
Leveraging new technologies and digital transformation for inclusive growth and development in Africa: *drawing lessons from the COVID-19 pandemic*

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Opportunities and Issue-based Coalition 4



United Nations
Economic Commission for Africa



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First printing June 2021

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Designed and printed in Addis Ababa, Ethiopia by the ECA Printing and Publishing Unit. ISO 14001:2015 certified. Printed on chlorine free paper.

Cover photos: <https://www.shutterstock.com>

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Abstract

New technologies and digital tools have the potential to solve development challenges across numerous economic sectors in Africa. With only ten years left to achieve the Sustainable Development Goals by the 2030 deadline, and with the world suffering the repercussions of the coronavirus disease (COVID-19) pandemic, this is an opportune time to take stock of technological progress and assess how innovative technologies can be used to foster inclusive growth and development in Africa.

In the context of the United Nations reform process, a number of regional opportunity and issue-based coalitions have been established under the Regional Collaborative Platform. The United Nations development system in Africa has identified seven priority areas. In the light of the African continent's unique geopolitical positioning, demographics and policy and operational landscape, Opportunities and Issue-based Coalition 4 is supporting continental and regional institutions and member States in promoting the use of technological and creative outputs that can accelerate implementation of the 2030 Agenda for Sustainable Development and Agenda 2063 of the African Union.



Introduction

The twentieth century witnessed the development of numerous technological and digital innovations that accelerated economic growth and development.¹ Leveraging those innovations can help achieve the Sustainable Development Goals² and help developing countries, including those in Africa, to reap the developmental benefits of the world's fourth industrial revolution. The Broadband Commission for Sustainable Development,³ established by the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), is committed to fostering digital cooperation with a view to supporting economies and societies through times of crisis and sustaining the world's most vulnerable populations, including aged persons, refugees and other forcibly displaced populations, persons with disabilities,

children, rural dwellers and indigenous communities.

This white paper highlights the potential opportunities stemming from emerging and innovative technologies and how digital technologies can promote inclusive growth and development. The COVID-19 pandemic has been a wakeup call for many African countries and has underscored the importance of technological innovation and digital tools, not only in health emergencies, but also in efforts to promote economic recovery. Successful approaches have included the digitalization of businesses and services, teleworking and video conferencing, and the provision of online access to health care, education and essential goods and services.

¹ World Health Organization, "Health and Development in the 20th Century" in *The World Health Report 1999*. Available at: www.who.int/whr/1999/en/whr99_ch1_en.pdf?ua=1 (accessed on 1 November 2020).

² United Nations, Department of Social and Economic Affairs, *Science, Technology and Innovation for the SDGs*. Available at: www.un.org/development/desa/indigenouspeoples/science-technology-and-innovation-for-the-sdgs.html (accessed on 1 November 2020).

³ For further information, see the website of the Commission. Available at: www.broadbandcommission.org/ (accessed on 1 November 2020).

Following this introduction, the paper provides an overview of the digital economy in Africa, which, it can be argued, has accelerated technological innovation throughout the continent. The paper then explores how technological innovation and digitization can promote

inclusive growth in Africa, and examines factors that can sustain development, related challenges and the need for a supportive policy and regulatory environment. The paper concludes with a number of policy recommendations.



Digital economy in Africa

Studies on digital technologies often make a distinction between low-tech mobile applications and digital platforms on the one hand, and high-tech integrated management systems on the other. The former are enabled by the rapid development of wireless communication and networking technologies that provide users with access to valuable information, while the latter are enabled by the Internet of things, big data analytics, distributed ledger technology, and artificial intelligence (AI), which together provide connectivity between so-called “smart” devices and humans, transforming how products are designed, produced and consumed.⁴ Together, those technologies constitute the digital economy.

The digital economy is a powerful catalyst for growth, innovation and social inclusion. Globally the digital economy

is worth some \$11.5 trillion, equivalent to approximately 15.5 per cent of global gross domestic product (GDP). By 2025, the digital economy is projected to be worth \$23 trillion globally, equivalent to some 24.3 per cent of global GDP.⁵ Although the digital economy in Africa is still relatively small in absolute terms compared to the digital economy in other emerging markets, it is expected to grow to more than \$300 billion by 2025 on the back of massive mobile penetration and other innovative technologies,⁶ potentially accelerating socioeconomic development across the continent.

In the past two decades, the digital economy has witnessed impressive growth in several African countries and, in some cases, accounts for more than 5 per cent of GDP. Recently, the race to respond to COVID-19 has further stimulated

⁴ Ivan Durić, “Digital technology and agricultural markets”, (background paper for *The State of Agricultural Commodity Markets*, (Rome, FAO, 2020).

⁵ Huawei and Oxford Economics, *Digital spillover: measuring the true impact of the digital economy* (2017). Available at www.huawei.com/minisite/gci/en/digital-spillover/files/gci_digital_spillover.pdf (accessed on 1 November 2020).

⁶ McKinsey & Company, *Lions go digital: The Internet’s transformative potential in Africa* (November 2013). Available at: www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/lions-go-digital-the-internets-transformative-potential-in-africa (accessed on 1 November 2020).

innovation and creativity across Africa, underscoring the continent's potential for accelerating industrial development on the basis of home-grown technologies. One of the most positive aspects of the digital economy during the pandemic has been the fact that many people have been able to stay connected while in quarantine. Their capacity to do so was possible due to the rapid adoption

of mobile technologies in Africa and due to the fact that approximately one third of the continent's 725 million mobile subscribers now use Internet-enabled smart phones.

This section discusses the trends, outlook and growth factors sustaining the digital economy in Africa and its impact in the fight against COVID-19.



Trends in emerging technologies and digital solutions in Africa

Over the last ten years, Internet access has increased in Africa more than in any other continent, jumping from a mere 2.1 per cent in 2005 to some 24.2 per cent by 2018.⁷ According to data provided by ITU, more than 80 per cent of the population of Africa had a mobile phone subscription by 2019. The impact of the digital economy in Africa is huge and the mobile economy is forecast to account for 7.6 per cent of African GDP (\$214 billion) by 2020, up from 6.7 per cent in 2016.

However, the successes achieved in the mobile telephony sector in terms of both penetration rates and innovation have not been repeated in terms of Internet and broadband access. Indeed, ITU estimated that Africa was one of the most poorly connected global regions in late 2019, with a mere 28.2 per cent of the population of Africa enjoying access to

the Internet and an average bandwidth of only 31 kilobits per second per Internet user. Internet access also varies considerably within countries, with access often depending on users' income, age and gender. There are also substantial disparities among rural and urban communities, while marginalized communities, including refugees and forcibly displaced persons are particularly disadvantaged.

Technology is a powerful determinant of change, and digital infrastructure is critical for the development, provisioning, use and sharing of digital products and services. New and emerging mobile-enabled platforms across the region have disrupted traditional economic value chains. A number of digital tech giants including Google, Intel, IBM, Samsung, Nokia and Microsoft have established a presence in Africa, while the rapidly expanding tech start-up ecosystem comprised 618 tech

⁷ African Union-European Union Digital Economy Task Force, *New Africa-Europe Digital Economy Partnership: accelerating the achievement of the Sustainable Development Goals* (2019). Available at: <https://ec.europa.eu/digital-single-market/en/news/new-africa-europe-digital-economy-partnership-report-eu-au-digital-economy-task-force> (accessed on 1 November 2020).

hubs by 2019, having risen from 442 the previous year. Furthermore, Alibaba's Jack Ma sees promising prospects in Africa and has initiated business ventures in a number of African countries.⁸

The increasing use of digital technologies in the financial sector (e-finance) is leading to much lower costs and greater competition in financial services, providing customers with better services, including enhanced online banking and ATM services. For example, M-Pesa has over 42 million active customers and almost 400,000 active agents operating across the Democratic Republic of the Congo, Egypt, Ghana, Kenya, Lesotho, Mozambique and the United Republic of Tanzania. In the 2019 fiscal year, M-Pesa customers conducted more than 11 billion transactions, with an average of more than 500 transactions per second by December 2018.⁹ In fact, fintech services have become a powerful lever for growth and financial inclusion in Africa by providing large numbers of services to people who, traditionally, were excluded from basic financial services. At the end of 2018, more than 80 per cent of the continent was covered by mobile money services.¹⁰

The pandemic offers opportunities for African countries that have invested in their technological, human and infra-

structure capacity to reinvigorate their economies, create new businesses, and skill, reskill and upskill their young populations so that they can play a more significant role in the post-COVID-19 economy. Digital technologies are thus more important than ever in that they can facilitate economic activity and daily activities across the continent. Indeed, African countries' public, private and voluntary sectors stand ready to respond to the pandemic and sustain socio-economic progress. A number of tech start-ups across the continent have proven critical during the COVID-19 lockdown.

Numerous digital innovations, such as pandemic tracker tools and ringer tone audio messages designed to inform the public about ways to prevent the spread of COVID-19, have been developed. Those initiatives are shaping national strategies and policies to protect lives and livelihoods and are sustaining the growth of digital economies across the continent. Official online information platforms on the management of the coronavirus pandemic have been put in place by governments. Several policies and initiatives have been rolled out to encourage the use of digital payment systems rather than cash.

As social protection measures are a critical part of countries' COVID-19 re-

⁸ James da Costa, "How Jack Ma sees a thriving future of entrepreneurship in Africa", *The European Sting*, 2 March 2020. Available at: europeansting.com/2020/03/02/how-jack-ma-sees-a-thriving-future-of-entrepreneurship-in-africa/.

⁹ For further information, see: www.vodafone.com/what-we-do/services/m-pesa.

¹⁰ GSM Association, *2018 State of the Industry Report on Mobile Money* (2019). Available at: www.gsma.com/wp-content/uploads/2019/05/GSMA-State-of-the-Industry-Report-on-Mobile-Money-2018-1.pdf (accessed on 1 November 2020).

response strategies, and as most Africans enjoy only limited access to social safety nets, telecom companies have stepped up to the plate by waiving certain fees. In Kenya, for example, money transfers made using the M-Pesa mobile money platform are subject to reduced tariffs, while the Ethiopian Government has worked with Ethio-Telecom in order to reduce tariffs on fixed broadband services and increase Internet speeds. Furthermore, Ghana has adopted a universal Quick Response (QR) code and proxy pay platform to encourage the use of cashless payments. Meanwhile, the Kenyan Government has signed an agreement with Google Loon to allow 35 Loon balloons carrying 4G base stations to fly over Kenyan airspace with a view to improving Internet coverage, reportedly as a way to address the impact of COVID-19 on productivity. A single balloon can provide Internet connectivity to an area approximately 80 km in diameter and some 1,000 users on the ground.

In terms of humanitarian assistance, governments, United Nations agencies and other international organizations are increasingly leveraging technology to support crisis-affected populations and forcibly displaced persons, and have sought to accelerate those efforts in the light of the COVID-19 pandemic. Regardless of whether those humanitarian assistance efforts focus on the provision of education services in refugee camps, or cash assistance delivered through mobile money platforms, support is increasingly linked with broader development outcomes and designed and implemented with sustainability in mind.

The COVID-19 pandemic has also drawn attention to the important role played by digital technologies in facilitating trade. Countries must therefore enhance their e-commerce capacities with a view to boosting intra-African trade, as envisioned under the terms of the Agreement Establishing the African Continental Free Trade Area.

Role of technological innovation and digitization in promoting inclusive growth in Africa

The COVID-19 pandemic has drawn attention to the need to promote digitization in socioeconomic sectors of particular relevance in the response to the ongoing crisis. Of particular importance are digital health-care services, digital forms of learning and teaching, and the digital transformation of agriculture in rural areas. It is also important to promote the establishment of well-connected sustainable smart cities that can respond effectively to pandemics and other socioeconomic shocks. Furthermore, e-government platforms can facilitate the smooth delivery of public services during lockdowns while also promoting inclusive growth. Moreover, there has been an exponential increase in online commerce during lockdowns. Finally, digitalization can foster the establishment of a green economy and promote climate-resilience in African countries.

A. Health-care sector: technology and digital innovations in the response to COVID-19 and beyond - prevention, testing, tracking and treatment

The digital health response to COVID-19 requires the application of innovative technologies in a range of areas, including surveillance, prevention, diagnosis and treatment. With respect to surveillance, innovative technologies may enhance the collection, analysis, interpretation and dissemination of data regarding COVID-19 and inform public health and other relevant decisions. With regard to prevention, those technologies can be used to reduce infection rates, among other measures, by addressing behavioural and health risks at individual and community levels. Innovative technologies and the use of AI and big data can also enhance diagnosis and treatment in populations.

B. Education sector: towards digital forms of learning and teaching

Governments around the world have temporarily closed education institutions in an attempt to limit the spread of COVID-19 and, according to the World Bank, one and a half billion students worldwide require digital learning tools in order to continue their education. In Africa, almost all school children and university students had been affected by the pandemic by mid-March 2020. School closures and other restrictions on education are expected to deepen inequalities between those with and without access to digital technologies.

C. Digital transformation in agriculture and in rural areas

A number of serious challenges continue to impede the development of the agricultural sector in Africa, including fragmented agricultural production as a result of an overreliance on smallholder farmers, climate shocks, pest and disease outbreaks, inadequate transport networks, limited and unreliable power and communication infrastructure and chronic underinvestment. Digitization, while not a silver bullet, offers solutions to many of those challenges. Digitization is impeded by Africans' limited access to the Internet and electrical power, particularly in rural areas, the low literacy rates among target users and users' often limited capacity to operate innovative in-

formation technology (IT) systems. The financial sustainability of IT solutions and their scale-up potential may also be questionable.

Digital technologies have had a tangible impact in the agriculture sector, including by providing smallholder farmers with access to information about markets and advice on how to improve agricultural efficiency. Digital technologies are strengthening the agricultural sector in African countries in numerous ways, including by:

- *Enabling access by value chain actors to timely, reliable and accurate information.* Access to reliable and timely information and data can be useful for both policymakers and farmers. The Food Insecurity and Vulnerability Mapping System (FIVMS), for example, which was first implemented in Zambia and is now being replicated in Kenya and Lesotho, provides governments with a platform for managing the distribution of subsidized agricultural inputs in a transparent and efficient manner. In addition, once registered on the platform, farmers can access a suite of targeted services, including credit, mechanization assistance, e-extension services and training. They also enjoy access to government-controlled inputs, including pesticides, fertilizers, soil supplements and seeds. Other services that can be provided to

farmers through FIVMS include the provision of localized weather forecasts, crop calendars and soil testing kits. FIVMS collects vast amounts of data, enhancing policymakers' capacity to make effective data-driven decisions. The Food and Agriculture Organization of the United Nations (FAO) has further developed a set of mobile applications which, among other services, provide localized weather and crop calendars, current market prices for agricultural outputs, information on animal disease control and guidance on animal feeding regimes.¹¹

- *Enhancing pest and disease management.* Digital technologies can also be used to track, report and provide guidance on pest and disease outbreaks. Mobile apps such as FAWS, eLocust3m and DLIS have been used to track and combat disease and pest outbreaks, including desert locust outbreaks in East Africa, and could potentially be used in COVID-19 surveillance. Moreover, drones and satellites have been used to track and map locust swarms. Other applications have been piloted for land usage mapping, tracking illegal logging, mapping farm boundaries for land registration, flood and drought tracking and assessing crop health. Recently, drones have been used in South Africa for crop-spraying¹² and in Kenya for spraying locust swarms.
- *Enhancing access to extension services.* In many African countries, extension service providers suffer from chronic staff shortages and are unable to meet the FAO recommended ratio of one extension officer for every 400 farmers. In Kenya, the ratio is one extension service officer for every 1,500 farmers, while in Uganda it is one for every 1,800 farmers. In some African countries, the ratio is as low as one officer for every 3,000 farmers. The digitization of extension services and the use of mobile telephony and social media platforms, including WhatsApp and Facebook, helps extension officers reach many more farmers than they could ever hope to meet in person. Although virtual consultations with farmers cannot fully replace all in-person meetings, they enable governments to reach more farmers with fewer staff. The digitization of extension services can improve understanding of diseases and pests, enhance outbreak tracking and strengthen responses to localized

¹¹ For further information, see: FAO, *Digital services in Africa*. Available at: www.fao.org/in-action/africa-digital-services-portfolio/en/ (accessed on 1 November 2020).

¹² For further information, see: "South Africa's first licensed crop spraying drones take flight", *Fresh Plaza*, 24 May 2019. Available at: www.freshplaza.com/article/9105531/south-africa-s-first-licensed-crop-spraying-drones-take-flight (accessed on 1 November 2020).

challenges. In many countries, the private sector provides additional support, and private-public partnerships can enhance extension service coverage.

- *Improving the efficiency of value and supply chains.* Many elements can comprise a digital supply chain, from the online purchase of inputs and seeds to the arrangement of logistics and storage to the establishment of market linkages. Many countries are considering the adoption of e-commerce solutions, creating business-to-business, business-to-consumer and fintech services. Jumia,¹³ an online retailer with a presence in 14 African countries, has started offering agricultural and livestock products on its online platform. Taimba,¹⁴ a mobile-based cashless platform that connects farmers to retailers, provides logistics services while offering price transparency and consistent quality. In Kenya, many value and supply chain services use blockchain and other technologies to enhance transparency throughout the entire supply chain. In Rwanda, the Government is working with FAO to develop national policies on the use of online agricultural

services. In addition, digital technologies can facilitate farmers' access to mechanization inputs, including tractors. Such services are offered in Zambia, for example, through that country's FIVMS platform, and in other countries through mobile apps such as Hello Tractor.¹⁵ Digital technologies are also a powerful tool that can help reduce risks associated with agricultural lending and establish trust among farmers and other agrifood system actors, including farmers' organizations, financial institutions and sponsors. Lending institutions can now make use of sophisticated analytical technology to make more reliable lending decisions. In Kenya, Mercy Corps, a global team of humanitarians, is working with Safaricom, a Kenyan mobile network operator, to build risk profiles that will enable farmers to obtain seasonal loans.¹⁶

- *Enhancing the assessment and monitoring of natural resources.* Africa is endowed with an abundance of natural resources including oil, natural gas, coal, iron and other minerals. Digital technologies are key to the identification, exploration, monitoring and use of those natural resourc-

¹³ For further information, see: Josephine Wawira, "Logistics challenges facing eCommerce in Africa", *Africa Business*, 26 June 2019. Available at: africabusiness.com/2019/06/26/e-commerce-jumia-africa/ (accessed on 1 November 2020).

¹⁴ For further information, see: taimba.co.ke/.

¹⁵ For further information, see: www.hellotractor.com (accessed on 1 November 2020).

¹⁶ Mercy Corps, *DigiFarm: a digital platform for farmers. Case study*. Available at: mercycorpsagrifin.org/wp-content/uploads/2019/05/DigiFarm-Platform-Case_Final_.pdf (accessed on 1 November 2020).

es. For example, Geographical Information System (GIS) technologies are being used in the analysis, management and monitoring of natural resources and associated hazards. In natural resource management, GIS and other spatial data technologies can improve the collection of spatial data on past or potential disasters and mitigate their impact. GIS and other location intelligent technologies and applications are used in many location-enabled services to enhance natural resource management and monitoring. The economies of many Africa countries are heavily reliant on the exploitation of their natural resources. Others rely primarily on agriculture, livestock production, the exploitation of forest resources or tourism. The degradation or mismanagement of African countries' natural resources therefore threatens the economic, social, political and physical well-being of their populations and could exacerbate poverty and food insecurity. In many countries, the assessment of natural resources tends to be sector based, with those assessments often driven by the information needs of policymakers or institutions that focus on only one particular economic sector or resource. However, integrated natural resource assessments adopt a more holistic, ecosystem-based

approach and also take into account biodiversity and ecosystem functions and services. Such assessments can, for example, enhance understanding of how land use management practices affect natural resources and the ecosystem functions and services they provide.

Increased investment in digital technologies will be needed to support small-scale farmers both during the COVID-19 pandemic and beyond. Additional financial resources could also help accelerate the transformation of African food systems. In digital agriculture ecosystems, farmers can use mobile phones and other digital technologies to access customized, actionable agricultural information in real time, potentially revolutionizing how rural communities secure and improve their livelihoods. During the pandemic, it has been difficult for agricultural extension officers to conduct face-to-face visits with farmers due to travel restrictions. It is therefore critical that countries adopt digital technologies to help address the challenges that they face.

Digitization has the potential to transform the agriculture sector in Africa, particularly if there is strong collaboration among relevant governmental bodies, private-sector stakeholders and smallholder farmers. For example, online resources accessible via mobile phones can be used to help farmers select seeds and fertilizers adapted to local environ-

mental conditions, protect their crops from diseases and pests, adapt to and mitigate the impact of climate change, sell their products at optimal prices and access financial services.¹⁷

Beyond digital solutions, the agricultural sector has benefited immensely from other technological innovations, including the FAO-Thiaroye Processing Technique, an innovative fish processing technology developed by the National Training Centre for Fisheries and Aquaculture Technicians in Senegal and FAO that impedes the production of carcinogenic polycyclic aromatic hydrocarbons, which can contaminate fish products.¹⁸

D. Building and promoting climate-smart cities

Smart cities are cities that successfully establish digital ecosystems that enhance their liveability, workability and sustainability. Driven by urbanization, economic development and the technological needs of inhabitants and visitors, smart cities are zones within a territory. The International Telecommunication Union (ITU) defines a smart city as “an innovative city that uses information and communications technology (ICT) and other means to improve residents’ quality of life, the efficiency of urban operations and services and the city’s com-

petitiveness, while ensuring that the city can meet the economic, social and environmental needs of present and future generations”.¹⁹

According to the World Bank, the proportion of Africans residing in urban areas is expected to grow from 40 per cent in 2010 to 60 per cent in 2050. Urbanization rates in Africa are thus likely to outpace rates in all other parts of the world. The population of Africa as a whole is expected to reach 2.4 billion by 2050.

The rapid influx of people to urban areas presents a policy challenge for African countries as they seek to formulate and implement long-term development plans. Urbanization may result in starkly different outcomes: cities may be plagued by increasing inequality, widespread poverty and growing social unrest, all of which are likely to impede growth. On the other hand, African cities may become engines of economic growth that foster social justice, environmental sustainability and human development.

Stakeholders seeking to develop smart cities have been inspired by the development of technology parks in various countries. It is also argued that the continent’s young population is also an important positive advantage since young people are more likely than older work-

¹⁷ Michael Tsan and others, *Digitalisation of African agriculture report 2018-2019*, Technical Centre for Agricultural and Rural Cooperation, (2019). Available at: www.cta.int/en/digitalisation/issue/the-digitalisation-of-african-agriculture-report-2018-2019-sid0d88610e2-d24e-4d6a-8257-455b43cf5ed6 (accessed on 1 November 2020).

¹⁸ For further information, see: www.fao.org/3/CA2559EN/ca2559en.pdf (accessed on 1 November 2020).

¹⁹ For further information, see the webpage of the ITU Focus Group on Smart Sustainable Cities. Available at: www.itu.int/en/ITU-T/focusgroups/ssc/Pages/default.aspx.

ers to adopt technology and drive innovation, as has been the case in the so-called Silicon Savannah in Kenya²⁰ and the Yabacon Valley in Nigeria.²¹

One key event in that regard was the Transform Africa Summit 2017, held in Kigali in May of that year, which brought together over 300 African mayors and heads of State and government. At that event, the Government of Rwanda unveiled the Smart Cities Blueprint, a framework aimed at accelerating the adoption of ICT-driven initiatives across cities in Africa. Countries that have launched smart city initiatives include Ethiopia, Ghana, Nigeria and Rwanda.

E. COVID-19 and the shift to remote working and public e-services

The increasing adoption and diffusion of digital technologies is expected to create new opportunities for growth and inclusion, characterized by improved access to global markets, greater resilience and efficiency, improved public service delivery, greater transparency and accountability and the creation of new jobs. Digitization is also likely to pose new challenges, however, including the risk of traditional job losses, which

might need to be addressed through policy interventions.

COVID-19 is forcing policymakers to review how work is organized and reflect on the need to re-tool employees with the skills required in the twenty-first century labour market. During the pandemic, many firms and organizations have asked their employees to work from home. Remote working (telework) has permitted some countries to minimize disruption to certain public services. In Rwanda, for example, the justice system is increasingly using videoconferencing for court hearings. A new e-passport agency in Côte d'Ivoire has established an online portal through which members of the public may submit documentation, make appointments and submit payments. The United Republic of Tanzania has established a similar system, and Tanzanian passports may now be issued by any Tanzanian embassy abroad. Meanwhile, the e-Citizen portal in Kenya is increasingly being used by citizens to access government services, including the issuance of civil and vehicle registration documents.²²

On the other hand, COVID-19 has led to a significant rise in unemployment across the continent. However, as public and private sector services go digital,

²⁰ For further details see, for example: Ian Steadman, "Kenya breaks ground on its 'Silicon Savannah' city project", *Wired*, 25 January 2013. Available at: www.wired.co.uk/article/kenya-silicon-savannah (accessed on 1 November 2020).

²¹ Bola Adetunji and others, *Microeconomics of Competitiveness Final Paper: Lagos ICT Services Cluster* (2017). Available at www.isc.hbs.edu/resources/courses/moc-course-at-harvard/Documents/pdf/student-projects/Lagos_ICT_2017.pdf (accessed on 1 November 2020).

²² International Monetary Fund, "Digitalisation in Sub-Saharan Africa", *Regional Economic Outlook for Sub-Saharan Africa* (April 2020).

opportunities for job creation may arise, including by facilitating remote and collaborative working.

Digital media platforms have in some instances undermined the viability of traditional media platforms, including traditional television channels. The COVID-19 pandemic has, moreover, led to a steep drop in advertising revenue for traditional media, with Google, Twitter, Facebook, Amazon and Microsoft now absorbing the lion's share of advertising revenue in Africa, even though those multinational companies pay no taxes in African countries.

F. Finance sector: e-business, trade and COVID-19

Compared with the situation in other global regions, little e-commerce currently takes place in Africa. Nonetheless, African e-commerce is growing rapidly and, in 2019, e-commerce revenues were growing at an annual rate of some 24 per cent across sub-Saharan Africa. About a quarter of the continent's population were active, online customers in 2019, compared with at least half the population in all other global regions and 90 per cent in advanced economies.²³

The extent of e-commerce varies widely across the region, however, with more

than half of those who engage in e-commerce residing in a select group of African countries, while less than 15 per cent of people in certain other countries sell or purchase goods online. On the other hand, sub-Saharan Africa continues to lead the world in terms of mobile money transactions. Indeed, mobile money transactions in Africa are now equivalent to 25 per cent of the continent's GDP, compared with just 5 per cent of GDP in the rest of the world. Furthermore, e-business and trade has been fuelled by technological innovation and the proliferation of tech hubs across the continent.

In times of crisis, countries often turn to cash disbursements to alleviate the immediate financial hardship experienced by their citizens. African countries have adopted a number of digital solutions to facilitate that process, including the issuance of e-vouchers and the use of biometric identification mechanisms, GPS location services and mobile money platforms. Many countries are considering e-voucher systems as part of their response to mitigate the impact of the COVID-19 pandemic. One useful lesson that many countries have learned from the current crisis is that it is crucial to invest in human capacity building and technological innovation in order to prepare as fully as possible for future challenges.

²³ Ibid.



Building a digital post-COVID economy

The impact of COVID-19 and new trends in the way people work, conduct business and engage in social life are accelerating the adoption of digital technologies. Inclusive growth will prove essential if countries are to achieve broad-based and comprehensive economic transformation. In that context, this section reviews key areas and technologies that could be leveraged to achieve inclusive growth and development. The section also highlights best practices adopted by certain African countries to address the negative repercussions of the COVID-19 pandemic.

A. Digital trade and financial services

Generally, financial inclusion refers to formal financial services, including deposit and savings accounts, payment services, loans and insurance, that are readily available to and used by consumers to meet their specific needs. Providing individuals with access to financial services is not specifically addressed in the Sus-

tainable Development Goals. However, it is likely to prove difficult to achieve the Goals without integrating the poor into the financial ecosystem.

Digital financial services are developing rapidly in Africa for several reasons. According to McKinsey & Company, a United States-based management consulting firm, approximately 80 per cent of adults in Africa do not have access to formal banking services, including to bank branches and ATMs. As a result, the majority of the working population, who are often employed in the informal sector and receive only small irregular incomes, must rely on unreliable postal mandate services. According to the African Development Bank, sub-Saharan Africa has the world's lowest penetration rate of depository institutions, with an average rate of a mere 16.3 per cent. This compares with a rate of 63.3 per cent in developing countries.

Financial technology is radically changing the continent's financial services

system, however. That technology is now being promoted and rolled out by financial technology companies, including more than 300 financial technology start-ups, operating in areas such as payments, lending, retail banking, asset management, fraud protection and regulatory compliance.

B. Digital identity

Target 16.9 of the Sustainable Development Goals calls for the provision of legal identity for all, including free birth registrations, by 2030. The achievement of that target could be facilitated by the use of efficient and effective digital identification systems. In that connection, it should be emphasized that the widespread lack of legal identity in developing countries in general, and in Africa in particular, is a critical stumbling block that continues to impede economic growth. Furthermore, recent studies have revealed that more than half the population of certain sub-Saharan countries have no official identification document, even though more than two thirds of people in sub-Saharan Africa have a mobile phone subscription. In the last couple of years, digital identification mechanisms have become a transformative tool that has promoted development by facilitating the delivery of digital services.

A digital identity (ID) can be established biometrically through a person's facial or optical characteristics or their fingerprints, all of which can be verified on-

line in real time using a smart phone or other connected device. Connectivity is a well-recognized precondition for the establishment of a digital society. The adoption of digital identification mechanisms is another prerequisite.

The full deployment of digital identification mechanisms could have a huge positive impact on a wide range of stakeholders, including citizens, businesses and governments. Indeed, the deployment of those mechanisms could put a bank account within reach of the 500 million people whose lack of a recognized ID excludes them from the formal banking sector. Modernizing government ID systems could facilitate significant efficiency gains in business by allowing for digital transactions on the basis of reliable data. It has been estimated, moreover, that the adoption of digital ID systems could result in global taxpayer savings of up to \$50 billion per year by 2020.

By advancing government accountability and transparency, digital ID systems could also help eliminate the corruption and theft that plague many paper-based systems. In Guinea-Bissau, for example, a 2010 biometric census of civil servants reportedly identified 4,000 non-existent workers on the public payroll. Nigeria reported that it successfully eliminated 43,000 so-called "ghost" workers in its first phase of a digital ID pilot project in 2011, saving the country some \$67 million. Furthermore, the deployment of a biometric platform for the disbursement of pensions and social assistance grants

in Botswana has eliminated waste by identifying duplicate records, while a new fingerprint-based digital national ID system in Ghana will cover the entire population of over 25 million people and is facilitating the provision of government and commercial services.

Digital identities are also vital for refugees and other forcibly displaced persons. Those individuals often lose their ID documents or leave them behind as they flee persecution. Access to a digital identity is vital to enhance the protections offered to those groups and facilitate their integration into society. A digital ID is often a vital gateway that allows marginalized groups to access information or educational and banking services, or to take advantage of economic opportunities.

However, to fully exploit the opportunities stemming from the adoption of digital ID platforms, countries must also put in place robust legal and technical frameworks for the protection of data so as to address privacy concerns. The successful deployment and implementation of digital ID systems will depend on governments instilling a climate of trust with regard to those systems. This will, in turn, require strong political commitment and leadership.

C. Digital inclusion

As stated previously, Internet access has increased in Africa more than in any

other continent in recent years, jumping from a mere 2.1 per cent in 2005 to some 24.2 per cent by 2018. It is therefore a paradox that Africa remains one of the least connected global regions. In fact, the successes achieved in the mobile telephony sector in terms of both penetration rates and innovation have not been repeated in terms of Internet and broadband access.

Only 27 per cent of Africans enjoy access to the Internet, few African citizens have a digital ID, businesses are only slowly adopting digital technologies, and only a few governments are investing strategically in the development of digital infrastructure, services, skills, and entrepreneurship. The African Development Bank estimates that between \$130 billion and \$170 billion must be mobilized annually in order to address the continent's infrastructure needs. However, annual infrastructure financing in Africa currently falls short of that target by between \$68 billion and \$108 billion. Bridging this gap would, among other effects, significantly enhance efforts to establish digital economies in Africa.

The second guiding principle for implementation of the 2030 Agenda for Sustainable Development provides that no one shall be left behind. Specifically, attention will need to be given to diverse groups and the barriers they face when seeking to achieve meaningful connectivity and access digital technology and associated services. To that end, numerous organizations are now endeavouring

to understand and analyse the impact of the COVID-19 pandemic on communities' access to digital technology.

D. Digital health

Since the adoption in 2005 by the fifty-eighth World Health Assembly of resolution 58.28 on e-health, the African region has witnessed the deployment of a vast range of e-health solutions. Following advancements in technology, the field has transformed itself into what is now referred to as digital health. More recently, the World Health Organization (WHO) has defined digital health as “a broad umbrella term encompassing e-Health (which includes m-Health), as well as emerging areas, such as the use of advanced computing sciences in ‘big data’, genomics and artificial intelligence”.

By the end of 2019, 33 United Nations Member States in the African region had developed digital health strategies. Several of those States are now digitizing their health systems by making use of the National eHealth Strategy Toolkit, developed by WHO and ITU, which emphasizes the need for countries to formulate a national vision, action plan and a monitoring and evaluation framework.

M-Health is the most widely used digital health intervention in African region. The most recent survey, carried out in 2015 by the WHO Global Observatory for eHealth, shows that m-health was

in use in 24 Member States. Interventions adopted by Member States in that area include the following: facilitating access to health information; providing toll-free emergency assistance; establishing health call centres; providing appointment reminders; establishing mechanisms for mobile tele-health; establishing mechanisms for the management of disasters and emergencies; formulating protocols for treatment adherence; fostering community mobilization; establishing databases and tools; streamlining patient records; supporting m-learning; establishing decision support systems; facilitating patient monitoring; and, conducting health surveys and disease surveillance.

Besides m-health, other digital health services showing progress are social media (21 Member States), tele-medicine (20 Member States), e-learning (17 Member States), electronic health records (6 Member States), big data (2 Member States) and other services, including the establishment of human resource information systems, laboratory information systems, and supply chain and logistics management information systems.

Key issues that must be addressed in the area of digital health in the African region include the interoperability of digital health systems, health workforce capacity-building, system governance, privacy and security, and the adoption of emerging technologies such as blockchain, AI and the Internet of things.

Scaling up new and emerging technologies to support sustainable growth

AI is rapidly transforming the world. Together with other emerging technologies, such as robotics, 3D printing, nanotechnology and biotechnology, AI is blurring the traditional boundaries separating the physical, digital and biological worlds, thereby affecting all disciplines, economies and industries and even challenging ideas about what it means to be human. Those innovative technologies are expected to continue revolutionizing society both during and in the aftermath of the COVID-19 pandemic. This section will assess the progress made by certain countries in embracing those technologies, the challenges they have encountered and the prerequisites for leveraging those technologies, promoting digital transition and ensuring inclusive growth and development.

While the world is entering what has been dubbed the fourth industrial revolution, much of Africa has yet to reap the full benefits of the second and third such revolutions. A strategy is therefore

needed to enable the continent to move forward rapidly and simultaneously reap benefits stemming from the second, third and fourth industrial revolutions. By doing so, Africa could save significant time and resources, maximize opportunities and avoid the costly mistakes made by other continents in the context of previous industrial revolutions. In the energy sector, for example, Africa lags significantly behind other continents in terms of energy access, but it is also blessed with high levels of solar radiation and hydropower potential. By embracing renewable energy, the continent could skip the unsustainable carbon-intensive economic development stage.

This example demonstrates that continents that, in many respects, lag behind others could potentially leapfrog more advanced regions of the world by exploiting the strategic advantages stemming from new technologies. Similar examples can be identified in other sectors of the economy. Opportunities

to develop sustainable and green cities and promote the use of sustainable transport networks may stem from the fact that infrastructure in African cities is often poor compared with infrastructure in similar-sized cities in other continents. Similarly, African countries could address challenges related to ICT gaps and poor connectivity by adopting advanced and cost-effective ICT solutions, while significant challenges related to water, energy and food security, many of which are being exacerbated by climate change, could be addressed by establishing an innovative, resilient and sustainable energy-water-food nexus across the continent.

An English proverb states: “Necessity is the mother of invention”; it is clear that the COVID-19 pandemic has accelerated innovation and drawn attention to the capacity of African innovators to develop practical digital and technological solutions to many of the continent’s problems. Indeed, many African countries are now making use of technologies that have emerged during the pandemic. Many governments and private-sector institutions are supporting the production of protective clothing for both front-line health-care workers and other citizens using 3D printing technology. The adoption of those technologies, which has been supported by many African institutions of higher education, has resulted in declining prices for protective clothing: a welcome development for the many Africans for whom it had previously been unaffordable.

Those initiatives must now be scaled up in order to benefit more people. Support from governments for the purchase of 3D printers, particularly by institutions of higher education, would be a good first step. Those institutions would then ensure that others learn about 3D printing, thereby ensuring the sustainability of 3D projects once the COVID-19 pandemic is over.

In the context of COVID-19, Rwanda is now using unmanned aerial vehicles to distribute medicine and deliver public-service announcements. It has also used robots to complement the efforts of front-line health-care workers. Drones will also be used to patrol the border between South Africa and Zimbabwe with the aim of preventing illegal border crossings during the COVID-19 pandemic.

Although Internet penetration rates in Africa remain relatively low, the pandemic is poised to spur innovation that is likely to increase access. Technologies to improve educational outcomes have been adopted in many African countries, with Senegal introducing online learning and other countries working with private-sector technology companies to create online learning platforms. In countries where Internet connectivity is low, radio is being used to deliver lessons to students. Evidence shows, however, that for science, technology, engineering and mathematics (the so-called STEM subjects) the teaching of which often requires visual aids, radio is often not the most appropriate educational

medium. Governments should therefore foster the emergence of a culture of online learning and encourage the use of webinars to deliver lessons. Governments and Internet providers should also strengthen their collaboration with a view to increasing Internet penetration rates and providing affordable educational data packages. To that end, the Higherlife Foundation, a social impact organization in Zimbabwe that invests in human capital, offers free limited access to its educational platforms, while Econet Wireless Zimbabwe, a provider of telecommunications services, offers affordable educational data packages for students at all levels.

In South Africa, the National Department of Basic Education provides a wide range of easy-to-use distance learning materials on its website. Students can find multimedia resources, including video and audio files, interactive workbooks and other study materials on a dedicated web page, which also provides pedagogical information for parents. South Africa also transmits educational television and radio programmes that enable students to continue their education at home. Telkom ZA, a telecommunications company, also provides cost-free access to educational websites.

In Zimbabwe, the Harare Institution of Technology and other institutions of higher education have used their innovation hubs to develop a range of COVID-19-related interventions, including the development of low-cost

ventilators. Funding shortfalls are, however, hampering efforts to scale up those efforts and significant investment will be required to support mass production.

Robotics could also prove to be useful in the fight against COVID-19 and other pandemics, particularly in treating and disinfecting affected areas. Utilized effectively, robots could minimize person-to-person contact and protect health-care workers at risk of contamination. In South Africa, Nexmed Healthcare Solutions has developed a medical robot that uses short-wavelength ultraviolet lamps to disinfect operating theatre facilities in just eight minutes. Additionally, the use of robots not only complements the activities of health-care workers, but could also promote the establishment of robust health-care systems with the capacity to respond effectively to future health crises. Scaled up, those and other innovations could significantly improve efforts to disinfect public spaces.

United Nations Member States, particularly in Africa, stand to reap further benefits from the application of those innovative technologies through their adoption of an “open science” approach that provides for scientific collaboration and the sharing of data. In the context of pressing planetary and socioeconomic challenges, the formulation of sustainable and innovative solutions will undoubtedly require efficient, transparent and vibrant scientific efforts, not only by members of the scientific community, but also by society as a whole. In that regard, the re-

response of the scientific community to the COVID-19 pandemic has demonstrated clearly how open science can accelerate the formulation of scientific solutions to address global challenges.

This approach, which may be termed “science of the future”, aims only to democratize science but also to allow for the sharing of locally-relevant data to inform policy decisions, promote scientific and technical advancement, and even the inclusion of local and indigenous knowledge systems with a view to formulating efficient responses to pandemics and other disasters and promoting sustainable development. An open approach to scientific research, data, resources and outputs can foster scientif-

ic collaboration, strengthen a culture of science, enhance the involvement of citizens in research activities and enhance access to scientific data by communities and decision makers.

Investors, entrepreneurs, policy makers and citizens, are now calling for an open approach to science, technology and innovation. Achieving consensus among a range of stakeholders can facilitate the adoption and scaling up of new technologies. It should, however, be emphasized that, for the continent to make effective use of key emerging technologies, there is an urgent need to train an adequate number of Africans in basic science and engineering.



VII

Challenges associated with new technologies and digital solutions

Challenges associated with innovative technologies and digital solutions include those related to widening technological and income gaps between developing and advanced economies, challenges related to countries' digital infrastructure and service needs, and skills gaps that impede the effective exploitation of emerging technologies to promote inclusive growth. This section will identify current and potential challenges that must be addressed.

Innovative technologies offer solutions to many of the challenges that have emerged during the COVID-19 pandemic. At the same time, however, the roll out of those technologies has helped draw attention to a number of key challenges, including those related to access to electrical power, digital connectivity, the literacy of target users, IT capacity and skills gaps, and the financial sustainability and scale-up potential of interventions.

- **Inclusivity:** several countries must address significant Internet connectivity gaps and cover the costs of innovative technologies that can facilitate efforts to ensure that no one is left behind. Although the cost of rolling out digital technologies continues to fall rapidly, many individuals, including smallholder farmers, can still not afford to exploit those technologies effectively. Access to electrical power and literacy and skill gaps among target users are also issues that must be addressed by many African countries. Refugees and other forcibly displaced persons are also half as likely to enjoy access to digital technologies as members of their host communities. With over 18 million forcibly displaced persons, stateless persons and returnees in Africa, efforts to foster their inclusion in digital technology initiatives will be critical.

- **Identification:** providing citizens with a digital identity is a key enabler in the digital economy. An officially-issued ID is often needed to open a bank account or to make and receive digital payments.
- **Data sovereignty:** security and trust are fundamental in the adoption of new technologies because they reassure both consumers and businesses. It is therefore essential for countries to establish laws and regulations on consumer protection, data protection and cybercrime.



VIII

Challenges related to innovation

Intellectual property registration in Africa remains prohibitively expensive and the high cost of registration is a significant factor that continues to impede innovation.

The continent faces a number of significant challenges as it seeks to leverage digital technologies in the context of the COVID-19 pandemic and accelerate efforts to achieve the 2030 Agenda for Sustainable Development and Agenda 2063 of the African Union. As mentioned previously, access to digital technologies remains low in African compared with other continents, and there is a persistent and significant digital divide both within and between African countries. The continent's limited digital infrastructure and its connectivity deficit also pose significant challenges. The COVID-19 pandemic has also aggravated inequalities between those with and without access to digital technologies.

The COVID-19 pandemic has also made clear that African countries must give priority attention to improving digital

connectivity. Indeed, while half of the world's population is connected to the Internet, connectivity in Africa, home to almost 15 per cent of the world's population, remains much lower, with only 21 per cent of Africans using the Internet and only 34 per cent of the continent covered by broadband networks. Only 17.8 per cent of households enjoy Internet access within the home and access to high-speed Internet at home remains beyond the reach of the majority of Africans. According to ITU, the proportion of women using the Internet globally was only 22.6 per cent in 2019, compared to 33.8 per cent of men, and the digital divide and the digital gender gap are both likely to have widened during the COVID-19 pandemic.

In terms of GDP per capita, Africa is by far the world's poorest continent. Nonetheless, 1 GB of data on the continent costs, on average, some 7.12 per cent of an individual's income. In some countries that figure is as high as 20 per cent, far higher than the 1 or 2 per cent of income that is deemed affordable. The

fact that most Africans cannot afford to access the Internet is now a serious challenge impeding the delivery of basic public services.

Infrastructure and connectivity deficits can impede countries' capacity to combat COVID-19 and reap the benefits of the digital economy. Africans, and particularly those living in landlocked and least developed African countries, have limited or no access to the high-speed broadband internet connections that are required to access streaming video and other key internet services and few African Governments are investing strategically in the development of digital infrastructure, services, skills, and entrepreneurship. In that regard, the ITU-UNESCO Broadband Commission for Sustainable Development, has estimated that achieving universal, affordable and high-quality Internet access by 2030 across Africa may cost as much as \$100 billion.

Broadband connectivity is also crucial if educational institutions and businesses are to continue to provide essential services. Almost all school children and university students in Africa had been affected by the COVID-19 pandemic as of mid-March 2020, with a number of estimates indicating that more than a quarter of a billion school children had been affected. The majority of those children were unable to continue their studies using digital tools, potentially

exacerbating entrenched inequalities within the continent.

Social protection initiatives are hampered by the fact that more than 40 per cent of Africans have no officially-issued identity document, with women and young people less likely than men to have any form of ID at all. The COVID-19 pandemic has helped underscore the urgent need to address disparities in access, which could aggravate social and economic inequalities, impede the social mobility of individuals and undermine innovation and economic growth.

COVID-19 has also helped draw attention to the potential disruption and abuse of digital networks. Criminals have launched a number of cyberattacks while considerable misinformation has been spread online concerning the pandemic. Furthermore, a number of attacks on registered domains on the Internet that contain the terms: "coronavirus", "corona-virus", "COVID19" and "COVID-19" have been reported. Research suggests that there has been unprecedented interest in hacking and cybercrime during the COVID-19 pandemic. Indeed, Google search trends indicate that online searches related to hacking, scamming and other forms of cybercrime skyrocketed between March and May 2020, while visits to popular hacker websites and forums increased by as much as 66 per cent in March of that year.

Developing policy and regulatory frameworks to leverage the digital economy

With the adoption of new and emerging technologies, policy and regulatory environments are likely to evolve so as to leverage those technologies across economies and societies. This section identifies key policy and regulatory issues that should be addressed by African countries in order to leverage those technologies and promote inclusive and sustainable growth.

Developing an inclusive and enabling legal and regulatory environment is crucial if countries are to spur innovation and scale up digital solutions in Africa. At the same time, legal and regulatory frameworks are needed to promote cybersecurity and personal data protection and allay privacy concerns. In fact, government intervention in the marketplace is usually justified on the basis of market failures and the need to ensure societal well-being. Consequently, policy and regulatory measures enacted by countries have implications for the affordability, accessibility and use of ICT, digital solutions and other innovative technologies across the continent.

At the continental level, the African Union, the European Union and ITU have established the Policy and Regulation Initiative for Digital Africa to create a more harmonized and enabling legal and regulatory framework for the use of ICT for social and economic development.

Other issues that should be considered include the following:

- The recognition and enforcement of intellectual property rights. Young entrepreneurs on the continent have sometimes complained of their ideas being stolen.
- The fact that, while policymakers may find it challenging to design regulations for emerging, experimental technologies, doing so can attract investment and encourage further innovation. According to ITU, new technologies, AI, big data, the app economy, cloud computing, the Internet of things, blockchain, social media, mobile

technology and emerging business models are severely testing existing regulatory paradigms.

- The fact that few African countries have adopted policies governing the use of data or exercise any type of oversight of online services. Lack of oversight increases the risk that data or online services will be misused and undermines confidence in the accuracy of data.
- The fact that many marginalized individuals, including undocumented and forcibly displaced persons, lack the necessary credentials to access many digital services and are at considerable risk of being left behind. Although efforts are being made to enhance the provision of documentation for those individuals, tiered “know your customer” regimes and other solutions should also be considered by telecommunications regulators to facilitate the inclusion of marginalized individuals and communities while successfully managing risk.

- The need for governments in Africa to offer fiscal incentives, including tax holidays and the provision of risk capital, to encourage and support innovation.

On the legal and regulatory front, African countries have a relatively limited set of options for regulating the collection, management, storage and use of data.²⁴ Of the 54 countries in Africa, 28 countries have so far failed to adopt legislation on data protection, while 6 countries are in the process of drafting legislation in that area.²⁵ Few African countries have established data protection authorities and there is little harmonization of data privacy regulations across Africa. Massive amounts of personal data are currently captured outside Africa, putting control of that data in the hands of vendors and platforms located outside the continent. It is critical that African countries develop frameworks that protect the privacy of individuals while also ensuring that individuals and societies reap the greatest possible economic and social benefit from the data they provide.²⁶

²⁴ For further information, see: United Nations Conference on Trade and Development, *Data Protection and Privacy Legislation Worldwide*. Webpage available at: unctad.org/page/data-protection-and-privacy-legislation-worldwide (accessed on 1 November 2020).

²⁵ Ibid.

²⁶ Parminder Jeet Singh, “Digital Industrialisation in Developing Countries - A Review of the Business and Policy Landscape”, *IT for Change*, 2017. Available at: <https://itforchange.net/digital-industrialisation-developing-countries---a-review-of-business-and-policy-landscape> (accessed on 1 November 2020).



Recommendations

This white paper has highlighted some of the most pressing issues arising in the context of the COVID-19 pandemic, and has drawn attention to how new and emerging technologies can be leveraged to facilitate digital transition in Africa, both during the pandemic and beyond. This section sets forth a number of key policy recommendations for consideration by African decision makers and other relevant stakeholders.

Policy: countries must adopt an innovative approach in order to accelerate the adoption of new technologies in African development plans. The COVID-19 pandemic has demonstrated clearly that countries must consider the adoption of alternative but practical regulatory steps and policies to address issues such as market competition, limited private-sector engagement and market dynamics. The design and implementation of appropriate policies and the creation of an enabling environment are crucial if countries are to support the adoption of innovative digital technologies. Governments should also put in place robust

legal and regulatory frameworks so as to build trust among ICT users that systems are secure and that their privacy and personal data are protected.

Infrastructure: robust digital infrastructure, including broadband access, is critically important in the delivery of effective and inclusive public services. Access to affordable broadband is a pillar of the digital economy. Priority attention should therefore be given to building broadband infrastructure, including in rural areas, and ensuring affordable access to broadband services. By doing so, countries can foster sustainable socioeconomic growth. A range of approaches are needed to achieve that objective, including the use of wireless and satellite networks. Innovative financing mechanisms are also needed to accelerate the creation of the digital economy. Member States can provide incentives such as reducing the fees charged for licences and permits and streamlining licence and permit application procedures.

Digital skills: despite its significant youth dividend, Africa still lacks sufficient numbers of appropriately-skilled workers with the capacity to adopt and implement big data and other emerging digital technologies. Governments should therefore invest in programmes to enhance the digital skills of workers across the social, industrial, governmental and educational sectors, with particular emphasis on programming, coding, app development, computer engineering, system development and design, and business process engineering. Investing in skills development will help the African labour force adapt to a rapidly changing skills landscape and enhance employment opportunities. The private sector has an important role to play in that regard by investing not only in outcomes but also in human capital inputs.

Digital ID: a digital ID is a fundamental enabler of almost all digital interactions. Countries adopting digital ID platforms have the potential to capture significant value in a wide range of areas, including health care, financial inclusion, employment and the delivery of e-government services.

Data protection and privacy: digital technologies offer new opportunities for people to share data and information. They facilitate the tracking of people's movements, behaviour and preferences and contains large amounts of sensitive and personal information that may be exposed to privacy, confidentiality, and cybersecurity risks. If not adequately protected, personal data may be vulnerable to cyberattacks, used to profile individuals, and sold to third parties. Governments should therefore adopt robust policies and regulatory frameworks to build users' trust in the security of digital technology platforms.

Cybersecurity: African countries must take action to protect users and systems against cybercrime. Governments must establish secure information network infrastructure and adopt strong cybersecurity laws and regulatory frameworks to ensure that sensitive personal data is protected from abuse and criminal activity.²⁷

²⁷ Graham Greenleaf, "Global Data Privacy Laws 2019: 132 National Laws & Many Bills", 157 *Privacy Laws & Business International Report*, 14-18 (8 February 2019). Available at ssrn.com/abstract=3381593 (accessed on 1 November 2020).



XI

Conclusion

This paper is a living document that will be updated periodically.