa to better serve the market and to facilitate the safety and the interoperability that facilitates a SD single market. This should be done in articulation with international partners and take into consideration the limitations imposed by global supply chains and the rapid evolution of technological solutions. This work should be done in articulation with the expertise of standardization entities.

Initiative 10.3.2. – Accelerate trade facilitation in smart devices.

In order to have a real single market there should be SD trade facilitation within African borders which should include customs cooperation, ease of transit, trade facilitation and remedies, and elimination of technical and tariff barriers.

Initiative 10.3.3. – Establish new sourcing and procurement efforts considering a wider African market than individual countries.

Buying in a fragmented way reduces the bargaining power of African countries. Joint sourcing of components and joint procurement of solutions and purchases creates economies of aggregation and the sharing of best practices. Eligibility criteria of public procurement programs can create demand for linkages among producers in the AfCFTA. African governments can use their relatively sizable public procurement efforts – on average 8.7% of GDP for purchasing goods and services, compared to 6% in Latin America – to attract local producers to the SD value chains.

Additionally, African governments could invest in e-procurement systems, thus providing wide information to the market and allowing SMEs companies to bid more easily, while at the same time improve bidding transparency. An e-procurement system could also allow for regional producers to bid and not only local producers. E-procurement also helps to harmonize product standards thus reducing costs to buyers.

Flagship Project - P.10.2. – Create a unitary marking, patent and trade-mark system for SD in Africa

Assess and articulate between all African countries the marking, trade-mark, national patent and other protection system in order to create a unitary technically efficient and financially affordable intellectual property rights system able to be recognized at a global scale, so that all African innovators, big (corporations) or small (start-ups) can benefit from IP education and protection in the market from counterfeiters and copy-cats which disrespect patents or do not want to pay for the use of innovations developed by others.

This will also imply the construction of market surveillance mechanisms to detect non-compliant products and services and impose penalties or move them out of the market

Recommendation 10.4. – Make provision for free movement of talent, capital and of labor in SD

Objectives: Unblock internal market dynamics.

Parties Involved: Member States

The production of smart devices – hardware and software – as well as the services associated require much talent and growing expertise. It is necessary to allow for free





movement of the African and the international talent and capital that will need to come together to create the innovative dynamics that can sustain such an industry. This should include a special visa program and financial and fiscal incentives for SD capital investments. Specialized labor might also need to be accounted for if production facilities gain a certain dimension. The following initiatives should be considered.

Initiative 10.4.1. – African standardization of the evaluation and validation of regulated professionals

This should involve universities and professional associations and would greatly facilitate movement of professionals in Africa, improving productivity and competitive agility and accelerate knowledge spread.

Initiative 10.4.2. – Streamline administrative procedures and facilitate pan-African expansion of business activities associated with smart devices value chain.

This should involve not only manufacturing activities but also service providers associated with the SD value chain as cross-border provision of services would improve competitiveness, thus raising quality of service and lower prices to consumers.

Recommendation 10.5. – Evaluate and introduce mechanisms for equitable distribution of benefits of the SD single market, under AfCFTA

Objectives: To avoid unbalanced gains from the SD single market and negative reactions by those who will be losing out, putting in danger the benefits for all.

Parties Involved: Member States

Disparities are wide in Africa, between member states, between urban and rural areas, between large companies and SMEs and informal operators in production capacity in general and SD production capacity, in SD market consumption power, in financial strength, in general skills and digital skills, in digital connectivity, in income, among others. A free trade area with these pre-existing inequalities could distribute benefits disproportionately across countries, regions and businesses, if there are no balancing mechanisms. In a situation characterized by large pockets of poverty, by a growing mass of young population aspiring to have decent and stable jobs, a perceived AfCFTA-driven increase in inequality could lead to mobilization against it and to some unrest.

Initiative 10.5.1. – Devise regional development plans around SD manufacturing and entrepreneurship

The objective is to create conditions for development and synergetic cooperation between regions around concrete value chains of SD production, distribution, and disposal. Together, Nigeria, South Africa and Egypt – three out of 54 countries – account for about 50% of Africa's GDP. Trade Map reports that in 2020 Africa imported US\$20 billion worth of goods from South Africa, the sixth-largest supplier of African imports¹¹⁰. Within countries, cities and urban areas are better integrated into trade value chains than rural areas. Unrestricted open trade could widen income gaps between cities and rural areas. Balance between regional commodity-production and value-added activities should also be taken into account. Special investment plans might be needed in some regions to improve their

¹¹⁰ <https://www.trademap.org/>



productive competitiveness, especially around skills development. These plans should have monitoring mechanisms on impacts in society in terms of job creation and income generation.

Initiative 10.5.2. – Impose Minimum Local Integration between Manufacturers and Local SMEs and give incentives to entrepreneurship and innovation in SD

The economies of scale of large conglomerates and manufacturing companies will have the advantage in an open market because they are more competitive in many respects. Local economy programs for the creation of horizontal and vertical economic links focused on job creation and income-generation activities are needed to promote sustainable development. Taxation could also be used to incentivize investment in rural areas.

Smart Devices Fuel a Data-Driven Economy where value has a new meaning

The digital economy and, specifically the generalization of the use of smart devices by individuals, by business and by governments has created a data-driven economy. Data is the new economic value. Economic agents need to evolve in the “data value chain”, that is, to gain capacity to transform raw data produced by individuals using smart devices into intelligent data, by collecting data, aggregating it, analyzing it and processing it in a way that it can be monetized for commercial purposes or used for social objectives. In the digital economy, adding value to data is what contributes to moving up in the development process.

This poses a huge challenge to the African Single Market and to the African Digital Single

Market because data cannot be treated as conventional goods and services. Data is not traded or exchanged but shared. Data is not used up in a transaction. More important than origin and ownership is the right to access, control and use of data.

The challenge is that:

- Data processing is borderless
- African economies have yet little capacity to collect, aggregate and process data
- The data market is a global market, characterized by major power imbalances and inequalities between and within countries
- The data market is dominated more and more by a few large platforms and by two countries, the US and China, which are getting most of the benefits of this data-economy¹¹¹.
- The pandemic has aggravated this as more people moved online.

African countries are presently in a subordinate position, with data produced by users through their smart devices being captured, processed and concentrated in a few global digital corporations and other multinational enterprises that control the data.

Recommendations regarding Data

The following strategy actions are recommended for Africa to build and take full benefit from the Africa digital single market.

Recommendation 10.6. – Build capacity to create intelligent data from the raw data

¹¹¹ The *Digital Economy Report 2021*, UNCTAD, 2021

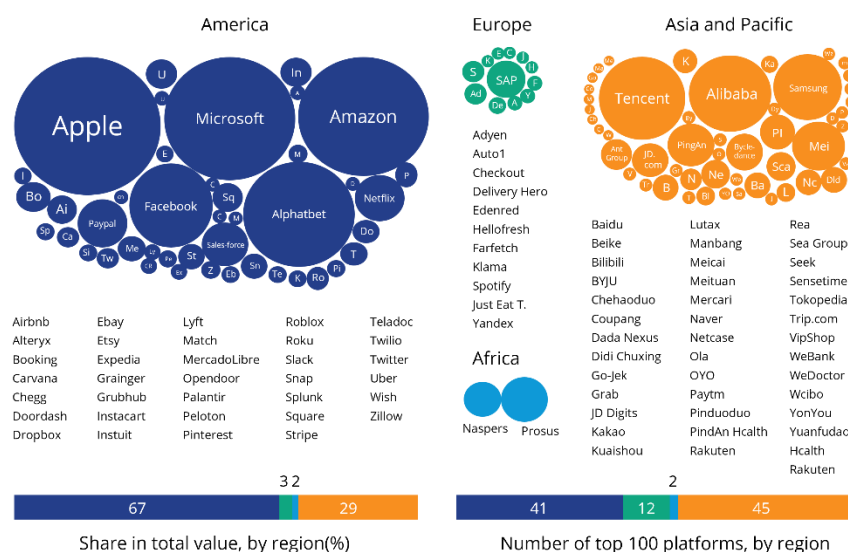
In order to capture the value of the data generated by users of smart devices – and in the future, by the exponential growth of IoT devices – African countries need to devise joint policies to stimulate, nurture and support all kinds of African digital platforms As mentioned above global digital platforms have built a considerable global market power, mainly in the US and China, which gives them a dominant position over data collection from all

points of the globe, being able to capture most of the monetary gains of the data-driven digital economy and thereby also of cross-border data flows.

Initiative 10.6.2. – Build competences in Big Data, Cloud and AI and New Advanced Technologies

The capacity to African countries to evolve in the data value chains requires capacity to bring intelligence to raw data, building platforms and data products. This requires a large investment in building competences in big data, cloud, artificial intelligence and new advanced technologies such a blockchain and IoT related software. This requires a structured program of capacity building at African universities in partnership with international experts and universities, or even earlier, at final years of high school. Experts need to be attracted to Africa and engaged in capacity building programs and startup development.

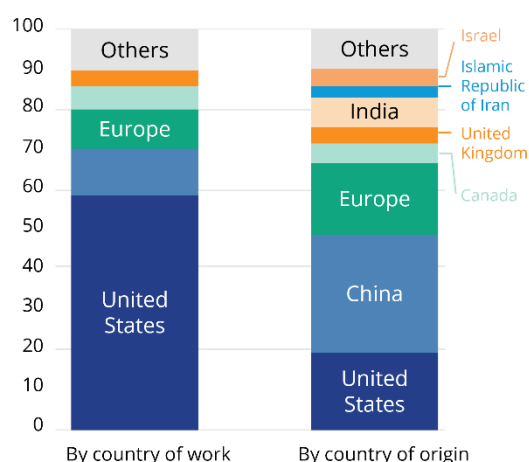
Table 11 - Geographical distribution of the top 100 global digital platforms, by market capitalization 2021



Source: Holger Schmidt, available at www.netzoekonom.de/vortraege/#tab-id-1 (data as of May 2021).

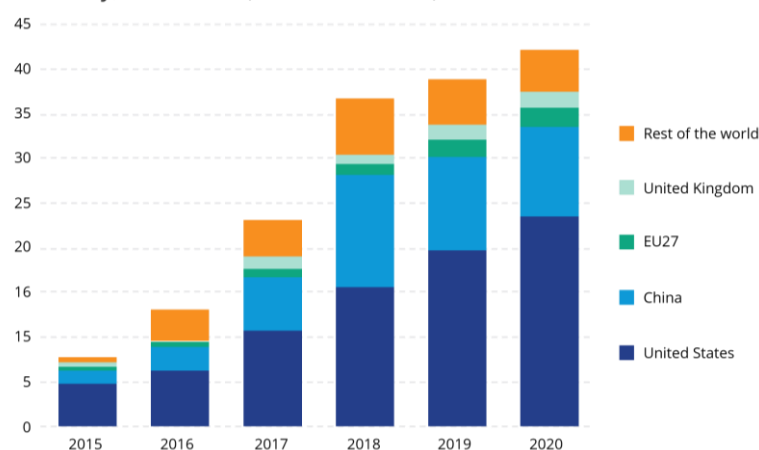
Note: As a reference, the market capitalization of Apple is \$2.22 trillion, while for Mercado Libre it is \$88.7 billion, \$80.2 billion for Baidu and \$59.7 billion for Spotify

Geographical distribution of AI researchers, by country of work and origin, 2019 (Per cent)



Source: UNCTAD, based on the Global AI Talent Tracker, available at <https://macropolo.org/digital-projects/the-global-ai-talent-tracker/>.

Private investment in AI companies, by economy, 2015-2020 (Billions of dollars)



It is estimated that global investment in AI companies has increased tremendously over the past five years¹¹². In 2019 alone, privately held AI companies attracted nearly \$40 billion in disclosed equity investment across more than 3,100 discrete transactions. Because some transactions do not have publicly disclosed

values, total transaction value could have been significantly higher – as much as \$74 billion. Several countries, based on their research institutions and global digital platforms are dominating the production and attraction of talent related to AI and to the management of global data, a crucial component of today's digital economy and future growth in all industries.

Flagship Project - P.10.3.- Impactful Technology Capacity Program - a University and Expert Exchange and Bursary Program on Big Data, AI, Cloud and Advanced Technologies (Blockchain and others)

Differentiated talent will bring differentiated results. The Impactful Technology Capacity Program should be a Pan-African Program of rapid acceleration of differentiated digital technological skills to be applied in a digital single market in Africa focused on data management for development. The program would be based on: i) a set of students exchanges and short-duration specialized courses; a) with leading international universities and b) within African universities; ii) a set of bursaries open to African students to study at the most advanced international universities: a) individuals in standard courses and b) programs specifically negotiated and customized for a batch of African students (30 at a time), from different countries, focused on applied challenges and projects relating to Africa; iii) attraction of professors, lecturers from leading universities to mount new courses and to lecture at African Universities; iv) attraction of experts to be engaged with projects in Africa; v) promotion of joint projects between universities and business firms with applied knowledge to real life problems; vi) feeding of living labs with impactful technology experts

¹¹² The Digital Economy Report 2021, UNCTAD, 2021

Initiative 10.6.3. – Promote and subsidize African Datacenters and promote one hyperscale data center in Africa

The large majority of companies (over 80% by 2025, according to Gartner, 2019) will drop their traditional data centers and move into co-location data centers and hyperscale data centers to take benefit of Cloud computing, allowing companies to access their information much faster, with the support of innovative services, at much lower costs.

Co-location data centers are highly concentrated in developed countries. As of January 2021, within a total of 4,714 co-location data centers, almost 80 per cent were based in developed countries, mainly in North America and Europe. Only 897 were in developing countries, mainly in Asia, and 119 in transition economies. Africa and Latin America hosted, respectively, 69 and 153 of these data centers. In the case of hyperscale data centers, the leading position is held by the United States, which accounted for 39 per cent of the total of 597 hyperscale data centers by the end of 2020, followed by China with 10 per cent and Japan with 6 per cent.¹¹³

African countries must subsidize their data centers and promote the creation of one hyperscale data center in Africa to reduce costs and provide much better services benefiting socio-economic development in Africa.

Recommendation 10.7. – Develop appropriate models of governance of data flows.

Objectives: Maximize the economic and social benefits of data and data-driven sectors for its

citizens ensuring effective regulatory oversight and enforcement of domestic laws

Parties Involved: Member States

Initiative 10.7.1. – Build a pan-African governance model within a Digital Single Market perspective

The datafication of the society has prompted Governments across the world to adopt wide-ranging regulations on cross-border data flows for a variety of reasons, as shown below.

Protection of citizens	National security/sovereignty	Economic development
Data protection and privacy	Address foreign surveillance	Build domestic data champions
Cybersecurity	Protect critical infrastructure	Ensure equitable access to data
Regulatory oversight over sensitive sectors	Increase sovereign control over domestic internet	Address local demand through local products and services
Access to data for law enforcement	Social/cultural stability	
Data ethics	Political stability	

African countries are behind in this process. Several models have been devised worldwide. The Digital Economy Report 2021, UNCTAD, 2021, provides a very detailed analysis and frameworks of action which are an excellent technical base for African countries to use in the development of their national approaches.

African countries could benefit from a common approach among all African countries, for two reasons: i) it would benefit the creation of a

¹¹³ The Digital Economy Report 2021, UNCTAD, 2021



Digital Single Market and ii) it would strengthen their collective standing internationally within the global search for adequate mechanisms for the international coordination of data flow regulations.

Initiative 10.7.2. – Integrate processes of definition of global governance of data

The proliferation of different national approaches to regulating cross-border data flows contributes to the fragmentation of the Internet, impacting on its proper functioning and limiting the potential development benefits of data-sharing. For this reason, there has been a growing awareness and efforts through various international forums to establish adequate mechanisms for the international coordination of data flow regulations: multilateral, multistakeholder, multidisciplinary. It would be important for Africa to be present at these global forums as one entity to reinforce its weight in the defense of its interests

India is increasingly shifting towards a regulatory model primarily focused on maximizing the economic and social benefits of data and data-driven sectors for its citizens and the domestic economy and minimizing revenue flows to companies based in digitally advanced economies. A key motivation behind the various proposed data regulations in India appears to be protecting the country's economic interests by ensuring that local digital data are primarily used to develop domestic digital start-ups (or “data champions”), and thereby push back against the “data colonialism” of big technology companies. In addition to protecting economic interests, the regulatory approach of India on cross-border data flows is informed by the various advantages of data localization for ensuring effective regulatory oversight and enforcement of domestic laws. In “The *Digital Economy Report 2021*”, UNCTAD, 2021

Relevant Case Study

Championing domestic digital development: the approach of India

7.3. Pilar 11: Smart Devices Vertical Adoption

7.3.1. Introduction

In order to achieve inclusive adoption of smart devices it is necessary to act on the four foundation pillars – digital infrastructure, digital skills, digital entrepreneurship and digital regulation – to improve the value chain of smart devices – production, distribution, use and disposal – and to address critical issues such as

affordability, digital single market and digital inclusion.

However, smart devices also have a transformative impact on several activities, of which the following are highlighted: e-agriculture, e-education, e-health and e-government.





Therefore, the adoption of smart devices vertically in any of these four activities is also of utmost importance for socio-economic advancement in Africa, for those who benefit from these activities and specially for the most disadvantaged persons.

Each of these four activities would require an in-depth of analysis that could not fit into this blueprint. For brevity's sake, this chapter only addresses some high-level recommendations regarding adoption of smart devices in each of these four areas. The relevance of smart device for each of these activities, has been presented in Chapter 2.4. Contribution for socio-economic development.

7.3.2. Strategies for Action

The development of digital services relevant to citizens and business, in these four activities, is the most relevant strategic action to promote the adoption of smart devices by individuals and business. This involves continuous investment and large-scale programs that transform these activities in terms of process redesign, data management, back-office development and the front-office interface with the end user.

More specifically related to smart devices, three strategic actions with ample impact are suggested.

Recommendation 11.1 – Centralization of the acquisition of smart devices for the public sector in terms of e-government, e-education and e-health.

Objectives: Acquire more for less. To improve the quality of devices bought and reduce costs, thus accelerating massification of smart devices in the public sector.

Parties Involved: Governments

The centralization of the acquisition of smart devices and associated peripherals such as printers is associated with savings of up to 50% in cost, better adequacy of device for each different type of user, reduction of the variety of brands and better quality of device and of service.

Centralization also allows for adequate data collection, so that governments more easily and more accurately know what the stock of smart devices in use is and what is their performance.

The centralization of the acquisition of smart devices requires the following actions:

- (i) Legislation to make it obligatory for all public entities to buy via the central unit.
- (ii) Professional staffing of the central purchasing unit, with purchasing experts and adequate legal support.
- (iii) Definition of specific types of devices for each category of user.
- (iv) Definition of the characteristics of each type of smart device.
- (v) Anticipatory planning of needs and calendar definition of purchases.
- (vi) Control of maverick buying.
- (vii) If possible, establishment of a digital platform.
- (viii) Definition of KPIs and permanent data collection

Recommendation 11.2 – Provide training in the use of smart devices for public employees





Objectives: Ensure that all public employees have the necessary training for a more effective and efficient use of the SD in their area of work

Parties Involved: Service providers, schools, universities, TVET's, SD providers, supported by DFIs and Government

For public employees in these four activities to make the most productive use of smart devices and also serve the public well, it is necessary to provide them with continuous training in ICT skills.

It is of special importance to train teachers so that they are a positive driver of innovation at school and not a limiting factor to the digitalization of the education sector.

Flagship Project - P.11.1. - Create a digital training task force for public employees

Just as important as having an entire digital system for provision of public services is to have public employees also digitally trained and prepared to make good use of the devices and still be able to ensure greater efficiency in the provision of their services.

A Digital Training Task Force will have the following benefits: it is specialized and therefore more effective in terms of results; it responds for the results it achieves, since this is the only activity, they have; it gathers learning of the needs of public employees and on the most successful training processes.

Recommendation 11.3 – Support African companies and technological startups that invest in the creation of apps for e-health, e-government, e-education, e-agriculture and that contribute to the development of new platforms and software for public management.

Objectives: Use the public procurement budget to support the growth of the African companies and startups that develop solutions relevant to government

Parties Involved: Governments, Investment and Development Banks

The public budget must be used strategically to spur the growth of an endogenous ICT sector in Africa and in each country. So, government should steer their public procurement to be aligned with the local offer that emerges in each country.

In addition, these startups and companies provide government with the innovative solutions that will help them serve the population better and, in this way, also promote the use of smart devices by all.

States (with support from the African Union and international and multilaterals strategic partners), should establish programs where African technology companies and startups that create and develop digital applications and platforms (for e-Government, e-Health, e-Education, e-Agriculture, etc.), can access funding to help support some operating expenses and the operationalization of new ideas and R&D.

Flagship Project - P.11.2. – Ensure broadband connectivity and stimulate the creation of computer labs in primary and secondary schools

It would be a strong value-added to connect primary and secondary schools with broadband connection and to provide spaces to use the devices in an educational context, stimulating the implementation of digital education in African countries. Therefore, governments should ensure that schools, or at least most of them, have access to broadband connectivity, creating programs, in partnership with



MNOs and other relevant stakeholders, to establish internet connectivity at schools and create computer labs, since they address a larger number of beneficiaries.

Public tender programs (by the different telecom operators), with technology, connectivity, service levels, phasing in time and implementation direct at different schools, and a well-defined governance model, enable African countries to have their schools connected to the internet, which would allow them to stimulate and leverage the use of smart devices in the educational context.

Flagship Project - P.11.3. - 1 Interactive board per secondary school Program

It is proposed that the program “1 interactive board per secondary school” be implemented with the aim of strengthening the skills of secondary school students and to inspire them to choose in the future, professional areas related to ICTs that will allow them to develop more advanced skills and contribute significantly to the smart devices single market (alternatively, this program might be more useful in lower grades as young students consume more content than produce).

Considering the high costs involved in acquiring interactive whiteboards and training teachers who will use the boards in the classroom context, it is recommended that:

- the implementation of this program be carried out gradually in each of the countries, starting with a pilot which includes three secondary schools: one located in a rural area, another located in a peri-urban area and the last located in an urban area
- partnerships be established with technology companies and multilateral entities that can finance the acquisition of interactive boards for secondary schools and with telecommunications companies that can provide quality internet to schools

so that they can make a productive use of the interactive boards.

Within the scope of this initiative, it is recommended that a committee be created at the Ministry of Education level to monitor and continuously reinforce the skills of teachers in order to facilitate and promote the process of integrating interactive white boards into the classroom.

In order to assess the impact of the 1 interactive board per secondary school program, it is proposed that a survey be carried out annually, involving all the secondary schools that have at least 1 operational interactive board, with a sample size enough to ensure results with a maximum margin of error of 3 percentage points.

Main activities for the flagship project

1. Establish partnerships with technology and telecommunications companies and multilateral entities to finance interactive boards acquisition and internet for secondary schools
2. Select the secondary schools that will be integrated in the program's pilot phase
3. Select, train and evaluate all the secondary school teachers that will be part of the pilot phase
4. Prepare the necessary conditions in the secondary schools selected to receive the interactive board, including security
5. Implement the pilot phase for 1 academic year
6. Evaluate the implementation of the pilot phase
7. Prepare and implement the action plan to expand the program to other secondary schools
8. Carry out an annual survey to measure the program's impact



7.4. Pillar 12: Digital Inclusion

7.4.1. Introduction

In spite of considerable progress in past decades, Africa still has many socio-economic inequalities and a high percentage of poor people. Covid-19 has had a further negative impact on inequality and poverty. Smart device current adoption levels mirror these inequalities, especially in terms of income levels, skill levels, gender and the urban-rural continuum.

Looking into the future, the desired and much needed rapid progress in the digital dimension can exacerbate this inequality on those less prepared and already disadvantaged in society. In addition, electricity and broadband connectivity is still not available to all geographical areas, especially remote poor rural areas.

Therefore, Africa needs “growth with inclusion”, that is, “inclusive adoption” of smart devices.

The inequalities in income and in skills in particular affect smart device adoption the most. Previous chapters address these two factors. However, an added special attention is required to improve the impact on the most vulnerable to ensure that *“the promise of digital transformation leaves no one behind”*.

7.4.2. Current Status

Digital Inclusion refers to the process necessary to ensure that all individuals and communities, including the most disadvantaged, have access to and use ICT. In this context, smart devices inclusive adoption includes the access of the most disadvantaged groups to a global market of information, communication and transactions with public and private entities,

which translates into social, economic and financial inclusion.

Increasing digital inclusion has been one of the priorities of African countries in recent years, including smart device adoption. Efforts have been made in this direction, as evidenced by several studies carried out in this field. Even so, the levels of digital inclusion remain low.

The more vulnerable groups in the digital transformation process are women, people living in remote rural areas, people living with disabilities, elderly, illiterate and low-income individuals.

With the pandemic, the world has become an even smaller village, which determines a greater urgency in the process of digital inclusion of the millions of Africans who live isolated in social, economic and financial terms due to the non-adoption of smart devices. For example, the pandemic effect in the education sector with the suspension of face-to-face classes in most countries had a large impact on children’s education. While countries with a higher level of digital inclusion were able to continue with classes, switching to online platforms and adapting the methods and techniques, countries with a greater digital divide had to completely suspend classes until safety conditions were met. So, the lack of digital inclusion has large effect in socio-economic development in different countries.

The Inclusive Internet Index 2021 Facebook Report refers that *“The cost of being offline or under-connected now carries far-reaching consequences”* than before the COVID-19 pandemic. The same report presents data that shows a large gap between men and women in terms of internet access and access to mobile





phones, mainly on Sub-Saharan African countries. Additionally, the data shows that this gap has increased in 2021, both for Middle East and North Africa, and Sub-Saharan Africa.

7.4.3. Goals

Skills development and affordability support are the two most important factors in smart device adoption by vulnerable user groups, where connectivity is already available. Affordability is extensively covered in Chapter 7.1 – Smart Devices Affordability, including the most disadvantaged. Skills development is extensively covered in Chapter 5.2 – Skills Development. The recommendations below expand on further measures regarding skills development for disadvantaged user groups.

The main Goals in the digital inclusion component are:

- (i) To provide the disadvantaged groups with enough digital skills to make a productive and safe use of smart devices.
- (ii) To develop relevant, usable and interesting content for disadvantaged groups.
- (iii) To make smart devices available for targeted groups to use for free or at low price (in chapter 7.1.).
- (iv) To finance the acquisition of smart devices by low-income people (in chapter 7.1.).

To achieve each of these goals, the following lines of action, focused only on the skills dimension, are proposed:

- (i) Stimulate disadvantaged group's interest in the use of smart devices.
- (ii) Improve disadvantaged group's digital skills at personal, professional and social levels.
- (iii) Stimulate the production of relevant content for illiterate and disabled people.

7.4.4. Strategies for Action

There is a set of recommendations on the development of digital inclusion in Africa's strategic documents that are also relevant in the context for smart devices, namely:

- Promote gender-inclusive education frameworks and policies and boost relevant education opportunities and digital skills development for women and girls in STEAM-subjects to narrow the gender digital divide.
- Ensure that online services that are relevant to the everyday life of citizens (e.g., e-government) are tailored to different levels of literacy, including financial literacy and digital skills.
- Promote technology-supported learning, including creating and scaling-up e-learning platforms, which offer instant access, and use open educational resources.
- Ensure that innovative digital knowledge products and learning opportunities reach people from diverse backgrounds and regions, by ensuring that platforms have mobile versions and offline functionalities targeted to those living in disconnected remote areas.
- Ensure access to affordable devices to people living with disability, elderly and the Disadvantaged.



- Create innovative financial instruments for infrastructure deployment in Africa with a focus on underserved areas.
- Build on and scale up existing initiatives to map the infrastructure needs in Africa and provide a priority list for investments in building the missing links.

The implementation of these initiatives has a direct impact on the increase of digital inclusion and therefore in a higher adoption rate of smart

devices. Even so, there is need to complement these interventions, with more specific ones in terms of smart devices.

The proposed initiatives that are presented below have a common denominator: the change of culture. *"A strong digital culture ensures that no person is left behind as a country advances in its digital transformation"*.

Strategy	Short Description	Main Entities Involved	Type of Strategy
Raise Awareness of SD Impact	Raise awareness of disadvantaged groups, through specific communication campaigns, to the importance of smart devices and of the digital skills and capabilities needed to improve the quality of their lives in several specific areas.	National communication authorities, Media, Providers (MNOs, manufacturers, and assemblers) and Associations	Individual, group, project focused
Train SD Users from Excluded Groups	Train users from excluded groups in the basic skills of using a smart device so that they can take full benefit of their use, thus promoting SD adoption and SD impact on daily life.	Service providers, schools, universities, TVET's, SD providers, supported by DFIs and Government	Individual, group, project focused
Develop relevant content for illiterate and disabled people	People's interest in using smart devices largely depends on the perception of benefits that they can access with these devices, namely products, services and content.	Service providers, universities, SD providers, supported by DFIs and Government	Individual, group, project focused

Table 12. Recommended strategies for digital inclusion that will promote smart devices' adoption.



Recommendation 12.1 – Raise awareness of smart devices' impact on raising quality of life

Objectives: Raise awareness of disadvantaged groups, through specific communication campaigns, to the importance of smart devices and of the digital skills and capabilities needed to improve the quality of their lives in several specific areas.

Parties Involved: National communication authorities, Media, Providers (MNOs, manufacturers, and assemblers) and Associations

This will involve broadcasting key-messages and personalized use cases on specific channels to make people from excluded groups aware of the importance of smart device adoption, mainly through sharing of success stories from their peers. These should relate to specific life activities and specific target groups, such as women and girls, people living in remote rural areas¹¹⁴, people living with disabilities, elderly, illiterate and low-income individuals, in several national languages using clear and simple language. Annual campaigns over the next 5 years.

Main activities:

1. At country level, develop and implement communication plans targeting all the excluded user groups.
2. Establish partnerships with associations for the design and dissemination of communication and awareness materials and formats to stimulate the adoption of smartphones.
3. Produce communication and awareness materials and formats – workshops, videos, leaflets, posters, plays, among others - to

stimulate the adoption of smartphones targeted at each user group.

4. Produce communication and awareness materials and formats in all official and national languages of African countries.
5. Carry out an annual survey to measure the impact of communication and awareness campaigns.

Recommendation 12.2 – Specific Training on SD Use and benefits for Excluded Groups

Objectives: Train users from excluded groups in the basic skills of using a smart device so that they can take full benefit of their use, thus promoting SD adoption and SD impact on daily life.

Parties Involved: Service providers, schools, universities, TVET's, SD providers, supported by DFIs and Government

This strategic action involves specific national training programs over the next 5 years to uplift the skills of women and girls, people living in remote rural areas, people living with disabilities, elderly, illiterate and low-income individuals in the use of smart devices: smartphones, tablets and PCs.

For each of these target groups, it is recommended the development of personalized training programs for different levels (basic, intermediate and advanced skills) and the establishment of partnerships for their implementation, namely cooperatives, service providers and DFIs.

Initiative 12.2.1 – SD digital skills training to empower women and girls

¹¹⁴ With the support of community leaders and local authorities.



The development of digital skills for the productive use of smartphones by women and girls is one of the important forms of empowerment. For the implementation of this initiative, it is recommended to develop an integrated training program that focuses on the development of 3 levels of digital skills, starting from the basics for the use of smart devices and business development to advanced ones for the production of relevant content for African women and girls.

These programs should focus mainly on the basic skills level to heighten the benefit of the use of smart devices, namely for income generation and growth. However, with women and girls, there should be a strong effort to also train them in the more advanced skills, at university level.

Main activities

1. Develop the training program in coordination with service providers, schools, universities, TVET's, SD providers, supported by DFIs
2. Implement and evaluate the pilot in 3 areas: rural, urban and peri-urban
3. Program roll-out nationwide
4. Assess the direct and indirect impact of the implementation of the training program on the adoption of smart devices by women, girls and their families and business development
5. Select successful cases from the training program and integrate it into the awareness initiative of the women's and girls group

Case Study: African Girls Can Code Initiative

United Nations Women

UN Women, in partnership with the African Union Commission (AUC) and the International Telecommunication Unit (ITU) implemented the African Girls Can Code Initiative to train African girls in critical coding and tech skills.

Outcome: Launched in 2018, the first phase of the African Girls Can Code Initiative (AGCCI) has trained 600 girls, developed a guide on mainstreaming ICT, gender and coding in national curricula across the continent, launched an eLearning platform and hosted a series of webinars to keep the learning going in the pandemic.

Initiative 12.2.2 – SD digital skills training program in rural remote areas with solar energy

For this program to have an impact it needs to be integrated with renewable energy investment, mobilizing all existing potential resources in order to grant universal access to energy.

As stated in the Renewable Energy Transition in Africa¹¹⁵, energy is an enabler for sustainable development and has several impact dimensions namely: access to new technologies; online learning; new healthcare technology; new communication skills; new businesses creating employment opportunities; and safeguarding biodiversity and the environment.

Most of the population that live in rural remote areas do not have access to grid energy¹¹⁶, although they may have access at some points to telecommunications and internet services. Therefore, one way to motivate the adoption of smart devices among this target group is

¹¹⁵ https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/March/Renewable_Energy_Transition_Africa_2021.pdf

¹¹⁶ Around 548 million people in Africa have no access to electricity today. Of these, 472 million live in rural areas (Source: Renewable Energy Transition in Africa)



providing training in digital skills using SD that are powered by solar energy grids and that can be acquired as a package.

Main activities

1. Develop a training program in digital skills in coordination with renewable energy authorities, supported by DFIs
2. Implement the training program in remote rural areas powered by solar energy.
3. Develop a financing program to promote the acquisition of smart devices and solar energy systems
4. Implement the financing program to promote the acquisition of smart devices and solar energy systems
5. Assess the direct and indirect impact of the implementation of the training program on the adoption of smart devices by people living in remote rural areas and business development
6. Select successful cases from the training program and integrate it into the awareness initiative of the people living in remote rural areas

Initiative 12.2.3 – SD digital skills training program to the elderly and abandoned children

One of the groups that has been excluded from the digital transformation process is the group of elderly, due to limited digital skills, including the ones needed for the proper use of smart devices.

In Africa, due to cultural habits, society tends to value the elders as living libraries. By excluding this group from the digital transformation process, a lot of knowledge that usually was passed from generation-to-generation orally is

lost. With the implementation of digital skills in SD training program directed to elderly, opportunities arise for the creation of content relevant to African audiences, as well as the possibility of a more efficient knowledge transfer between professionals with greater experience.

On the other hand, many children are separated from their parents or extended family due to socio-economic disruption or wars. Sport has played an important role in providing a focus of attention and of growth to these kids. Nowadays, digital skills can be a more powerful focus and empowering tool for these kids.

It is proposed that training be given to elderly and the abandoned children in focused programs, but that intergeneration programs also be developed, joining young people to elderly, and implemented in secondary schools and in children support centers. The idea is to create a program that allows younger people to coach and mentor the elderly in SD digital skills given them a purpose and also to facilitate the learning process of the elders.

Main activities

1. Develop training programs in coordination with training service providers, schools, community centers, SD providers, supported by DFIs
2. Implement a pilot and evaluate in 3 areas: rural, urban and peri-urban
3. Program roll-out nationwide
4. Assess the direct and indirect impact of the implementation of the training program on the adoption of smart devices by older people and by children



- 
5. Select successful cases from the training program and integrate into the awareness initiative of the elderly.

Recommendation 12.3. – Develop relevant content for illiterate and disabled people

Objectives: Increase the number of contents that can be useful to illiterate people and people with disabilities, so that they see a purpose and take benefit in using SD.

Parties Involved: Government, Service providers, universities, SD providers, supported by DFIs

Initiative 12.3.1 – SD Competition for content development for illiterate and disabled people

This initiative should inspire and promote the development of content designed specifically

for excluded groups, namely people living with disabilities and illiterate, both in the public and private sectors, through the development of content, apps and websites.

It is expected that with these competitions the number and diversity of content produced and available for people living with disabilities and illiterate in Africa will grow significantly, while increasing the weight of digital content developed by Africans globally.

It is important to highlight that the type of language and the form of communication used for these target audiences have a set of specificities that have to be taken into account when producing content. Depending on the type of disability, the way in which smart devices are operated must also be adapted.







8. IMPLEMENTATION PILLARS





8. IMPLEMENTATION PILLARS

The Foundation Pillars, Smart Devices Value Chain Pillars and Critical Issues Pillars address the challenge of inclusive smart device adoption mainly from a conceptual and continental perspective.

The Implementation Pillars address the challenge of making it happen, looking into an integrated Roadmap and four main pillars of implementation.

8.1. A Road Map for Action

The implementation of the Blueprint for Inclusive Adoption of Smart Devices in Africa involves the steps summarized in the image below, requiring decisions and actions at political levels, such as the African Union and each African country, the engagement of multiple stakeholders, the definition of funding, monitoring and reporting mechanisms, agreement on and mobilization of the necessary funding, adoption of structural measures at continental and national levels, as well as awareness campaigns and concrete implementation focused on SD affordability, SD production, SD skills development and SD vertical adoption. External to the blueprint are fundamental actions relating to the necessary energy, connectivity and road infrastructure, as well as broader actions on skills development.

In order to optimize the implementation four pillars are detailed below:

(i) The National Framework Pillar presents a methodology for each country to establish

concrete objectives and action plans to “move from paper to action”, a term used in the African Union’s Agenda 2063, adopting this Blueprint as the point of departure, expanding or omitting some of the strategic actions recommended, or adding new ones, and establishing the organizational capacity and mobilizing the necessary resources.

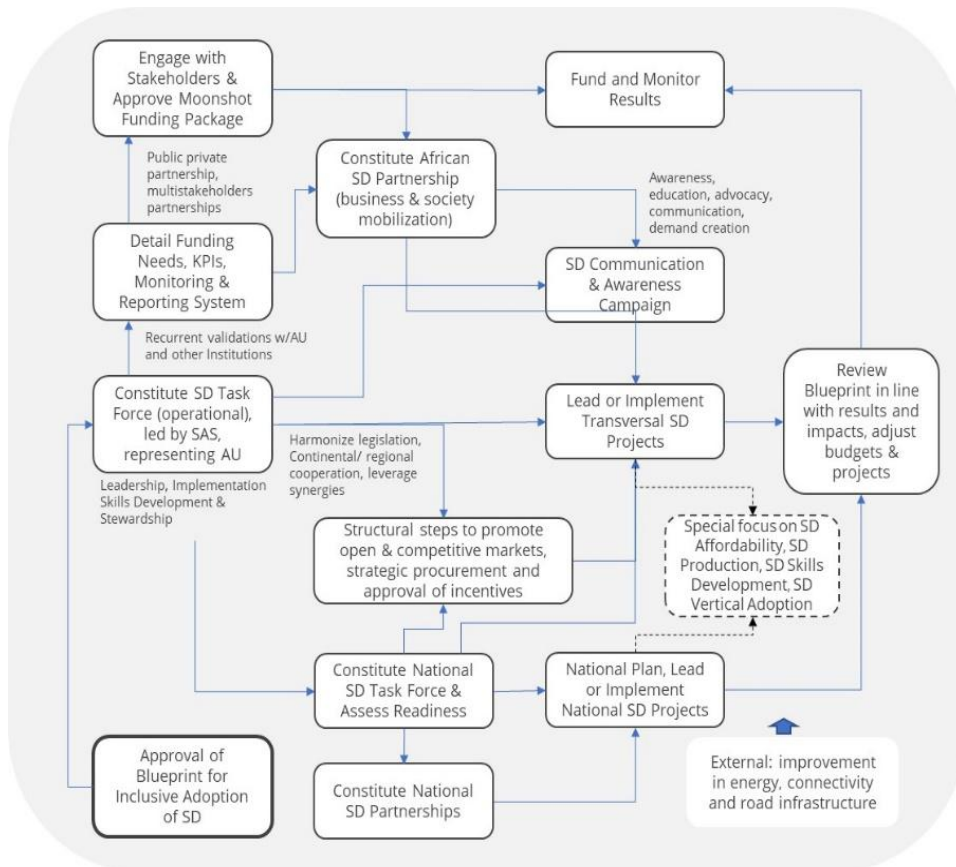
(ii) The Communication and Cooperation Pillar highlights the importance of a campaign of awareness of the critical relevance of smart devices in empowering citizens and business in Africa to make the 4th Industrial Revolution a success and the need to integrate cooperation strategies into the implementation process that cut across silos and work through the various interdependencies involved in making smart devices a basic daily tool for each African citizen.

(iii) The Stakeholders Engagement and Alignment Pillar identifies the key institutions



that should be involved in funding and implementing the blueprint, as well as some priorities of action.

Figure 42. Road Map for Implementation of the Blueprint for Inclusive Adoption of SD



- (iv) The Adequate Funding and Incentives Pillar address not only the funding challenges that need to be overcome but also the right incentives to keep investment flowing into this challenge over time and naturally.

African countries have different characteristics and are at different stages regarding digital development and smart device adoption. So, recommendations have different levels of applicability and priority in different countries. Even within each country, there are significant differences and even inequalities, namely between urban and rural areas and among different user groups, as well as situations of exclusion, namely regarding the poorest, remote farmers and young women.

8.2. Pillar 13: National Frameworks for Inclusive Smart Device Adoption

The principles for the development of the national frameworks for the implementation of this blueprint are aligned with the ones of the Digital Transformation Strategy for Africa (2020-2030), which, among others, recommends fostering a harmonized policy, legal and regulatory framework, a robust monitoring, evaluation and reporting framework with

appropriate key performance indicators (KPI) for the strategies proposed, capacity building and a framework for regional cooperation and mutual assistance.

African countries must follow a 9 steps approach in order to put into practice the recommendations proposed in this blueprint.

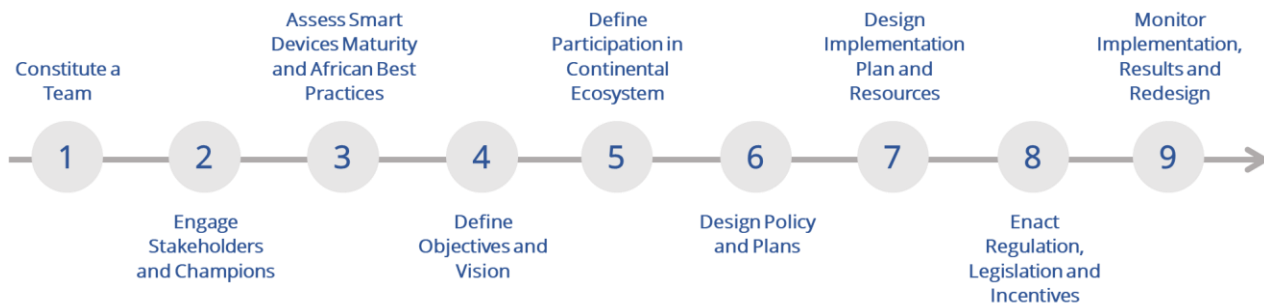
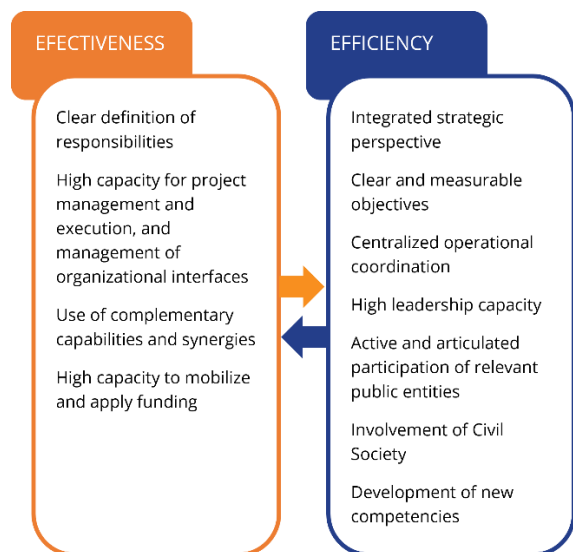


Figure 43. Steps of the SD National Frameworks

8.2.1. Constitute a Team

Constituting and empowering a dedicated SD team is a critical success factor for the implementation of the recommendations of this blueprint. It prevents the existence of dispersed responsibilities in decision makers who have various objectives to achieve, which would jeopardize the efficiency of the implementation of the recommendations.



Moreover, the implementation of a SD strategy is a learning process, which must be apprehended by a dedicated team. The creation of such a team must meet the requirements of effectiveness and efficiency, as indicated in the figure.

The SD team should have different dimensions in different countries, although it is recommended to have at least a team leader, a manager for SD production programs, a manager for SD affordability programs and a SD procurement specialist.

Additionally, it is important that social and economic agents are involved in the implementation phase. A participative model should be adopted, based on the creation of a Partnership for the development of the SD ecosystem, which must act as catalyst of the participation of all relevant entities.

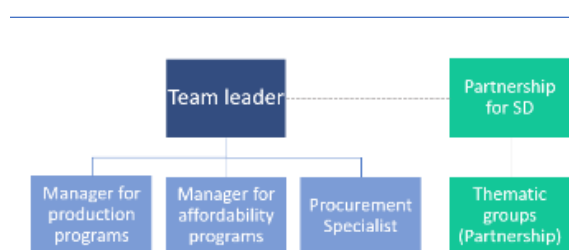
The team leader must have knowledge in smart devices and of the African context, capacity to build bridges, ecosystems and relationships in order to be able to mobilize government institutions and the private sector (big international manufacturers, distributors, MNOs and others). The team will be responsible for articulating and monitoring the work carried out by other teams and for monitoring the levels of implementation of the strategy.



The manager for production programs needs to have knowledge about manufacturing and Industry 4.0 dynamics and technologies. The main role of the manager for production programs is to find solutions to implement production objectives in Africa, by stimulating the involvement of universities, R&D institutions, investors, manufacturers and distributors in the ecosystem.

The manager for affordability programs must be focused on the affordability recommendations of this blueprint, especially those referring to 3rd Party Finance and to fiscal policy. This manager also needs to be permanently engaging with MNOs, retailers, manufacturers and other players of the value chain, such as distributors, in order to arrive at solutions that allows reduction in the total cost of ownership. Additionally, this manager must also collect market data regularly: prices, income, consumption patterns and other relevant data and come up with solutions for the issues identified.

Figure 44 - Organizational architecture for SD development in each country



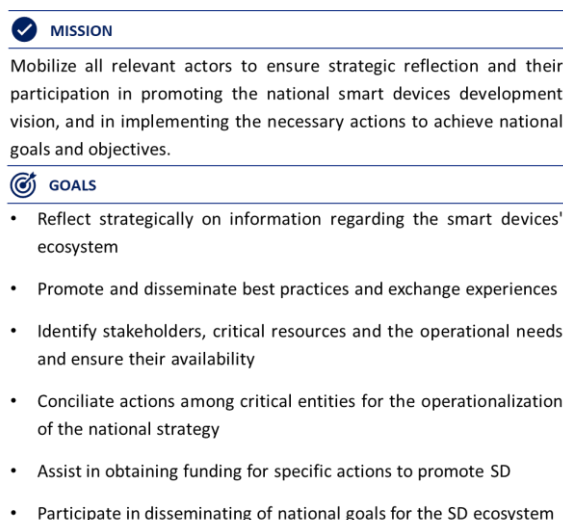
The procurement specialist must be a sector specialist in SD for the purchases of SD for public institutions or in programs where the public sector is involved. Governments with specific procurement policies for SD projects

can achieve significant efficiencies by aggregating demand across the public administration sector. This specialist must advise or substitute the procurement department on aggregation, assist all departments in the definition of specifications and terms of reference and help to calculate and negotiate total cost of ownership. The procurement specialist needs to ensure that decisions on purchases consider device durability and maintenance factors and not only its cost of purchase.

Finally, for this organizational structure to function properly, its ethical code and legislative framework must also be created.

The National SD Partnership should have the following mission and objectives, as indicated in the figure. It should be internally organized in thematic groups, either by Blueprint pillars or other criteria to be more focused in its action. These thematic groups represent the operational capacity of the Partnership.

Figure 45. Mission and goals of the Partnership for the SD ecosystem



These groups must adopt a posture of consensus and accountability and include





people with high knowledge and power of decision.

8.2.2. Engage stakeholders and champions

The engagement of stakeholders and champions is essential to have a diverse representation and making sure the strategy is implemented efficiently. Countries need to engage with multilaterals, NPOs, MNOs, retailers, vendors, manufacturers, distributors, local entrepreneurs and start-ups as they are necessary elements for the implementation of the recommendations. In addition, these consultations must be intentional in drawing from a diverse array of backgrounds, especially with regards to gender and geographic areas.

The partnership for SD development can be a way of mobilizing stakeholders, promoting meetings to identify willingness to carry out or participate in the implementation of the strategy. There should be at least one annual seminar with all the stakeholders in each country, to promote alignment.

Champions are influential individuals or organizations that are at the forefront in a given area and can help make change happen. Champions can work with the SD Team to guarantee the vision is successfully implemented. African countries must identify and nurture champions of all sizes, follow their examples, learn from their experience and clean the path for them to continue to succeed.

8.2.3. Assess Smart Devices Maturity and African Best Practices

Each country must do a SD maturity assessment to understand its position, comparing the national market with the rest of the African countries. In addition, a SWOT analysis must be carried out, to identify strengths, weaknesses, opportunities and treats in the development of the SD ecosystem.

For this purpose, countries should come together and define a common framework for the assessment, with national, regional or global key performance indicators for the assessment. Data should be analyzed and presented in formats that are easy to understand and follow a pattern. It has been recommended in Chapter 4.3. that a common SD Inclusive Adoption Score Card is developed for all African countries.

To guide decision each country must collect data and produce statistics on Smart Devices, either through the National Statistic Authority, an ICT Observatory or university/research body. National Statistics Authorities can play an essential role in collecting data on smart devices, given that they already have the skills and the means for data collection. The first step is to understand if the entity already collects relevant data on smart devices and identify the typology of it. If the information available is not enough for a complete maturity assessment and strategy implementation, the national statistics entity should be involved and made aware of the need to collect this data in its normal procedures.

8.2.4. Define Objectives and Vision

The vision and the objectives to achieve within the national strategy for smart devices must be defined with the inputs, not only of the recommendations of this blueprint, but also with inputs of the assessment made on the



maturity of smart devices. After understanding its current position in the continent, each country should define the strategic ambition for the ecosystem of SD to be achieved in 5 years and in 10 years. So that all countries can develop *pari passu*, it is recommended that this ambition be concerted among all countries, or at least, with the ones with similar current situations.

This vision statement and objectives defines the main reason for implementing the strategy and it will help to engage stakeholders, champions and the society in general, by making transparent the objectives that are intended to be achieved. Besides that, it gives direction for the long-term, ensuring that the strategy does not deviate from the main objective. The objective must be SMART: Specific, Mensurable, Achievable, Realistic and Timebound.

Finally, the vision and objectives need to be clearly communicated to engage stakeholders and champions.

8.2.5. Define Participation in Continental Ecosystem

Several recommendations of this blueprint are collective actions involving several countries. Each country must identify the joint actions in which it wants to actively participate.

Countries can choose to prioritize shared actions at the regional or pan-African level. Whichever option is chosen for collaboration in the continental ecosystem, it must be clearly communicated to all involved. The collaborative actions to be taken can be refined and the responsibilities of each partner must be jointly

defined.

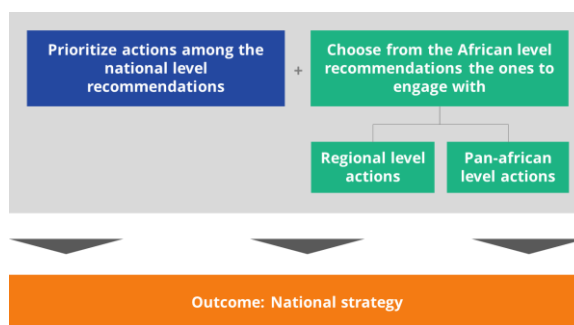


Figure 46 - National strategy decision flowchart

8.2.6. Design Policy and Plans

It is necessary that all countries create a national blueprint, identifying the priority measures and actions and evaluating the needed budget to implement them. This blueprint provides the basis for the national plans. The national blueprint for inclusive smart device must be approved officially by the government of each country and have legislative recognition.

8.2.7. Design Implementation Plan and Resources

Once the national blueprint has been created and the budget defined, it is necessary to specify the implementation plan and identify the necessary resources (human, financial, technical and others).

Implementation priorities and respective deadlines must be outlined, responsibilities and funds assigned, and indicators of the implementation of the policies must be chosen. When possible, as recommended for the maturity assessment step, the key performance indicators and the report models should be aligned between countries that are working



together and with stakeholders, both in terms of frequency, as well as the information included and the model for presenting the results. This will help to compare positions and to understand the progress made towards the single market for Africa.

The implementation plan can be conceptually described as follows.

8.2.8. Enact Regulation, Legislation and Incentives

Without an adequate regulatory environment, the objectives of the SD blueprint will not be achieved.

In addition, countries must also consider the formulation of legal policies that promote the creation of a single market for SD in Africa.

regulations, legislation and incentives were called legal policies).

8.2.9. Monitor Implementation, Results and Redesign

Monitoring Implementation, Results and Redesign is a decisive procedure in verifying the efficiency of policy implementation, both the increased adoption and use of smart devices, as well as the digital empowerment of the population, ensuring that each country can have a sense of feasibility, whether the goals and metrics are realistic, and whether or not the results are being achieved, according to the defined key performance indicators.

This step must be based on a logic of:

- Measuring the return on investment, in economic terms, of efficiency, effectiveness and usefulness
- Reporting the results obtained with transparency
- Measuring concrete results, comparing with the established objectives
- Being on top of the event, rethinking actions whenever necessary

When monitoring the implementation of the national strategy, it is critical to monitor three aspects of effectiveness – deadlines, budget and quality of the results obtained – and two aspects of efficiency – verification of the adequacy of the technical solution and of mobilization and participation.

Such monitoring could be guaranteed by the SD Team, which could assist in the communication between the Governments and the population.

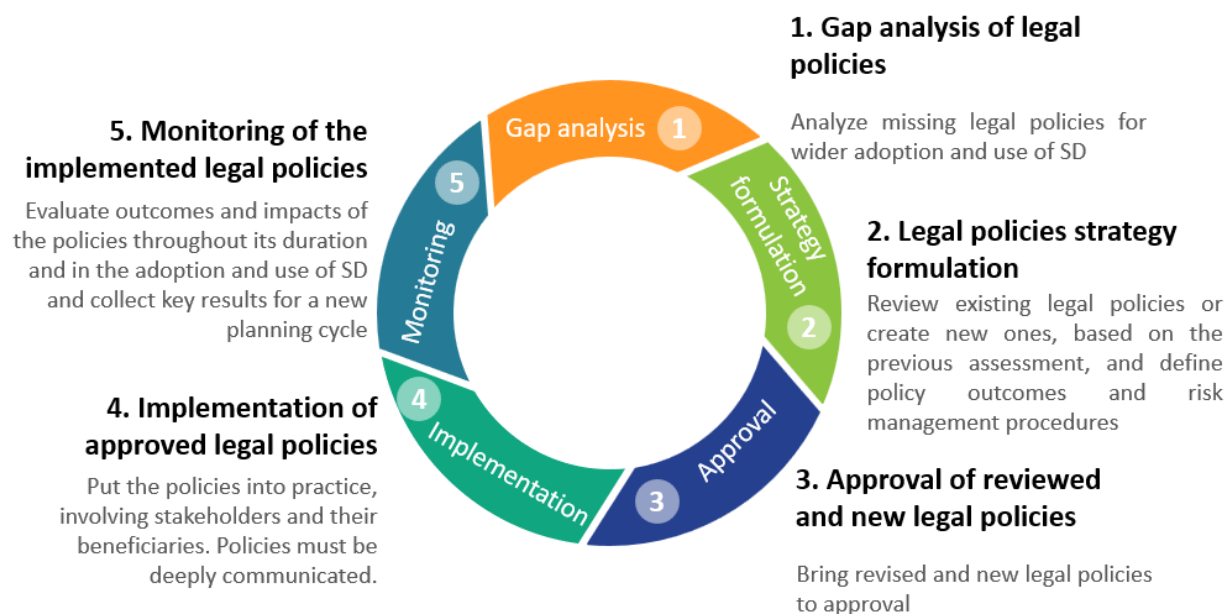
The legal policy planning process can follow 5 steps (to simplify the communication,



Figure 47. Essential steps to develop a national framework implementation plan.



Figure 48. Legal policy planning process



8.3. Pillar 14: Communication & Cooperation Strategies

SD Inclusive Adoption is a pan-African challenge that needs to be prepared at a continental, regional and country level and involves multiple stakeholders which brings complexity and the need for a communication and cooperation strategy based in an innovative ecosystem perspective.

An innovative ecosystem consists of interdependent actors, from within the value chain and beyond, working to pursue both individual and collective goals – many times conflicting ones. Transformation processes that require a high level of technological innovation, knowledge management and human talent, need integration and interaction among all the components, adding up much more than the value of the parts individually.

Working through an innovative ecosystem includes elements that are fundamental to the process, such as: i) the collaborative work –

sharing knowledge and progress and especially attracting new actors that can bring added value to the process; ii) an innovative approach, bringing new ideas, tools and models to the process, that would not otherwise be activated; iii) the adaptive capacity, the possibility of shaping the process at every moment and adjust quickly, focusing on the critical issues; and, iv) the dynamics of operation, mobilizing resources and partners that otherwise could not be integrated.

While ecosystem-building has been a red-hot topic in recent years, the COVID-19 crisis has amplified the importance of digital interactions and will likely further accelerate the adoption of digital-ecosystem models. That is why it is highly recommendable that many of the communication tools can be digital and that a digital collaborative network tool be implemented.

Combining every effort also requires analytical capabilities that are a source of competitive advantage in an ecosystem. Any value chain or business that lacks advanced-analytics capabilities will struggle to remain relevant. Advanced-analytics excellence also requires open, modular tech/ data capabilities.

8.3.1. Communication and Cooperation Key Elements

The first step is to clearly revise the main vision and key messages so that they are sufficiently powerful to achieve an alignment between all stakeholders. Then a communication strategy shall be designed and anchored in the process. The next stage is to implement support tools and finally establish a follow up process.



The following key communication elements are recommended.

- (i) The first practical action to be implemented is the designation of a C&V (Communication and Visibility) focal point within the SAS SD Task Force for the most important stakeholders to coordinate all the efforts and manage the budget allocated.
- (ii) A tool for sharing innovation and development, which allows the integration of all stakeholders in a collaborative and

secure way, is another of the fundamental elements of the implementation of the program in order to ensure cooperation between all stakeholders in different countries.

- (iii) A powerful analytical tool that has the various data in terms of markets, production, user-needs, value chains, among others, and that is equally shared among the stakeholders is another cooperation tool that must be implemented.
- (iv) It is also important the development of a modern web site where the entire program and its different areas of action are presented so that the entire community can access the program and objectives that are intended to be accomplished as well as the results already achieved. This website should also have some calls to action, in terms of the potential participation of all agents who are willing to join the process.
- (v) Several seminars focused on the various topics must be held in order to obtain specific contributions and commitment of the stakeholders – especially for the most important implementation pillars – in order to bring the entire value chain to the implementation of the program.
- (vi) A more comprehensive annual conference is recommended, where major actions and budget are defined and decided, complemented by a set of specific workshops for each of the key issues.
- (vii) For a more bottom-up approach, some webinars focused on specific technical issues (for instance, conducted by research and investigation institutes) – for the participation of a wide range of actors.



8.4. Pillar 15: Stakeholders Engagement & Alignment

A multiple-stakeholder approach to the Smart Devices economy and value chain is essential for a successful implementation, combining the indispensable efforts of the various participants who will play different, but important roles in the operationalization.

These are the main stakeholders necessary to implement the main recommendations of this blueprint:

- African private sector companies are the primary drivers of the Smart Devices economy across the value chain and the main actors of implementation. They will be key to develop the value chain and generate employment. Among these entities, the mobile / telecommunication operators should be highlighted, as they can make a difference in prioritizing the commercialization of smart devices produced in Africa.
- The African Governments to develop the necessary policies and legislation necessary to support the development of the smart devices value chain and manufacturing processes and also implement all the supporting instruments needed to leverage the actions within this blueprint.
- African SME's and new startups, participating in specialized and focalized areas of the value chain, complementing the role of the main private actors, actively engaging in the processes of the value chain, so they can strengthen their market positions in the future and conquer new market.

- The international SD mega players, international investors and venture funds that have the interest of investing in Africa, implementing new production sites that constitute a complement to the current ones and can gradually gain cost efficiency.
- The multilateral organizations with its institutional aggregation competence and its financing capabilities of initiatives that allow the growth of production, employment and sustainability conditions in Africa.
- Research and Training Institutions including the academy at university level, that allows the generation of new knowledge, skills and competences that have an impact on the sustainability of the value chain.
- Special interest groups including specific trade associations, African labor unions, lobby groups, women's groups, consumer organizations and other specific groups that are important to defend the sector and value chain interests across Africa.

8.4.1. Specific Issues to Promote Stakeholder's Alignment

To promote the alignment among all these stakeholders, there are some specific issues that should be considered:

- Let everyone participate and be aware of the plan.
- Ensure enthusiasm and buy-in, discussing and communicating the benefits of the proposed changes.



- Focus on capacity building more than in systems or technology, understanding that it is people who will inevitably design, implement, disseminate, and support the necessary changes.

Stakeholder engagement can be best reached by performing 7 steps.



Figure 49. Stakeholders' engagement framework

ANNEXES

Annex 1 — Types of Smart Devices

	Description	Purpose
 117	Basic and Feature Phones are hand-held mobile devices with cellphone capability, small low-resolution screens and typically an alphanumeric keypad. The main difference between the two is that basic phones do not have internet access (therefore, are not smart devices) while feature phones have basic internet access and a lightweight operating system that supports pre-installed apps.	Basic phones are used for communication purposes and do not allow users to access digital services. Feature phones have access to the internet, but do not allow users to expand their digital skills beyond a basic level due to their limited capacity — they typically cannot download apps and when they do their memory is very limited. Mainly consumption device.
	Smart-Feature Phones are a recent upgrade on the traditional keypad feature phones. They support a lightweight operating system (<i>i.e.</i>, KaiOS) with the capacity to install mobile applications.	Smart-feature phones provide users with a wider range of possibilities than feature phones due to their ability to download mobile apps, however like feature-phones they have a fairly limited memory. Mainly consumption device.
	Smartphones are hand-held mobile devices with a large touch screen display, cellphone capability and an operating system (commonly Android or iOS) with processing capacity for multiple apps, which can be downloaded online. They have Wi-Fi connectivity and mobile network modems (3G and above).	Smartphones are optimized for mobile internet uses such as communication through social media (Facebook, WhatsApp, etc.), information access (weather forecasts, market research, etc.) and digital money transfers. They allow for the uptake of basic digital skills. Mainly consumption device.
	Tablets are portable personal computers similar to smartphones regarding operating system and capability, with the exception of the screen display size which is larger (7" — 10"). They are mainly designed for internet use and not to be used as a telephone. While tablets have Wi-Fi connectivity, they may or may not have mobile network modems. Furthermore, they can be coupled with peripherals devices such as keyboards for a more comfortable typing experience.	Although tablets are mobile, they are mostly for indoor use due to their size. The larger high-resolution screens are ideal for consuming media, online learning (e-books, visual media, etc.) and simple and structured input of data (surveys, monitoring data, etc.) and simple production work. Larger screens also give them more functionality when compared to smartphones regarding tasks that require user input (<i>e.g.</i>, secretary and administrative work). Mainly consumption device.

¹¹⁷ Icons by Freepik, available at <https://www.flaticon.com/authors/freepik>



	Desktops are personal computers designed for use at a single location (e.g., desk), commonly with Windows, MacOS or Linux operating systems and processing capacity for multiples programs. They require both peripherals (i.e., screen monitor, keyboard, mouse, microphone and speakers, etc.) and a power supply — since they do not have batteries. Their components and peripherals are also customizable to the user's needs.	Desktops are the most suitable devices for activities which require extended user input and advanced processing capacity (e.g., writing, presentation and graphical design, data management and technological development). They are most commonly used by enterprises, government and <i>gamers</i>, which usually need high computing power or a device that isn't mobile due to the type of work and/ or for security reasons. However, their use is dependent on stable power supplies. They are both consumption & creation devices.
	Laptops and Notebooks are portable personal computers with Windows, MacOS or ChromeOS operating systems and all the peripherals needed imbedded, namely the screen monitor mounted on the inside of the upper lid and the keyboard and mouse pad on the inside of the lower lid. Notebooks were traditionally smaller and lighter than laptops, however the terms are mostly interchangeable today.	Laptops and notebooks join the capabilities of both tablets and desktops. They are portable and suited for media consumption, while useful for extended user input and advanced processing capacity (depending on the devices specifications). When compared to desktops, portable devices typically have less processing power and customizability, however they do not need a stable power supply due to their battery and tend to be less expensive. They are both consumption & creation devices.
	2-in-1's are portable personal computers with similar operating systems as laptops, a touch screen (unlike traditional laptops) and a keyboard. The device can be either convertible or hybrid. <i>Convertible</i> — It has a physical keyboard attached, which can be hidden behind the screen by sliding or rotating it. <i>Hybrid</i>—It has a detachable physical keyboard.	2-in-1 devices join the functionalities of both tablets and laptops. They are both consumption & creation devices.
	Interactive white boards (IWB) are touch screen displays in the form of a classroom whiteboard typically with 50" to 75" in size. These can be either a stand-alone device with the features of a computer or connected to a personal computer.	IWBs are ideal for communicating with large audiences due to their screen sizes and interactive features. They are useful in the context of education (as a way to expose students and teachers to digital content) and in corporate/ government meeting rooms where graphical presentations are important. Mainly consumption devices.

Table 13. Types of Taxes on Smart Devices. ¹¹⁸

¹¹⁸ Alliance for Affordable Internet - Luxury to Lifeline Report:

https://docs.google.com/document/d/1YFXbUr-WOLTOAXs9QEtlf8oEBsrakQ_ILeHUyb-6oEY/edit#heading=h.u9bc6ra0ng2k



Annex 2 - Internet activities by level of development and region

Internet activities undertaken by individuals, by level of development and region, in %					
Internet Activity	Developed economies	Transition economies	Developing economies - Africa	Developing economies - Asia	Developing economies - Latin America & Caribbean
Participating in social networks	70.4	70.7	86.3	87.2	79.0
Streaming or downloading images, movies, videos or music, playing or downloading games	67.4	52.9	64.2	66.4	50.8
Downloading software or applications	19.0	5.5	62.8	41.0	20.7
Making calls (telephoning over the Internet/Voice over Internet Protocol using Skype, iTalk, etc.)	56.9	71.0	47.6	63.2	73.4
Sending or receiving email	84.9	44.8	46.6	69.7	52.4
Accessing or posting opinions on chat sites, blogs, newsgroups or online discussions	13.9	11.6	45.1	26.6	26.0
Reading or downloading online newspapers or magazines, electronic books	76.4	413.0	38.6	46.0	30.2
Getting information about goods or services	83.9	50.4	30.6	68.0	51.8
Watching web television	41.1	8.8	30.2	33.1	18.1
Seeking health information (on injury, disease, nutrition, etc.)	62.4	37.5	24.3	47.1	41.1
Getting information from general government organizations	55.1	11.1	17.6	20.9	23.2
Doing a formal online course	81.0	4.5	17.5	15.9	28.5
Using storage space on the Internet to save documents, pictures, music, video or other files	68.7	16.0	17.5	20.8	21.7
Consulting wikis, online encyclopedias or other websites for formal learning purposes	23.8	14.5	17.2	13.2	31.4
Purchasing or ordering goods or services	63.9	18.2	14.6	29.1	13.1
Looking for a job or sending/submitting a job application	17.4	9.8	14.3	19.9	16.6
Listening to web radio	61.2	17.0	13.3	20.9	11.2
Uploading self/user-created content to a website to be shared	38.8	23.4	12.7	21.3	35.6
Interacting with general government organizations	64.6	6.7	12.1	25.6	10.7
Internet banking	62.3	14.9	9.8	34.8	11.6

GSMA Mobile Connectivity Index:

<https://www.mobileconnectivityindex.com/>



Using services related to travel or travel-related accommodation	66.0	5.7	7.5	25.2	2a4
Using software over the Internet for adding text documents, spreadsheets or presentations	24.0	4.3	6.1	11.7	4.8
Participating in professional networks	21.0	3.6	5.9	6.4	0.7
Taking part in online consultations or voting to define civic or political issues	9.8	3.6	5.5	8.1	N/A
Making an appointment with a health practitioner via a website	16.4	3.9	4.0	7,6	3.1
Selling goods or services	16.8	7.0	3.5	6.4	9.3

Source UNCTAD calculations, based on ITU World Telecommunication ICT Indicators database. Notes: Country groups are those of the source. Averages for country groups are medians of countries for which data are available and for the latest year, which ranges between 2015 and 2019.

Annex 3 — Types of Taxes on Smart Devices

Tax Group	Description	Designation
Consumer Taxes		
Value Added Tax (VAT)/ General Sales Tax (GST)	A common tax applied to consumer goods and levied proportionally to the value of the product being sold.	General Tax
Excise Tax	Special taxes (or higher VAT rates) on the purchase and use of mobile handsets and services, SIM cards and their activation, etc. Excise taxes are commonly applied to tobacco, alcohol and luxury goods.	Sector-Specific Tax
Import Duties (on Consumer Goods)	Customs duties/ fees on imported handsets and SIM cards.	Sector-Specific Tax
Operator Taxes		
Corporation Income Tax	Income tax on profits/ revenue.	General Tax
Employment Taxes	Tax paid on behalf of the employees: including personal income tax, social security contribution, etc.	General Taxes
Regulatory taxes and fees	Taxes and fees related to the telecom sector such as annual fees on licenses, treasury shares, universal service funds and numbering taxes.	Sector-Specific Taxes
Spectrum Fees	Annual fees on spectrum usage.	Sector-Specific Taxes
Import Duties (on Network Equipment)	Customs duties/ fees on imported network equipment.	Sector-Specific Taxex
Other General Taxes	<i>E.g.</i> , Municipal, environmental and property taxes, etc.	General Taxes

Annex 4 — Minimum Smart Devices Requirements

Smartphones' minimum requirements.

Network	
Technology	GSM / HSPA / LTE
Body	
Dimensions	113.6 x 65.7 x 9.8 mm (5.42 x 2.59 x 0.39 in)
Weight	134 g (4.73 oz)
SIM	Single SIM (Nano-SIM) or Dual SIM (Nano-SIM, dual stand-by)
Display	
Type	TFT
Size	5.0 inches, 64.5 cm ² (~71,4% screen-to-body ratio)
Resolution	480 x 960 pixels, 18:9 ratio (~215 ppi density)
Protection	Asahi Glass
Platform	
OS	Android 11 (Go edition)
Chipset	Mediatek MT6739 (28 nm)
CPU	Quad-core 1.28 GHz Cortex-A53
GPU	PowerVR GE8100
Memory	
International	8GB / 1GB RAM Emmc 5.1
Card Slot	MicroSDHC (dedicated slot)
Main Camera	
Single	5 MP, f/2.4, 1/5.0", 1.12 µm
Features	LED flash
Video	720p@30fps
Selfie Camera	
Single	2 MP, f/2.8
Video	720@30fps
Sound	
Loudspeaker	Yes
3,5 mm jack	Yes
Comms	
WLAN	Wi-Fi 802.11 b/g/n, Wi-Fi Direct, hotspot
Bluetooth	4.2, A2DP, LE
GPS	Yes, with A-GPS
NFC	No
Radio	FM radio
USB	MicroUSB 2.0
Features	
Sensors	Accelerometer, proximity
Battery	
Type	Li-Ion 2000mAh
MISC	
Colors	Volcano Black, AI Aqua
Price	About 60 EUR (Indicative)

Tablets' minimum requirements.

Network	
Technology	GSM / HSPA / LTE



Body	
Dimensions	260 x 156.6 x 9 mm(10.24 x 6.17 x 0.35 in)
Weight	440 g (15.52 oz)
SIM	Nano-SIM
Display	
Type	IPS LCD
Size	10.0 inches, 290.0 cm ² (~71.2% screen-to-body ratio)
Resolution	800 x 1280 pixels, 16:10 ratio (~151 ppi density)
Protection	
Platform	
OS	Android 8.1 (Oreo)
Chipset	
CPU	
GPU	
Memory	
International	16GB 2GB RAM
Card Slot	MicroSDXC (dedicated slot)
Main Camera	
Single	2 MP, f/2.8, 1/5", 1.65 µm
Features	
Video	720p@30fps
Selfie Camera	
Single	2 MP, f/2.8, 1/5", 1.65µm
Video	720p@30fps
Sound	
Loudspeaker	Yes
3,5 mm jack	Yes
Comms	
WLAN	Wi-Fi 802.11 a/b/g/n, Wi-Fi Direct, hotspot
Bluetooth	4.2, A2DP, LE
GPS	No
NFC	No
Radio	FM radio
USB	MicroUSB 2.0
Features	
Sensors	Accelerometer, proximity
Battery	
Type	Li-Ion 4080mAh, non-removable
MISC	
Colors	Prime Black, Midnight Blue-8088L, 8088Q, 8088X
Price	About 70 EUR (Indicative)



Laptops and Notebooks' minimum requirements.

Specifications	
Processor Brand	Intel
Processor Type	Intel Core i5-10210U
Hard Drive Capacity	512 GB
Processor Core Type	Quad-core (4 Core)
Manufacturer	LENOVO
Product Line	IdeaPad
Processor Speed	1.6 GHz
Manufacturer Part Number	81WA00Q7US
Wireless Technology	2x2 802.11AC
RAM Memory	8 GB
Maximum RAM Supported	12 GB
Operating System	Windows 11 Home
Battery Life	9 h
Model	81WA00Q7US
Screen Size	14 in
Brand	Lenovo
Features	Webcam
Assembled Product Dimensions (L x W x H)	9.50 x 12.90 x 0.78 Inches

	Good	Better	Best	
SPP Range	BASIC ACCESS: \$199 - 249	LEARN AND COLLABORATE: \$249 - 399	LEARN AND CREATE FROM ANYWHERE: \$399 - 599	ADVANCED USE AND TEACH: \$599+
Usage	Basic Home/School	On the Go, Collaborate & Productivity	Create & Prepare	eSports & Heavy Workloads
Edu Purpose – Built Device	Yes	Yes	Limited EDU Devices Consumer & Commercial	Consumer & commercial
CPU	Celeron (GLK-R)	Celeron, Pentium Silver (GLK-R, JSL)	Pentium Gold, Intel Core i3, i5 (CML, TGL)	Intel Core i5, i7 (CML, TGL) Intel vPro Option
Form Factor	Clamshell	All “Basic Access” options+ Convertible/Detachable Tablet	All “Learn and Collaborate” options + T/L options (<20mm)	All “Learn and Create from Analysis” options + Premium material options
Screen Size/Display	≥ 11.6 HD Anti-glare	≥ 11.6 – 14” HD	≥11.6 – 15” FHD IPS W/Touch	≥11.6 – 15” FHD/UHD/QHD W/Touch
Memory Storage	≥ 64 GB eMMc 4GB	≥ 64 – 128 GB eMMc 4 – 8 GB	≥ 128 – 256 GB PCIe SSD 8 GB	≥ 256 GB PCIe SSD 8 GB+
Camera	720P UF Camera	720P/1080P UF , 5MP WF	720P/1080P UF , 5MP WF	UF 5MP/WF 8MP
Connectivity	802.11AC	802.11AX w/4G LTE Option	802.11AX w/4G LTE Option	802.11AX w/4G LTE Option
Ports	1USB C & 1 USB A	1 USB C & 2 USB A	1 USB C & 2 USB A	2 USB C & 1 USB A
Touch/Stylus		Touch option Stylus option Garaged stylus that doesn’t require pairing or batteries	All “Learn and Collaborate” options + Touch USI Stylus Stylus magnetically attached or garage	All “Learn and Create from Analysis” options + Low latency stylus
Audio	2 Speakers & 1 Mic Background noise suppression W/GNA	2 Speakers, 2 Mics	2 Front-firing speakers, 2Mics	Premium high-fidelity 2-4 Front-firing speakers, 2-4 Mics
Battery Life	≥8 Hour’s battery life	≥8 Hour’s battery life	≥10 Hour’s battery life	≥12 Hour’s battery life
Other	Security Basics	Security Basics Fingerprint reader	Security Basics Fast Charging	Backlit keyboard

Annex 5 — Cheapest Smart Devices by Country

SMARTPHONES ¹¹⁹

Country	Smartphone (Brand and Model)	Cost (USD) ¹	Affordability (% of Average Monthly Income) ²	Ranking Affordability (40 Countries)
Botswana	Mobiwire Mahpee	36.35	6.6%	1
Seychelles, The	Nokia 1	74.36	7.3%	2
Mauritius	Samsung Galaxy A3 Core	99.86	11.7%	3
Côte d'Ivoire	Crescent Wing 8	22.97	12.1%	4
South Africa	Mobicel X1	66.8	13.3%	5
Morocco	Orange Sanza Touch 4G	40.12	15.9%	6
Eswatini	MARA S	50.08	17.6%	7
Zambia	Mobicel Rio	18.45	19.1%	8
Gabon	Alcatel U3	121.29	20.7%	9
Lesotho	Smart Kicka 3	19.99	21.8%	10
Namibia	Nokia C1	86.86	23.2%	11
Egypt	Alcatel 1	63.86	25.5%	12
Tunisia	ZTE A3	72.78	26.5%	13
Benin	MTN Touch RIO	29.39	27.6%	14
Cameroon	Rio 3G	34.92	27.6%	15
São Tomé and Príncipe	Alcatel U3	48.06	28.0%	16
Congo, Rep. of The	Logicom Fit	42.27	28.7%	17
Angola	Alcatel U3	51.26	28.7%	18
Senegal	Orange Sanza Touch	34.73	29.1%	19
Algeria	Condor Griffé T8 Plus	92.4	31.1%	20
Nigeria	Airtel Diva	52.49	31.5%	21
Cape Verde	Alcatel 5033G	81.95	32.1%	22
Equatorial Guinea	Vexia (Unidentified)	156.21	32.3%	23
Kenya	Neon Ray Pro	50.11	32.7%	24
Mozambique	Azumi V4	13.45	35.1%	25
Guinea	Alcatel U3 3G	34.33	40.4%	26
Rwanda	Mobicel Rio	28.18	43.4%	27
Mali	Orange Sanza Touch	33.08	47.8%	28
Guinea-Bissau	Orange Sanza Touch	33.08	52.2%	29
Tanzania	Alcatel One 5033 D	54.4	60.4%	30
Uganda	ITEL A14	40.56	60.8%	31
Sierra Leona	Orange Rise 32	27.45	64.6%	32
Togo	Stylo Granite S50	49.62	64.7%	33
Congo, Democratic Rep. of The	Itel MC10	35.54	77.5%	34
Burkina Faso	Orange Sanza Touch	51.46	80.2%	35
Ethiopia	SMADL SAFARI 2	62.19	83.9%	36
Madagascar	Telma i-Feel Max	34.27	87.5%	37
Niger	Lucentel Siren 1	45.94	100.2%	38
Liberia	Orange Sanza Touch	49	103.2%	39
Comoros	Samsung Galaxy A01	170.21	145.9%	40

¹Local currency converted to USD at the time of writing.

² %GNI per capita (2020), divided by 12 months (Source: World Bank, <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD>).

¹¹⁹ Alliance for Affordable Internet (2021). 2021 prices and affordability of smartphones and feature phones by country [database]. Retrieved from <https://a4ai.org/research/device-pricing-2021/>

TABLETS

Country	Tablet (Brand and Model)	Cost (USD) ¹	Affordability (% of Average Monthly Income) ²	Ranking (25 Countries)
Mauritius	Ematic 8" IPS Tablet with Android 7.1	59.65	7%	1
South Africa	Ematic 8" IPS Tablet with Android 7.1	66.34	13%	2
Botswana	Lenovo Tab E7	126.56	23%	3
Tunisia	Ematic 8" IPS Tablet with Android 7.1	65.84	24%	4
Morocco	Ematic 8" IPS Tablet with Android 7.1	64.85	26%	5
Egypt	Ematic 8" IPS Tablet with Android 7.1	71.79	29%	6
Uganda	Ematic 8" IPS Tablet with Android 7.1	21.89	33%	7
Ghana	Ematic 8" IPS Tablet with Android 7.1	64.33	33%	8
Côte d'Ivoire	Ematic 8" IPS Tablet with Android 7.1	66.68	35%	9
Nigeria	Ematic 8" IPS Tablet with Android 7.1	59.98	36%	10
Kenya	Ematic 8" IPS Tablet with Android 7.1	62.78	41%	11
Angola	Ematic 8" IPS Tablet with Android 7.1	73.46	41%	12
Cameroon	Ematic 8" IPS Tablet with Android 7.1	67.22	53%	13
Senegal	Ematic 8" IPS Tablet with Android 7.1	67.22	56%	14
Ethiopia	Ematic 8" IPS Tablet with Android 7.1	48.73	66%	15
Zimbabwe	Ematic 8" IPS Tablet with Android 7.1	64.00	67%	16
Tanzania	Ematic 8" IPS Tablet with Android 7.1	65.58	73%	17
Zambia	Ematic 8" IPS Tablet with Android 7.1	70.92	73%	18
Mali	Inder C Idea CM801 Android Tablet	74.99	108%	19
Gambia, The	Inder C Idea CM801 Android Tablet	71.08	114%	20
Burkina Faso	Inder C Idea CM801 Android Tablet	74.99	117%	21
Togo	Inder C Idea CM801 Android Tablet	111.63	146%	22
Madagascar	Ematic 8" IPS Tablet with Android 7.1	61.96	158%	23
Mozambique	Ematic 8" IPS Tablet with Android 7.1	73.84	193%	24
Burundi	Inder C Idea CM801 Android Tablet	158.45	827%	25

¹Local currency converted to USD at the time of writing.

² %GNI per capita (2020), divided by 12 months (Source: World Bank, <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD>).



Laptops and Notebooks

Country	Laptop/ Notebook (Brand)	Cost (USD)	Affordability (% of Average Monthly Income)	Ranking (35 Coun.)
Seychelles, The	HP Chromebook 14" Intel Celeron 4 GB 32 GB	341.07	33.5%	1
South Africa	Proline 14.1" Intel Celeron	187.83	37.5%	2
Namibia	HP Chromebook 11 G5	148.68	39.6%	3
Botswana	Asus 11.6" Celeron N3350 4GB 65GB Win10 Home	255.26	46.1%	4
Gabon	HP Laptop 15-Dw1004nk	275.20	47.0%	5
Tunisia	Vegabook Plus 14 Quad-Core 4GB	161.88	58.9%	6
Zambia	HP Intel i5 6GB 700GB Win10	100.57	104.0%	7
Egypt	Lenovo V14 A4 3020E 14" 4GB 1TB	279.51	111.8%	8
Ghana	HP Intel Dual-Core 4GB 500GB	232.00	119.0%	9
Mauritania	HP Stream 11-ak0004nx Laptop Intel Celeron 4GB 64 GB	178.35	128.2%	10
Morocco	HP Stream 11-ak0004nx Laptop Intel Celeron 4GB 64 GB	325.82	129.5%	11
Côte d'Ivoire	Asus Mini VivoBook E203NAH Intel Celeron 4GB 500GB	264.69	139.3%	12
Kenya	Dell Latitude E6320 Intel i5 4GB RAM 500GB	221.00	144.1%	13
Cape Verde	NB HP ProBook 6460B Intel i5 4GB 120GB	402.09	157.7%	14
Cameroon	Asus X55A 15.6" Laptop Intel Pentium 4GB 500GB Win10	207.60	163.9%	15
Senegal	HP x360 Dual Core 8GB 128GB	197.80	166.0%	16
Guinea-Bissau	Lenovo Thinkpad Intel i5 6 GB 150 GB	120.40	190.1%	17
Nigeria	Lenovo S145-15 15.6" HD Intel Pentium Gold 4GB 500GB Win10 Pro	335.77	201.5%	18
Ethiopia	Toshiba Intel i3 4GB 500GB	160.00	215.7%	19
Angola	HP 15.6" N4020 HD 4GB 500GB Win10 Home	460.10	258.0%	20
Guinea	Acer Intel i5 4GB 500GB	220.00	258.8%	21
Libya	HP Notebook 15-dw3011nx	1126.40	272.5%	22
Sierra Leona	Samsung Chromebook 4	144.53	340.1%	23
Congo, Rep. of The	Lenovo Ideapad S145-15IGM	510.35	346.0%	24
Zimbabwe	HP Stream 14" Intel Celeron 4GB 64GB Win10	360.00	378.9%	25
Tanzania	LENOVO Ideapad 81MW 4GB 1TB	343.57	381.7%	26
Rwanda	Lenovo 14" Intel Celeron 4GB 500GB HDD	261.90	402.9%	27
Burundi	HP 14" AMD A4-9125 4GB 32GB 1TB OneDrive Win10 Home	78.31	408.6%	28
Uganda	Intel V130 15" HD Intel Celeron 4 GB 1TGB Win10	278.60	417.9%	29
Malawi	HP Intel i5 4GB 500GB HDD	233.70	483.5%	30
Congo, Democratic Rep. of The	Lenovo Intel i3 4GB 500GB	260.00	567.3%	31
Madagascar	Lenovo Chromebook Flex 3 11" MT8173C 4GB 64GB Chrome OS	239.58	611.7%	32
Niger	Lenovo IdeaPad 110S Intel Pentium 4G 128GB	390.78	852.6%	33
Somalia	HP Stream 11-ak0004nx Laptop Intel Celeron 4GB 64 GB	330.00	942.9%	34
Mozambique	HP 250 G6 N3060 15.6" 4GB 500GB Win10 Home	486.49	1269.1%	35

¹Local currency converted to USD at the time of writing.

² %GNI per capita (2020), divided by 12 months (Source: World Bank, <https://data.worldbank.org/indicator/NY.GNP.PCAP.CD>).



Annex 6 — National E-Waste Legislation in Smart Africa Members

Country	Relevant Legislations
Kenya	E-waste Rules (Draft – January 2019) National E-waste Management Strategy
Rwanda	Regulation No. 002 of 26/04/2018 Governing E-Waste Management in Rwanda. Rwanda Standard Board E-Waste Management Standard. 2019 Ministerial Guidelines. National E-waste management Policy.
Uganda	Electronic Waste (E-waste) Management Policy for Uganda, 2012 Strategy for Electronic Waste Management, 2013 Guidelines for E-Waste Management, March 2016
Tanzania	No specific legislation on e-waste. The Environmental Management (Hazardous Waste Control and Management) Regulations, 2019 covers waste streams including e-waste
Ethiopia	Electrical and Electronic Waste Management and Disposal Council of Ministers Regulations No. 425/2018 Article 20 of the Environmental Pollution Control Proclamation No.300/ 2002.
Sierra Leone	The scope of the National Policy roadmap for integrated Waste Management includes e-waste along with four other waste streams (draft).
Nigeria	National Environmental (Electrical/Electronic Sector) Regulations S.I. No. 23 of 2011 to address E-waste.
Malawi	No specific legislation on e-waste. The National Waste Management Strategy recognises e-waste a significant, emerging waste stream in Malawi.
Egypt	The Waste Management Law No.202 of 2020 Law 4/1994 & 9/2009 and its amendments and executive regulations
South Africa	No specific legislation on e-waste but it is covered in the National Environmental Management Act (Act 107 of 1998) (NEMA) and Environment Conservation Act (Act 73 of 1989).
Ivory Coast	The 2012-1047 decree of 24 October 2012 laying down the procedures for applying the principle of 'polluter pays' as defined by Law No. 96-766 of 3 October 1996 on the environment code Decree No. 97-678 of 3 December 1997.
Ghana	Environmentally Sound E-Waste Management for Collectors, Collection Centres, Transporters, Treatment Facilities and Final Disposal, Technical Guidelines, February 2018. Hazardous and Electronic Waste Control and Management Act 2016. Prohibition on Manufacture, Sale and Import of Incandescent Lamps and Sale and Import of Used Refrigerator, Freezers and Air Conditioners, Regulations, LI 1932, 2008. Draft Bill on Control and Management of E-Waste.
Mozambique	No specific legislation on e-waste. Hazardous Waste Decree mentions e-waste but nothing much.
Zambia	The Extended Producer Responsibility (EPR) Statutory Instrument No. 65 of 2018

Annex 7 — Smart Device Cluster Analysis of African Countries

Country	Internet users (% population) ranking	Connectivity ranking	Digital skills ranking	Manufacturing ranking	Average of the rankings	Global Ranking	Cluster
Egypt	3	3	1	2	2.3	1	A
Seychelles, The	2	4	2		2.7	2	
Mauritius	6	1	4		3.7	3	
Tunisia	5	2	5	7	4.8	4	
Morocco	1	5	15	4	6.3	5	
Algeria	11	7	10	5	8.3	6	
Cape Verde	7	14	8		9.7	7	
Ghana	12	13	6		10.3	8	
South Africa	4	9	29	1	10.8	9	
Djibouti	10	12			11.0	10	B
Gambia, The	13		9		11.0	11	
Botswana	8	8	19		11.7	12	
Senegal	16	16	7		13.0	13	
Kenya	30	18	3	8	14.8	14	
Namibia	15	11	21		15.7	15	
Cameroon		26	12	10	16.0	16	
Côte d'Ivoire	17	23	17	9	16.5	17	
Gabon	9	10	31		16.7	18	
Nigeria	19	21	27	3	17.5	19	
Lesotho	14	17	24		18.3	20	
Libya	32	6			19.0	21	
Zimbabwe	27		13		20.0	22.0	C
Ethiopia	28	30	18	11	21.8	23	
Sao Tome and Principe	20	24			22.0	24	
Benin	21	28	20		23.0	25	
Eswatini	25	19	25		23.0	26	
Rwanda	24	35	11		23.3	27	
Angola	18	15	38		23.7	28	
Mauritania	33	25	14		24.0	29	
Mali	23	29	22		24.7	30	
Guinea	29	20	28		25.7	31	
Tanzania	34	27	16		25.7	32	
Sudan	26				26.0	33	
Zambia	36	22	23		27.0	34.0	
Congo, Democratic Rep. of The	43		36	6	28.3	35	
Guinea-Bissau	22	37			29.5	36	
Liberia	31				31.0	37	D
Burkina Faso	38	33	33		34.7	38	
Togo	35	36			35.5	39	
Equatorial Guinea	37				37.0	40	
Mozambique	41	34	37		37.3	41	
Madagascar	42	40	32		38.0	42	
Malawi	40	39	35		38.0	43	
Congo, Rep. of The	46	31			38.5	44	
Uganda	51		26		38.5	45	
Chad	44		34		39.0	46	
Sierra Leona	39				39.0	47	
Burundi	49		30		39.5	48	
Comoros	47	32			39.5	49	
Niger	45	38			41.5	50	E
South Sudan	48				48.0	51	
Central African Rep.	50				50.0	52	
Somalia	52				52.0	53	
Eritrea	53				53.0	54	

The percentage of internet users, as assessed by ITU¹²⁰, serves as a proxy of smart devices users.

The connectivity ranking is an average of 5 connectivity indicators, measured by ITU¹²¹: Fixed broadband 5GB; Mobile broadband data only 1.5GB; Mobile Cellular Low Usage; Mobile Data and Voice Low Usage; Mobile Data and Voice High Usage.

The digital skills ranking describes the digital skills among the active population as surveyed by the World Economic Forum in the Global Competitiveness Report (2019)¹²².

The manufacturing ranking is based on the World Bank's World Development Indicators (2016-2017), as represented in Figure 21.

The ranking of the cheapest smart device by country is provided in the Blueprint but is not used in this overall ranking because it compares different devices and is not representative of the number of users of those cheapest devices.

Criteria with no data were not considered in the average of each country.

¹²⁰ <https://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx>

¹²¹ <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

¹²² <https://www.weforum.org/reports/how-to-end-a-decade-of-lost-productivity-growth>