Digital Economy for Africa Country Diagnostic Tool and Guidelines for Task Teams

Version 2.0

June 24, 2020

List of Acronyms

4IR	Fourth Industrial Revolution Technologies
A4AI	Alliance for Affordable Internet (A4AI)
ADI	Affordability Drivers Index
AfDB	African Development Bank
AML/CFT	Anti-Money Laundering and Countering Financing of Terrorism Act
APIs	Application Programming Interfaces
ARPU	Average Revenue Per User
ATCs	Accredited Test Centers
AU	African Union
AUC	African Union Commission
B2B	Business-to-Business
B2C	Business-to-Consumer
BEA	Bureau of Economic Analysis
CERT	Computer Emergency Response Team
CII	Critical Information Infrastructure
CtoG	CivicTech
DAI	Digital Adoption Index
DD	Digital Development
DE4A	Digital Economy for Africa Assessment
DEC	Development Economics Vice Presidency
DECA	Digital Economy Country Assessment
DFS	Digital Financial Services
DGRA	Digital Government Readiness Assessment
DII	Digital Infrastructure Initiative
DPO	Development Policy Operation
DSL	Digital Subscriber Line
DSO	Digital Switchover
DWDM	Dense Wavelength Division Multiplexing
ECDL	European Computer Driver's License
EDU	Education
EGDI	E-Government Development Index
EIU	Economist Intelligence Unit
EMIS	Education Management Information System
FCI	Finance, Competitiveness and Innovation
FCS	Fragile and Conflict-Affected States
FSPs	Full-Service Providers
FTTH	Fiber-to-the-home
FTTX	Fiber to the X
G2B	Government-to-Business

G2G	Government to Government
G2P	Government-to-Person
GDP	Gross Domestic Product
GEN	Gender Global Practice
GOV	Governance
GSMA	Global System for Mobile Communications
ICDL	International Computer Driver's License
ICT	Information Communication Technology
ID	Digital Identification
ID4D	Identification for Development Program
IDA	International Development Association
IDA	Individual Development Account
IDEEA	ID Enabling Environment Assessment
IFC	International Finance Corporation
ILO	International Labor Organization
IoT	Internet of Things
IPF	Investment Project Financing
IRU	Indefeasible Right of Use
ITU	International Telecommunication Union
IXPs	Internet Exchange Points
LCR	Learners to Computer Ratio
MDA	Message Delivery Attempt
MFD	Maximizing Finance for Development
MOOCs	Massive Open Online Courses
MPA	Multi-Phased Approach
MVNO	Mobile Virtual Network Operator
NREN	National Research and Education Network
OECD	Organization for Economic Cooperation and Development
OPMs	Online Program Managers
OSI	Online Service Index
PDH	Plesiochronous Digital Hierarchy
PE	Private Equity
PIAAC	Program for the International Assessment of Adult Competencies
PKI	Public-Key Infrastructure
PoS	Point of Service
PPPs	Public-Private Partnerships
SDH	Synchronous Digital Hierarchy
SDM	Single Digital Market
SIM	Subscriber Identity Module
SME	Small and Medium Enterprise
SMP	Significant Market Power
SOC	Security Operation Center
SSA	Sub-Saharan Africa
TA	Technical Assistance

TMT	Telecom, Media and Technology
TVET	Technical and Vocational Education and Training
TVWS	TV White Space
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific, Cultural Organization
VoIP	Voice Over Internet Protocol
WBES	World Bank Enterprise Surveys
WBG	World Bank Group
WDM	Wavelength Division Multiplexing
WEF	World Economic Forum
WIPO	World Intellectual Property Organization

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DE4A Diagnostic Tool V1.0

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I. PURPOSE

- ***The revised DE4A diagnostic tool provides an integrated framework for assessing the enabling environment and level of development of digital economy in a country in Africa.*** This document is intended to present a framework and provide guidelines to a multi-sector task team in carrying out an assessment of digital economy in a country in Africa. The objective of the diagnostic is to determine the current state of play of digital economy in the country and assess key levers that drive the country's digital economy. The findings of the diagnostic are intended to provide practical, actionable recommendations to governments and stakeholders on priority areas of development, with a mix of possible policy reforms and financing needs. The findings will also provide guidance on potential areas of World Bank Group (WBG) support to achieve its twin goals of ending extreme poverty by 2030 and boosting shared prosperity, as well as for the implementation of the African Union's Strategy for Digital Transformation which was adopted in February 2020[1]. The diagnostic is expected to build on relevant assessments already carried out and be a first step in building a dialogue with government for further developing digital economy in a country. Additional deep-dives may be needed to further study specific areas of development especially for key socio-economic sectors that drive digital transformation either as use cases (e.g. agriculture, health…) or as enablers (e.g. energy).

- ***The tool emanates from cross-GP and cross-WBG collaboration.*** The technical team comprised of experts from Digital Development (DD), Finance, Competitiveness and Innovation (FCI), Governance and Education Global Practices of the World Bank; as well as Telecom, Media and Technology (TMT), Disruptive Technologies and Funds (CDF) and Global Industry, Financial Markets, Digital Finance Advisory (CFGAD) teams of the International Finance Corporation (IFC).

- ***Version 1.0 of the tool was built on work previously done by World Bank Group teams on digital economy and related areas:*** In developing the DE4A V1.0, the teams at the World Bank Group worked on different aspects of a country's digital economy. Key among these included the Digital Economy Country Assessment (DECA) tool by DD; Digital Infrastructure Initiative (DII) assessment tool by DD/IFC; Digital Government Readiness Assessment (DGRA) by DD, the Financial Inclusion Guidance Note for the Financial Sector Assessment Program, the Payment Aspects of Financial Inclusion Principles, the Digital Entrepreneurship Ecosystems Diagnostic developed by FCI, and the digital identification (ID) diagnostic tool developed by the Identification for Development (ID4D) Initiative. The document builds on, and learns from these tools, and tailors the approach to produce an integrated diagnostic tool to assess digital economies in Africa. The tool was expected to be refined based on insights gained from its use in an initial set of countries assessed in FY19.

- ***Version 2.0 of the DE4A diagnostic tool further builds on the lessons learned by Task Teams from using the tool to assess digital economy development status and prospects in pilot countries during FY19.*** Following its use in about 10 countries, the World Bank Group has gained extensive insights on what worked and what could work better in using the tool for country assessments. Key areas that have been revised, clarified or improved include: a) Definitions of Digital Economy pillars and linkages between pillars; b) Separation between Digital Public and Private Platforms, c) DE4A Indicators and targets; d) cross-cutting areas such as data privacy, cybersecurity, competition, gender and cross-

[1] : https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030

cutting risks; e) capacity constraints for key regulatory areas and countries; and f) prioritization and sequencing of reforms to reflect country context.

- ***The output of the DE4A diagnostic review exercise is expected to be a synthetic report providing an assessment of a country's digital economy, along with specific, actionable and prioritized recommendations to inform the digital economy dialogue and inform the Systematic Country Diagnostic / Country Partnership Framework.*** A multi-GP task team is recommended to carry out the diagnostic. The task team should at the minimum constitute experts from DD GP, FCI GP, Education GP, and Gov GP, and, as needed and budget-permitting, include experts from relevant IFC teams[2], as well as experts from the cross-GP ID4D Initiative and other GPs for relevant deep dives in vertical sectors (e.g. agriculture, health…) or key enablers (e.g. energy). The diagnostic would involve desk research of the areas comprising digital economy in a country, and an in-country mission(s) for consultations with government counterparts, the private sector, and user representatives. The diagnostic should focus on the opportunities that digital technologies present for the country and the key hurdles that inhibit the development and growth of digital economy in the country, and provide specific, actionable and prioritized recommendations for the government and stakeholders.

- ***Government agencies responsible for digital economy may vary by country.*** Given the cross-cutting nature of digital economy, the task team should engage with the appropriate government agency tasked with the coordination of digital economy in the country for the overall coordination of the assessment. This could be the Minister in charge of Digital Economy, the Minister in charge of Economy and Finance or a higher entity such as the Office of the President or the Office of the Prime Minister. This should be complemented with engagement at pillar thematic level with a lead agency for each of the assessment pillars. Part of the work may involve educating government about the cross-cutting nature of digital economy and bringing a coordinating function for digital economy within government. Liaising with the private sector and civil society as key stakeholders would be important in the development of digital economy in a country. The diagnostic would highlight ways by which the findings could have the greatest "whole of government" impact, without being siloed in individual government agencies. Thus, digital technology may help address political economy challenges, without the process of digital transformation itself becoming hostage. Regardless of the agency identified for the overall coordination of the assessment, the Task team would need to ensure that the requisite capacity exists for effective implementation of proposed reforms.

- ***Timeline, costs, report format, internal clearances and dissemination guidance*****.** The diagnostic should be carried out, with a timeline of 8-10 months. Based on client interest and demand, an in-country workshop may be carried out in tandem to disseminate findings of the diagnostic, and to further build dialogue with counterparts and stakeholders (see Communication Guidelines). Internally within the WBG, all the necessary clearances including Concept Note and Decision Meeting Reviews should be arranged in a timely manner to allow Management Guidance during the DE4A process. The task team needs to ensure that the relevant experts are invited to peer review documents. A list of sample peer reviewer questions is included in **Annex 8** to provide guidance to Task Teams. The estimated cost of preparing and disseminating a DE4A diagnostic is US$150,000-200,000. Finalized DE4A diagnostic should follow recommended template and dissemination guidance note (see Report Template and Dissemination Guidance Note) and undergo a professional editing to bring them to a

[2] IFC teams may include: TMT for digital infrastructure; Financial Markets Team for digital financial services; Disruptive Technologies Team for entrepreneurship skills and digital ID; and Manufacturing, Agriculture and Services Team for digital skills

standardized level of quality. Publicly available Digital Economy country diagnostics can be accessed at: https://www.worldbank.org/en/topic/digitaldevelopment/brief/digital-economy-country-diagnostics-for-africa Also see **Figure 1** for a summary of completed and on-going DE4A diagnostic reports.

- ***Reflecting on country's ability to respond to and recover from this crisis leveraging on digital technologies.*** The diagnostic should provide a cross-cutting view on how the current stage of development of digital economy will strengthen the country's ability to respond to and recover from crisis such as the COVID-19.

Figure 1:Overview of Digital Economy Country Diagnostics

II. CONTEXT: DIGITAL ECONOMY

- ***Traditional economic sectors of Africa are paving the way to new growth models with rising mobile phone penetration, improving broadband Internet, and growing use of mobile money across Africa — unleashing new opportunities for people, businesses and governments.*** In 2017, mobile

technologies and services generated 7.1% of GDP or US$110 billion in Sub-Saharan Africa.[3] Mobile money, driving financial inclusion, doubled the number of accounts to 21% between 2014-17.[4] This digital revolution has spurred the development of a small but rapidly growing digital sector, with innovative entrepreneurs launching new digital products and services and creating 21st century jobs. More significantly, digital technologies are gradually driving productivity gains in traditional industries. Many governments have likewise begun to take advantage of these trends by moving public services online and utilizing data to improve policymaking and digital platforms to increase the efficiency of public service administration.

- ***While Africa's digital revolution has been impressive, the continent has more to achieve.*** While a consensus on how to define and measure the digital economy is still emerging, the share of digital economy in global and African GDP will continue to grow in coming years, possibly outpacing the growth of the overall economy.[5] African countries are currently capturing a fraction of the global digital economy. Access to and affordability of broadband internet remains low and is a major hurdle. More people in Africa require access to digital identity and mobile wallets which could enable them to use critical services such as e-commerce. Governments require enabling policies and investment climate for digital infrastructure, businesses, services, skills and entrepreneurship to help develop robust digital economies.

- ***Tomorrow's economies would be driven by digital transformation across sectors, especially in response to COVID-19:*** Increasingly, technology is at the center of people's daily lives. People rely on computers, smart devices, phones, and tablets for many of their daily activities. They use these to read and write, buy and sell, communicate, navigate, pay, or just hail a cab. They use these for personal and professional lives. In the unprecedented fight against COVID-19, digital technologies offer the only opportunity for governments, individuals and businesses to cope with social distancing, ensure business continuity, and prevent service interruptions. There is a widespread wave of disruption across traditional sectors in the global economy. The wave is upending traditional business models and industries altogether. Brick-and-mortar banking is being overtaken by online and mobile banking. Retail commerce is being displaced by e-commerce. Education is being challenged by massive open online courses (MOOCs). Covid-19 is redefining how social and economic activities occur across countries, and paving the way towards digital economies, at national, regional, and global levels. Availability of affordable and reliable broadband internet is even more critical and can be leveraged across multiple use cases (health, education, social protection, agriculture, …)

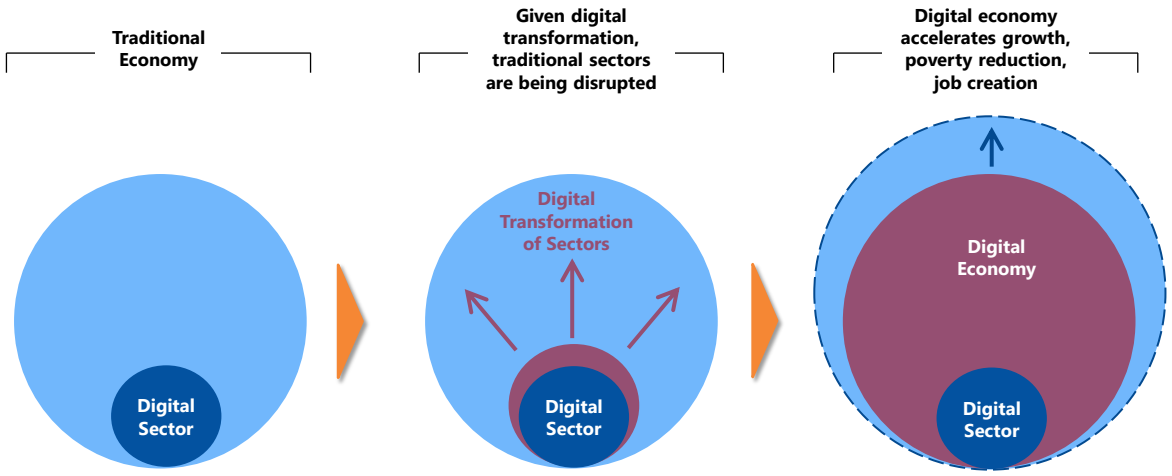
- ***Digital Data will continue to be at the core of digital transformation***. The amount of data being collected through digital platforms is growing exponentially, with data flows increasing from about 100 GB per day in 1992 to more than 45,000 GB per second in 2017 and projected to reach 150,700 GB per second by 2022 as more and more people go online.[6] Data has become an important economic resource which is challenging traditional ones and bringing competitive advantages to governments

[3] https://www.gsma.com/mobileeconomy/sub-saharan-africa/
[4] Global Findex 2017
[5] Bureau of Economic Analysis under United States Department of Commerce estimates the share of digital economy to be 6.5 percent in 2016 for the United States. The report also estimates that from 2006 to 2016, the digital economy grew at an average annual rate of 5.6 percent, outpacing overall U.S. economic growth of 1.5 percent per year. See https://www.bea.gov/data/special-topics/digital-economy. A report by Huawei Technologies and Oxford Economics, using a broader definition, estimates the share to be 15.5 percent globally for the same year. See https://www.huawei.com/minisite/gci/en/digital-spillover/files/gci_digital_spillover.pdf.
[6] UNCTAD Digital Economy Report 2019

and businesses that are more proficient at transforming data into digital intelligence and business opportunities. Gartner estimates the average financial impact of poor data on businesses to be between $9.7m and $14.2m a year. Building consumer trust, protecting data privacy and developing the requisite skills to harness digital data is key to building a strong digital economy.

- ***For countries in Africa, digital economy offers a leapfrogging opportunity, or the risk of being left behind:*** Today's technologies — such as artificial intelligence, robotics, blockchain, drones, the Internet of Things, big data, cloud computing, 5G and software-enabled industrial platforms — indicate the scale and speed at which technology is transforming traditional sectors of the economy. The African Development Bank (AfDB) estimates the economic potential of open data to be between one and two percent of the region's GDP. In particular, there are significant opportunities to be gained for the region in the agriculture sector, in public procurement, and in geospatial data. Many governments have begun to take advantage of these trends by moving public services online and utilizing open data for improved policy making and open platforms to increase the efficiency and accountability of public administration. The enormous economic potential far outweighs any downside risks that might emerge from greater transparency, or unreliable data[7]. Digital financial services are significantly increasing financial inclusion in many African countries, while on-demand ride-sharing is creating a new transport paradigm and making public transport smarter. Addressing connectivity gaps within and between countries, as well as gender gaps, remains critical for leveraging new technologies for newfound growth and poverty reduction. Developing the core infrastructure, systems, and competencies can also sustain new technologies and will help developing countries in Africa to skip the traditional model, and transition from an agriculture-based economy to a digital economy, leaping over intermediate steps. (see **Figure 2**:). The downside of not doing so may deepen the digital divide, creating leaders or laggards, or worse, winners or losers, in the global digital economy.

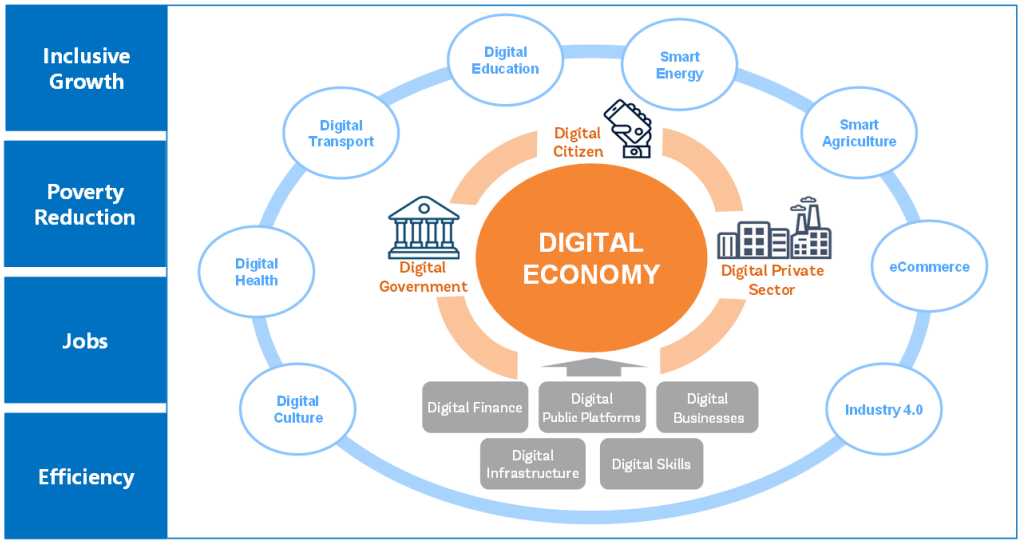
Figure 2:Traditional Economies Becoming Digital Economies



[7]AfDB. 2017. *Economic Benefits of Open Data in Africa*. Abidjan: African Development Bank. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Economic_Benefits_of_Open_Data_in_Africa_March_2017.pdf.

- ***A well-functioning digital economy can help accelerate achievement of the World Bank Group's twin goals of shared prosperity and reduced poverty.*** With a well-functioning digital economy, countries in Africa can achieve inclusive and faster economic growth, offer innovative products and services, create jobs and export revenue, and achieve greater international competitiveness. Digitization of tasks and information may enhance productivity of labor and capital and reduce transaction costs. The approach is likely to affect all segments of the economy and expand access to basic needs and services, particularly to poor and underserved communities in Africa. (see **Figure 3:**). According to a McKinsey study, about 75% of the benefits of internet are captured by companies in traditional industries.[8] Digital economies can also help accelerate poverty reduction. Several of the SDG goals such as financial inclusion, universal identification, efficient government services, social protection, industry innovation to increase value added and job creation require intensive use of digital technologies. Shifting cash into digital accounts for government payments, remittances, small and medium enterprise (SME) payments, and agricultural value-chain payments can enable broad-based participation in digital economy. Digital financial services can be more accessible for lower-income segments of population, and for women and agricultural households—population segments often underserved by traditional financial services. Digital identification enables trusted transactions, streamlines "doing business," creates opportunities for innovation, and increases inclusion and transparency in the use of public and private services.

Figure 3:Digital Economy can bring Shared Prosperity and Reduced Poverty



- ***A digital economy has potential to enhance productivity gains in multiple ways. However, digital economies also introduce new risks – to consumers, creditors or firms, in ways systemic or otherwise, and would require safeguards to mitigate these risks and ensure robust job markets.*** A digital economy can change the way economies of scale are achieved, particularly with online service delivery, as the incremental cost of offering an additional product or service may become negligible. The digital economy may provide better matching of buyers and sellers in a competitive marketplace. It may address certain concerns with asymmetric information, solving some principal-agent problems

[8] Pélissié du Rausas, M., J. Manyika, E. Hazan, J. Bughin, M. Chui, and R. Said. 2011. Internet Matters: The Net's Sweeping Impact on Growth, Jobs, and Prosperity. Report, May. McKinsey Global Institute. Available at http://www.mckinsey.com/insights/high_ tech_telecoms_internet/internet_matters.

where buyers and sellers are separated by intermediaries, or, even, multiple levels of intermediaries. It may strengthen people's trust in firms or governments by enabling some decentralized forms of trust (such as with blockchain) where centralized authorities are not trusted. It may allow products and services to be customized and targeted—enabling better inclusion but also easier ways to exclude some too. Despite the enormous opportunities, there is a need to protect Africa against the risks of digital transformation, including from the disruptive nature of work, cybersecurity, data protection, digital exclusion, and the potential monopolistic tendencies of digital firms. A key area of concern has, for example, been that widespread adoption of automation and other digital technologies can cause significant net job losses. However, in the aggregate, technological change does not seem to have led to a significant increase in joblessness, and global employment continues to expand in line with the growth of labor force.[9] Though it may displace jobs, automation using technology causes "creative destruction," stripping some jobs, while creating new ones. To develop safeguards for job markets, developing countries in Africa need to invest in requisite skills and systems early on, including in the digital domain, such that these skills are tied to meaningful jobs. This can help strengthen the country's competitiveness in the global marketplace. Additionally, the requisite physical infrastructure and enabling environment, including laws and legal frameworks, must be in place to ensure sustainable reforms. It is worth noting that while digital economic development can be critical, the process is neither linear nor a panacea. Effective prioritization and sequencing are required, especially as it deals with the public sector. For example, if public service delivery is a key priority to improve the targeting of the poor, the development of government platforms will need to be prioritized. Key investments and reforms need to be prioritized as part of an overall digital transformation strategy, and the private sector should play a key role.

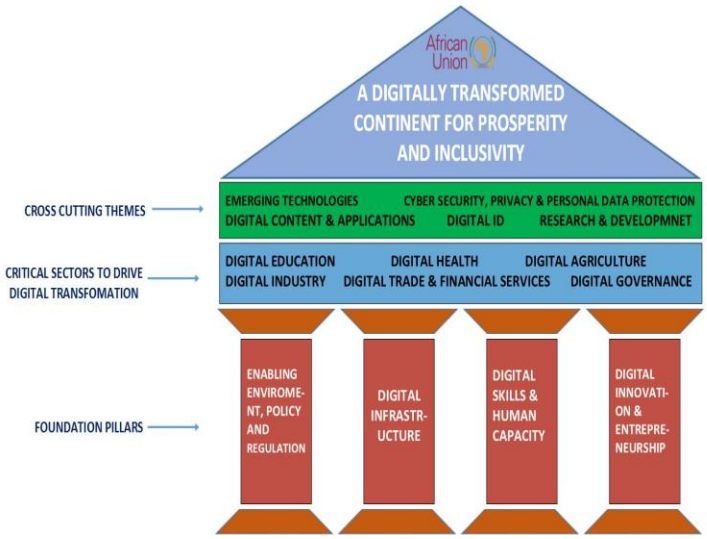
- ***Measuring progress and evaluating impact on contribution to achieving the twin goals of ending extreme poverty by 2030 and boosting shared prosperity are critical.*** While there is increasing consensus on the potential of a digital economy for productivity gains leading to shared prosperity and reduced poverty, it is critical that the progress towards established targets are measured rigorously and their impacts rigorously evaluated. This is important to ensure that regional and national reforms and policies are evidence based and necessary course corrections are made based on evidence as soon as they become available.

III. THE DIGITAL ECONOMY FOR AFRICA (DE4A) INITIATIVE

- The African Union (AU) adopted in February 2020 its Digital Transformation Strategy for Africa (see **Figure 4**) which was prepared with WBG support. The strategy seeks to harness digital technologies and innovation to transform Africa's societies and economies to promote Africa's integration, generate inclusive economic growth and stimulate job creation[10]. The Digital Transformation strategy is fully aligned with the work of the EU-AU Digital Economy Task Force[11]. It is also aligned with the UN Broadband Commission Working Group on Broadband for All which sets an action plan for universal broadband connectivity in Africa, combining investment needs, sector reforms and demand stimulation required to advance to a Single Digital Market on the continent[12].

[9] Issue Brief No.6 prepared for the Global Commission on the future of Work, ILO, 2018. See https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_618168.pdf
[10] https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030
[11] https://ec.europa.eu/digital-single-market/en/africa#title2
[12] https://broadbandcommission.org/Documents/working-groups/DigitalMoonshotforAfrica_Report.pdf

Figure 4: Overview of African Union Digital Transformation Strategy



- Prepared to support the implementation of the AU Digital transformation Strategy for Africa, the WBG DE4A Initiative sets out a bold vision to ensure that every African individual, business, and government is digitally enabled by 2030. The goal is to drive the digital transformation of Africa and ensure its full participation in the global digital economy. Measurable goals for 2021 and 2030 have been proposed with a DE4A Scorecard covering High-Level Indicators and Targets (see **Figure 5**) as well as pillar specific High-Level Indicators.

Figure 5: High-level Targets of DE4A initiative

PILLAR		GOAL	INDICATOR	ALIGNMENT WITH THE WBG AND GLOBAL DEVELOPMENT AGENDA		BASELINE	INTERIM TARGET (2021)	FINAL TARGET (2030)
OVERALL		**Enable every African individual, business, and government to participate in the Digital Economy**	**Individuals using the Internet per 100 inhabitants (by IDA, FCV)**	**SDG 17.8.1**	**IDA19 (JET, GD, GI)**	**26.37**	**35**	**75**
1. DIGITAL INFRASTRUCTURE		1.1 Increase access to broadband Internet	"Unique" mobile-broadband subscriptions per 100 inhabitants[13] **(by IDA, FCV)**	**SDG 1.4.1 SDG 9.c.1 AU 2063**	**IDA19 (JET, GI)**	25	32	67
		1.2 Increase quality of broadband Internet	Average Mobile Broadband download speed (Mbit/s) **(by IDA, FCV)**	**SDG 17.6**		2.66Mbps	3Mbps	10Mbps
		1.3 Increase affordability of broadband Internet	Mobile broadband basket (prepaid, 500MB) price per month (% of a country's average monthly GNI per capita) **(by IDA, FCV)**			9.95	6	2
2. DIGITAL PUBLIC PLATFORMS		2.1 Increase availability and adoption of secured and interoperable digital platforms for public services	Digital Adoption Index (DAI) (Government cluster) **(by IDA, FCV)**		**IDA19 (GI)**	0.41	0.45	0.80
		2.2 % ID coverage for adults	Percent of the 15+ population with an officially-recognized identity credential (i.e., a "foundational" ID)		**SDG 16.9**	66%	70%	100%
3. DIGITAL FINANCIAL SERVICES		3.1 Increase access to digital financial services	Percentage of adults with access to a transaction account (by gender, income group, education level, urban/rural; and by IDA, FCV)	**SDG 8.10.2**	**IDA19 (JET)**	41%	50%	90%
		3.2 Increase usage of digital financial services	Percentage of adults who made a digital retail payment in the past year (by gender, income group, education level, urban/rural; and by IDA, FCV)	**SDG 10.c.1**		27%	50%	90%
4. DIGITAL BUSINESSES		4.1 Increase in the number of digital start-ups	Number of IT startup firms with HQ in Africa graduating from Incubator/Accelerator programs and/or receiving private funding from Angel, Early Stage VC, Product Crowdfunding or, Seed round (by size of firm, female vs male ownership; and by IDA, FCV)	**SDG 9.3.2**	**IDA19 (JET)**	198	240	600
		4.2 Increase in the number of platform-based or data-driven firms operating in the country	Number of new digital business model firms, including all stages of digital businesses as long as they are platform-based or using data as a key input to create value (by local vs. foreign, founding year, size of firm; and by IDA, FCV)		**IDA19 (JET)**	73	90	220
5. DIGITAL SKILLS		5.1 Increase Internet connectivity in education institutions	Percentage of lower-secondary schools with access to internet for pedagogical purposes (by urban/rural; and by IDA, FCV)	**SDG 4.a.1**		35%	55%	100%
		5.2 Increase availability of digitally competent workforce	Proportion of youth and adults with advanced digital skills (by gender, urban/rural; and by IDA, FCV)	**SDG 4.4.1**	**IDA19 (JET and GI)**	2%	3%	6%

The WBG is fully committed to the operationalization of the DE4A initiative through initiatives including the following[14]:

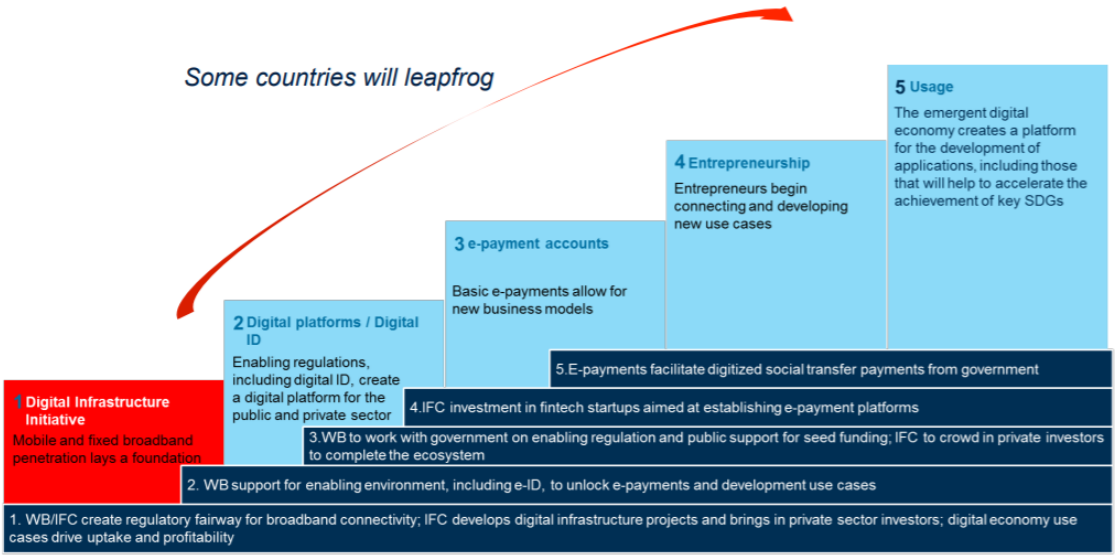
[14] The DE4A Initiative is also fully embedded in the IDA 19 Commitments. Key commitments include support to ensure: i) To help close the digital infrastructure gap, IDA will support 25 IDA countries to double their broadband penetration (16 on the African continent), including eight in landlocked countries, by 2023; ii) 50 percent of entrepreneurship and Micro, Small and Medium Enterprises (MSME) projects will incorporate digital financial services and/or digital entrepreneurship elements – and ensure they address particular constraints facing women and people with disabilities ; iii) At least 60 percent of IDA19 financing operations for digital skills development will support women's access to higher productivity jobs, including online work; iv) All IDA19 financing operations for

- *Digital economy reform program:* The WBG aims to offer technical assistance (TA) and a series of Development Policy Operations (DPOs) to national governments and regional bodies to address critical bottlenecks, such as those due to policy, law and regulation, that may be holding back development of a digital economy in Africa. The WBG's support would include, but not be limited to, issues of competition, digital taxation, fiscal policy and private sector investment, in areas including digital infrastructure and services, digital financial services (both domestically and across borders), data ecosystem (i.e. infrastructure, data protection regulations, and privacy regimes), and other policy reforms as may be necessary for innovation in the public and private sectors at the national, regional and applicable decentralized governance and administrative units.

- *Digital economy investment program:* The WBG aims to complement TAs and DPOs with Investment Project Financing (IPF) or Program for Results (PfoR) to address critical gaps in the five foundational areas of digital economy at national and regional levels. Individual countries or sub-regions may be able to come on board once they are ready. The approach would leverage Maximizing Finance for Development (MFD) and be complemented by private sector investments, including from the IFC.

- *Thought leadership and donor coordination:* The WBG is supporting country specific engagement for digital transformation building on the findings and recommendations of the Digital Economy country diagnostics, e.g. by helping prepare blueprints for priority sector reforms and investments in foundational areas of digital economy. Individual donors may opt to partner with and support specific aspects of the implementation of the recommendations of the Digital Economy country diagnostics.

Figure 6: Digital Economy Strategy and WB/IFC Intervention[15]



Digital Development will support women's increased access to and usage of digital services; v) Support at least 12 IDA countries to adopt universally accessible GovTech solutions; and vi) Support building client capacity in 50 percent of IDA FCS countries to use field appropriate digital tools for collection and analysis of geo-tagged data; and apply this technology to enhance project implementation and coordination.

[15] https://www.unescap.org/sites/default/files/Digital%20Infrastructure%20Initiative%2C%20IFC.pdf

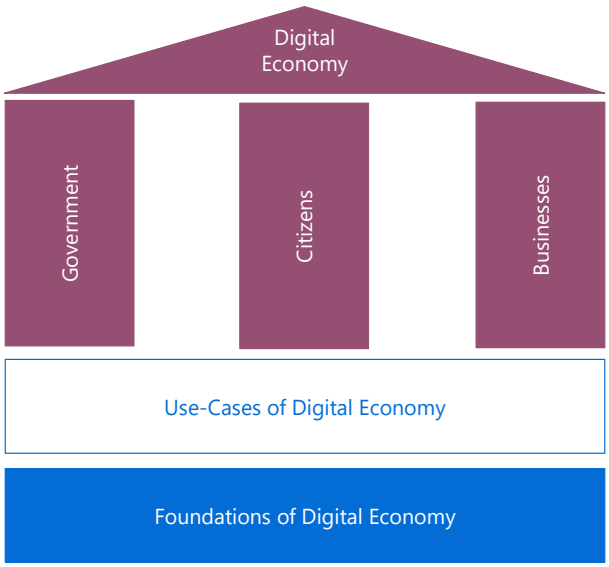
IV. ANALYTICAL FRAMEWORK FOR DIGITAL ECONOMY

- **Digital economy can be assessed using a top-down approach, as is done for a national economy, or a bottom-up approach, focusing on key foundations or pillars.** Possible ways by which digital economy can be assessed include:

- An economy-based approach: Digital economy may be seen as a derivative of, or similar to a national economy. Amongst other ways, a national economy is measured by gross domestic product (GDP), or the sum of consumption, investment, government spending, and net exports (i.e. exports minus imports). Thus, digital economy may equal the sum of economic activities undertaken using technology under each component of a national economy, by key stakeholders, namely government, citizens, and businesses (see **Figure 7**). In this way, the approach can provide a more accurate picture of a digital economy, if done properly. The challenge is that a comprehensive picture of digital economy is difficult to form. Digital economy is a relatively young topic. Good economic data on use of technology under each component of an economy is lacking in many developing countries. The exercise is gargantuan. Measuring digital economy in this way may not be readily feasible.

- A foundations-based approach: Another approach may be not to assess the entire digital economy, but only the enabling foundations that help advance a digital economy through a social inclusion and poverty reduction lens. In case a country has good enabling foundations, it is on the path of developing a robust digital economy. The reverse may also be true. Examining the experiences of successful companies and public sector institutions that form digital economies, those foundations are taken to be: the availability of internet or broadband which brings people online, the ability to identify and authenticate people digitally, and the ability to pay or transact digitally. Digital economies further energize when there is sizeable population of tech-savvy workforce, and an ecosystem that supports firms to enter or scale up in ways that brings about digital transformation across sectors. Once those foundations are in place, a wide array of use-cases can emerge, mostly driven by the private sector, in a digitalizing economy, bringing new products, services, and delivery channels.

Figure 7: Ways of Assessing a Digital Economy



- **The diagnostic tool proposes to focus on key foundations of digital economy.** For a vibrant, inclusive and safe digital economy, African countries would require building key foundational elements of a digital economy (see **Figure 8Error! Reference source not found.**). These foundations are synergistic and require the use of public and private sector solutions. Cost benefit analysis may help ensure that foundational investments are effectively prioritized and sequenced:

    - Digital infrastructure. Digital infrastructure provides the way for people, businesses, and governments to get online, and link with local and global digital services—thus connecting them to the global digital economy. Broadly, digital infrastructure consists of connectivity (such as with high-speed internet, and internet exchange points),[16] internet of things (such as with mobile devices, computers, sensors, voice-activated devices, geospatial instruments, machine to machine communications, vehicle to vehicle communications), and data repositories (such as with data centers and clouds).[17] It also includes all the active and passive infrastructure necessary to develop the digital economy downstream (e.g. sites, masts, towers, spectrum, etc.). With a growing digital economy, the role and importance of information and data protection and cybersecurity also increase, adding security functions to protect critical information and infrastructure. For digital economy, good connectivity given by internet or broadband is a critical foundation.

    - Digital public platforms. Digitally enabled and connected people and businesses are demanding more and better services from their governments. Digital public platforms developed for the public sector or as a public good—either by governments agencies, in partnership with private companies, or through a hybrid model —can help deliver on these goals. Digital public platforms can help create economies of scale and network effects, whereby additional users can create an exponential increase in value from other

[16] Connectivity includes mobile and fixed access networks, metro and backhaul networks, national backbone networks, and international connections.
[17] Service enabling infrastructure include private or independent datacenters, and, increasingly, Infrastructure-as-a-Service and Software-as-a-Service cloud platforms.

users, including the data they generate. When digital public platforms are designed following a "whole-of-government" and "user-centric" approach to digital transformation, they can significantly improve operational and economic efficiency. They can also boost service quality and accountability, including through providing new channels for public engagement and feedback and reducing opportunities for corruption. Finally, when digital public platforms are built using open technology and standards, they not only foster new public-sector applications, but also provide a foundational layer to catalyze private sector innovation and new markets. The development of digital public platforms underpins the expansion of e-government services that can be delivered by both public and private sectors, as well as support the efficiency of core government operations.

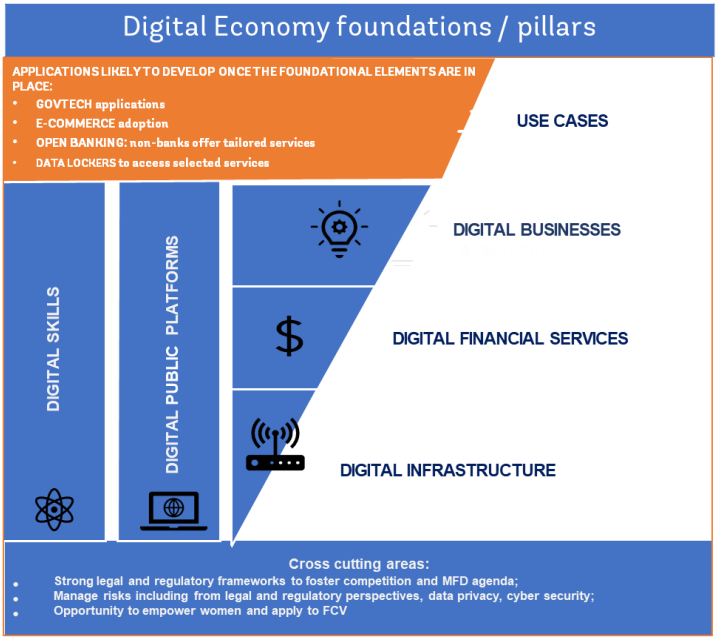
- Digital financial services. Digital financial services provide individuals and households with convenient and affordable channels by which to pay, as well as to save and borrow. Firms can leverage digital financial services to more easily transact with their customers and suppliers, as well as to build digital credit histories and seek financing. Governments can use digital financial services to increase efficiency and accountability in various payment streams, including for the disbursement of social transfers and receipt of tax payments. Digital payments are often the entry point for digital financial services and provide the infrastructure or "rails" through which additional products and use-cases can be developed, as has been demonstrated by the evolution of M-PESA in Kenya, and Alipay/Tenpay in China. A digital financial services ecosystem requires forward-looking and proportionate legal and regulatory frameworks (e.g., to allow market entry and innovation), robust financial infrastructures (e.g., national payment systems and credit reporting systems), and development and deployment of low-cost delivery channels (e.g., agents, point of sale devices, automated teller machines, mobile phones).

- Digital Businesses. Fostering economic growth through the development of frictionless economies, leveraging on digital technologies and new digital business models, is arguably an important goal of any strategy geared to generate new (and better) jobs, increase productivity growth or improve living standards. Digital businesses can be divided into two categories each with their distinct characteristics: 1) Digital start-ups refer to early-stage ventures that create new digital solutions or business models as part of their core products or services, 2) Established digital businesses are mainly large platform-based and data-driven firms that have passed the initial start-up stage, having acquired suppliers, contractors, and consumers rapidly. Digital businesses represent a unique opportunity for African economies to nurture and scale MSMEs, nurture entrepreneurship, increase efficiency, generate more and better jobs, foster economic integration, and promote integration of lagging populations and regions. In order to support the growth and proliferation of digital businesses, government should ensure that the enabling regulatory environment is set in place, while keeping in mind distortions that may arise as adoption increases.

- Digital skills: Economies require a digitally-savvy workforce in order to build robust digital economies and competitive markets. Digital skills constitute technology skills, together with business skills for building or running a start-up or enterprise. Greater digital literacy further enhances adoption and use of digital products and services amongst governments and the larger population.

Figure 8: Foundational Elements of a Digital Economy

Approach principles	
Comprehensive	Taking an ecosystem approach that looks at supply and demand and defies a narrow silo approach in defining the requisite elements and foundations for digital economy.
Transformative	Aiming at a very different scale of ambition beyond incremental 'islands' of success.
Inclusive	Digital Economy for 'everyone, in every place, and at all times' creating equal access to opportunities and dealing with risks of exclusions.
Homegrown	Based on Africa's realities and unleashing the African spirit of enterprise to have more homegrown digital content and solutions, while embracing what is good and relevant from outside the continent.
Collaborative	Dealing with the digital economy requires a different flexible 'mindset' requiring different type of collaboration among countries, among sectors and among Public and private players, facilitation, retooling and encouraging risk taking.



- **Foundations of digital economy involve several cross-cutting areas, including digital economy/agile regulation, competition policy, gender, cybersecurity, consumer protection and data protection.** The foundational elements of digital economy have some common themes. All areas of digital economy require effective competition. Firms operating within the digital economy – whether to offer digital connectivity, payment solutions, or digital platforms – require a good level playing field and rules that enable contestability. It is important for regulatory authorities to define the market, especially for data, to ensure efficiency of data flows within and across borders, and to manage potential collusion, discrimination or exclusion. Free and competitive market forces can help drive down prices, enhance quality and product variety and ramp up usage. All aspects of digital economy need to be inclusive, giving equal opportunity to men and women, and to the disadvantaged. Policy makers need to look at new ways of empowering women to play a more active role in the digital economy through mentoring, networking etc. to connect them with viable opportunities. With the growing use of digital information, protecting critical information and infrastructure, whether it is for digital platforms, financial services, transport, or energy, is paramount. The protection of people's personal information across sectors and government systems similarly requires robust safeguards, and more proactive policies need to be put in place to foster trust. The issue of taxation is becoming increasingly challenging for the digital economy given the heavy reliance of digital platforms on intangible assets, and the difficulty to value such assets. While existing tax laws need to be updated to address these challenges, tax authorities themselves need to be trained on what constitutes value creation on digital platforms to avert under/over taxation. Additional areas, including cross-border trade and data flows, and intellectual property rights, are important for a digital economy, and depend on the development maturity and needs of the country.

- **With foundations of a digital economy in place, a wide array of use-cases is possible.** Beyond the foundations, use-cases denote all ways by which a digital economy may take shape, serving people,

businesses, and government. Use-cases involve the use of technology across sectors, in ways referred to as digital transformation. The private sector may be the main driver of use-cases, offering major platforms and applications, including e-commerce, ride-sharing applications, gamification, and others. The government may also develop new government platforms, applications, and services to automate its functions, improving the government's efficiency and effectiveness.

- **With foundations of a digital economy in place, countries are better equipped in the case of crisis such as COVID-19.** In the unprecedented fight against COVID-19, digital technologies offer the only opportunity for governments, individuals and businesses to cope with social distancing, ensure business continuity, and prevent service interruptions. Availability of affordable and reliable broadband internet can be leveraged across multiple use cases (health, education, social protection, agriculture, …).

V. Assessing Foundations of Digital Economy

- **The diagnostic should focus on key levers that drive the growth of a digital economy.** Digital economy spans several sectors, including, but not limited to ICT sector, public sector, financial sector, and educational sector. To develop a digital economy, it may be impractical for any government in Africa to pursue deep reforms across multiple sectors in one go. Governments may opt to stage reforms over time and target those interventions early on that may help initiate or grow the country's nascent digital economy. The diagnostic should thus focus on critical areas, emphasizing selectivity over being exhaustive, to kickstart and drive the country's digital economy.

- **The level of a country's economic development may be an important gauging factor.** Africa displays a gamut of economies, from fragile and conflict-affected states (FCS) to high-income countries. The country's economic maturity would thus be an important factor as a baseline in determining the areas which need to be examined for assessing the country's digital economy (see **Figure 9**). Similarly, policy recommendations emanating from the diagnostic would thus need to respond to specific hurdles, depending on the country's current development context. The guidelines given in this diagnostic tool are based on development needs of mostly "nascent" or "growing" economies in Africa as they may stand at diagnostic stage. Please note that countries do not mature linearly and have an opportunity to leapfrog using digital economy. Also, a number of countries may not conform to these standard definitions. It may be important to accommodate further diversity through a more granular categorization to reflect i) Non-existent, ii) Nascent, iii) Nascent with recent signs of progress, iv) Growing, and v) Mature development needs. The country's economic maturity as a baseline is an input to the diagnostic exercise and does not determine in which way or how fast the country may advance.

Figure 9: Areas of Assessment Based on Maturity of Digital Economy

	Nascent	Growing	Advanced
Digital infrastructure	Access to undersea internet cables, backbone networks	Backbone networks, data clouds, IXPs, privacy, and cybersecurity	4G/5G networks, rural connectivity, internet of things
Digital platforms	Digital shared services, digital identity, and digital financial management	Digital government, open data, e-commerce	Mobile apps, AI applications, and software-enabled platforms
Digital financial services	Basic digital payments, e.g. person-to-person payments	Broad digital payments, e.g. business-to-person, government-to-person	Digital financial services, e.g. savings, credit, insurance
Digital entrepreneurship	Talent development, and business mentoring	Angel/seed financing, innovation centers, regional hubs	Venture financing, M&A, IPOs, BPO centers, local digital industry
Digital skills	Bootcamps, and digital skill trainings	Business/management skill training	Digital-savvy workforce

- **Governments may consider prioritizing usage from an equity perspective, particularly as it benefits the disadvantaged.** Mechanisms to draw the bottom 40% of a country's population into a digital economy may be needed. The diagnostic should highlight issues of inclusive access, where possible, especially as they relate to gender, the bottom 40% of the population, or disadvantaged communities. Emphasis should be on new business models for expanding access to rural and underserved communities including: increased competition to make internet more affordable; enabling eCommerce adoption in agribusiness value chains and gig-jobs to help disadvantaged groups to generate extra income and jobs; refarming and repurposing of spectrum to accommodate new technologies, notably 5G and IoT; promoting infrastructure sharing especially of ducts, poles, buildings etc. between Telecom Operators and between Telecom Operators and other Utility and Transport infrastructure operators. Infrastructure sharing can expedite network coverage expansion by significantly lowering costs and speeding up time to market. The cost of civil works represents about 70% of the total cost of deploying fiber[18]. Additional efforts for inclusive access include ensuring better usage and targeting of Universal Service Funds (USF), and seamless extension of services through effective national roaming arrangements[19]. The diagnostic should also highlight issues relating to effective use of digital economy, such as if there is available infrastructure, is this infrastructure effectively used, or if there is effective use, is this use equitable across gender, or income categories.

- **A more wholistic digital economy requires collaboration at the regional level.** Cooperation and collaboration at the regional level has the potential to provide major benefits through access to regional infrastructure and larger regional markets. Removing cross-border barriers to infrastructure development, data flows and financial transactions can foster a more interconnected digital market which can lower costs and improve access to digital services. East Africa's successful experience with the 'One Network Area' collaboration to remove cross-border

[1818] Broadband for Africa – Developing Backbone Communication Networks, WB 2010.

[19] There is also interest in wholesale open access networks (WOAN) which are generally managed under Public-Private-Partnership, as being explored in countries such as Rwanda and South Africa.

roaming and interconnection rates is a good demonstration of how cross-border traffic can increase through effective regional collaboration. Regional organizations are recognizing the potential benefits and economies of scale of regional single digital markets and becoming more proactive in developing and harmonizing regional frameworks. The Diagnostic Tool should assess when relevant the role of regional and cross-border collaborations in accelerating digital transformation in country.

- **Digital Economy Country Diagnostics should focus on delivering a wholistic assessment of the digital economy**. The following sections are meant to provide more details to task teams on what is to be assessed under each pillar. Each section provides a brief overview of the role and status of the pillar in the digital economy at the national and regional level, the potential for pillar growth, and the policy, legal, regulatory and institutional challenges to sector development. The sections also highlight the linkages between pillars and provides key recommendations for developing a vibrant, safe and inclusive digital economy. Task teams are not expected to draft detailed background papers on each pillar but to focus the resources on the wholistic summary paper with a good dissemination and engagement strategy[20].

A. Digital Infrastructure

1. Definitions

- **Within digital infrastructure, the need and urgency to offer universal, affordable and good quality high-speed internet (or broadband) for a country's digital economy runs high.** Although any activity that consumes data are associated with internet access, traditional dial-up or mobile internet on 2G networks does not allow transmission of a large volume of data due to the very limited data transfer rate that the technologies offer. Instead, the digital transformation agenda to kickstart a digital economy requires high-speed broadband internet which allows a full internet experience. In the meantime, the definition of broadband is not static but evolving. It requires frequent re-definition so that there is no discrepancy between expectations and capabilities as new technologies are deployed. Under the DE4A Country Diagnostics, good-quality broadband is defined as average download speeds of 10 Mbps or faster, for the goal for 2030, as aligned with the definition of the UN Broadband Commission[21].

- **"Mobile broadband internet," or the use of internet via mobile or smart devices**, is the principal way by which people in Africa use internet today. However, coverage and quality of mobile networks used for internet varies extensively amongst countries in Africa – and are often limited to urban, or more densely populated areas. In terms of technologies, mobile broadband includes the third-generation (3G) (e.g. WCDMA, HSPA, CDMA2000 1x EV-DO), the fourth-generation (4G) (e.g. WiMAX IEEE 802.16e and LTE) as well as next generation mobile networks.

[20] The deeper sectoral dives can be a demand-driven follow-up rather than a supply-driven precursor for the summary assessment.

[21] Broadband Commission for Sustainable Development. (2019). Connecting Africa Through Broadband: A strategy for doubling connectivity by 2021 and reaching universal access by 2030.

- **"Fixed broadband internet," or dedicated, physical links of internet, connected to homes, offices, and governments**,[22] has very limited reach in Africa. For economies in Africa to achieve transformational benefits of internet, fixed internet may be necessary, including for private sector development, better education, better healthcare, and improved governance. It is important to note that fixed fiber optic networks are also essential to enhance mobile networks. Fixed fiber optic networks are a pre-requisite for new technologies, such as 5G. Most advanced mobile networks are supported by strong fiber optic networks on backbone and backhaul parts. In addition, the availability, coverage, reach and cost of backbone networks forming the internet value-chain are critical.[23]

- **For developing universal, affordable and good quality high-speed internet, the broadband network value-chain needs to be incrementally built.** The broadband network value chain comprises four broad segments: first mile, middle mile, last mile, and invisible mile[24]. All parts of the value chain need to be built incrementally.

    - First mile. The first mile is where the internet enters a country. The network components are international internet access and include submarine cables, landing stations, satellite dishes, cross border microwave, and so on. Countries in Africa need to be connected to undersea cables or via cross border terrestrial links (particularly for landlocked countries). Many countries in Africa have access to submarine cable systems, either directly through local landing points or through terrestrial connections, particularly for smaller and landlocked countries. The rapid expansion of the submarine cable network circumventing the continent in the past decade has increased Africa's international submarine fiber capacity nearly tenfold since 2010[25], crossing the 100 Tbps mark in 2018, with new direct connections established with Asia and the Americas. Although the first mile has improved thanks to the regional submarine network infrastructure, it could be further improved if policies focused on liberalizing the market for satellite dishes, having wholesale providers instead of mobile operators own submarine cables (as there may be an incentive for operators not to provide submarine connectivity to competitors in their markets), and promoting competition over the international gateway and cable landing stations.

    - Middle mile. The middle mile is where the internet passes through a country. The network components are the national backbone and intercity networks, including the fiber optic cables or copper wires, microwave, satellite links, internet exchange points (IXPs), local hosting of content, and so on. Once connected to high-speed internet at the border, countries in Africa require fiber backbones to carry internet traffic from the border to urban and rural centers throughout the country and backhaul or metro networks to extend further. Africa's terrestrial fiber infrastructure has witnessed significant transformation. According to Hamilton Research, African countries have rolled out over 1,474,983 kilometers of terrestrial fiber links, of which about 1,025,441 kilometers were operational in 2019.[26] According to Xalam Analytics, at least another 230,000 kilometers of fiber are needed to reach planned target of

[22] Fixed access networks use fiber-to-the-home (FTTH), digital subscriber line (DSL) or cable technologies.
[23] These include metro and backhaul infrastructure, backbone infrastructure and submarine/international infrastructure.
[24] https://broadbandcommission.org/Documents/working-groups/DigitalMoonshotforAfrica_Report.pdf
[25] Xalam Analytics. 2017. The Future of African Bandwidth Markets, May. https://xalamanalytics.com/research/investor-reports/africa-bandwidth-report/
[26] Africa Bandwidth Maps. http://www.africabandwidthmaps.com/?p=6158

universal access by 2030, with another 25,000 kilometers to moderately densify the largest metros – only in Sub-Saharan African markets. Satellite transmission remains extremely important for Africa, with satellite bandwidth covering every square kilometer of Africa and providing connectivity beyond the reach of terrestrial transmission networks. Africa Mobile Networks (AMN) plans to use capacity from geostationary (GEO) satellites to build and operate 5,000 mobile network base stations to serve rural communities in Sub-Saharan Africa that currently lack service. Currently, 42 percent of countries in Africa lack IXPs. According to the Africa IXP Association (Af-IX), there are about 44 active IXPs located across 32 countries in Africa. This means that most of their domestic internet traffic is exchanged through points outside their respective country, usually through satellite or submarine fiber across multiple international hubs to reach their destination[27].

- Last mile. The last mile is where the internet reaches the end-user. Once highspeed internet arrives at a population center via the first and middle miles, telecommunications operators provide internet services (such as mobile or fixed internet services) to people, businesses, and governments. The network components are the local access network, including the local loop, which has historically been comprised of copper cables (but now fiber is increasingly used in urban areas), central office exchanges, and cellular wireless masts as well as satellite. There are also new developments, for example, last mile fiber could potentially be replaced with 5G fixed wireless access (FWA), and other innovative solutions (such as drones or balloons). With undersea internet cables being built for the first mile in Africa, and fiber backbones slowly emerging for the middle mile, Africa's last mile connectivity also continues to expand as operators roll out mobile and fixed broadband infrastructure. According to Hamilton Research, in June 2018, 54.2 percent of the population in Sub-Saharan Africa lived within a 25-kilometer range of an operational fiber optic network node, which marks a significant expansion of the reach of the internet beyond urban centers to thousands of towns in the interior. Despite the recent rapid expansion of network coverage around the world, mainly driven by the upgrading of 2G networks to 3G or 4G and network sharing, the mobile coverage gap is the most acute in Africa: 3G network coverage reached about 71 percent and 4G coverage about 40 percent in 2018. Further expansion is expected in the coming years.

- Invisible mile. The invisible mile consists of the hidden elements that are vital to ensuring the integrity of the value chain. This includes the network components that are not visible, including the radio spectrum[28], network databases (for example, for numbering), cybersecurity, and so on, but can also include potential bottlenecks such as market concentration, multilayered taxation of activities, lack of access to rights-of way, and inefficient laws and regulations including for transborder issues. While mobile technology has a leading role in extending broadband access and the significance of satellite services in African continent, the availability of frequency spectrum is limited in most of the African

[27] Internet Society. https://www.internetsociety.org/issues/ixps/facebook-ixp-partnership/

[28] Bottlenecks in spectrum policies may result in increased spectrum scarcity, and, consequently, in the creation or reinforcement of market power of mobile operators, increasing the risks of anticompetitive behavior and leading to suboptimal market outcomes for consumers (e.g., lower service quality). Adapted from WBG "Getting the Competition Game Right in Mobile Communications and Radio Spectrum in West Africa - An Assessment of Regulatory Restrictions to Competition", December 2019 prepared by the Global Competition Policy Team. Adapted from WBG "Getting the Competition Game Right in Mobile Communications and Radio Spectrum in West Africa - An Assessment of Regulatory Restrictions to Competition", December 2019 prepared by the Global Competition Policy Team

countries. Africa has amongst the lowest allocation of spectrum to the mobile network operators (MNOs).

- **Meanwhile, in addition to the network connectivity infrastructure, broadband connectivity requires additional components:**

    - End user equipment: Computers, tablets, smartphones, servers, and all related and peripheral hardware that connect to and utilize broadband networks, including the rapidly growing range of machinery that constitutes the Internet of Things (IoT).

    - Data repositories: Large-scale data storage and exchange facilities that improve data security and efficiency.

    - Supporting infrastructure: Access to reliable and affordable electricity services for a range of activities, from recharging devices to powering mobile base stations.

- **Increasingly, robust and effective ICT and digital infrastructure is conditioned by rules of market competition, shaped by the respective roles of the public and private sectors, and mediated by strong legal and regulatory capacity and the degree to which regulation of the sector is truly independent of government and the operators**. The goals of ICT and digital infrastructure policies differ between countries, but the general objective is to ensure that the internet is universally available, affordable, and of good quality. The government's role in achieving this goal is ideally to foster a good policy, legal framework and regulatory environment that allow the private sector to take the lead in developing infrastructure and offering high-quality internet services. Therefore, policy and legal reforms, including for competition, licensing, infrastructure sharing, taxation, and interconnection, often lay at the heart of opening or scaling up telecom markets in Africa. These reforms are set within context of the country's political economy and need to be approached as such. Limited government intervention, for instance in the form of public-private partnerships (PPPs), where appropriate and necessary, may also be used to attract private sector participation, and expedite development of internet infrastructure. PPPs are more likely to be needed where customers live in rural and remote areas that are difficult to serve, since investments needed are large and there is no immediate addressable market to provide a return on these investments. (See **Annex 7** for additional details on the State's roles in Broadband Infrastructure Deployment). Additional policy and legal considerations may include but are not necessarily limited to: transborder legal and regulatory issues, cybersecurity,[29] data privacy, and physical robustness of networks.

- ***Meanwhile, infrastructure is not always the biggest hurdle - essential enablers of internet adoption include awareness, digital skills and contents where coverage and affordability issues are addressed.*** This requires more emphasis on addressing demand-side barriers to adoption of broadband and digital technologies. People need to understand the relevance and benefit of getting online and have the necessary skills to use internet-based technologies to access information and to produce content. A shortage of relevant (and local-language) content discourages people to go online while a content creation ecosystem is unlikely to take root and grow until there is a sufficient user base to serve. Meanwhile, the digital skills gap is widening and most prominent across rural areas and marginalized groups, such as the poor, differently abled persons, young people and children, and

[29] Note that cybersecurity is additionally needed to advance a country's competitiveness, attract FDI, and protect intellectual property, as critical enablers for innovation, technological development, and more efficient markets.

women and girls. There is a need to invest in developing basic digital skills and supporting a local digital ecosystem targeted at those marginalized to support development opportunities.

1. Determining the current state

- ***The diagnostic should start by gauging the availability, affordability, quality, and use of digital infrastructure or high-speed internet in a country.*** While the digital infrastructure target refers to an increased access, quality, affordability of digital connectivity, the affordability threshold for data services is defined at two percent of average monthly income for 1GB of mobile data and 15 percent of the income for entry-level internet-enabled mobile devices.[30] Depending on the country's economic maturity, and the interest and capacity of government, the assessment may further include a country's preparedness for "infra of the future" or 4 Industrial Revolution technologies (IoT, 5G, etc.). **Table 1** provides core indicators based on the DE4A Scorecard to determine the state of broadband development in a country. For each core indicator:
    - If at individuals, possible breakdowns are: Sex, Age, Rural/urban, Level of education, Labor force status, Occupation.
    - If at households, possible breakdowns are: Income, Rural/urban, Household composition, Household size.

The assessment may be further focused on specific areas of the broadband value chain, such as first mile, middle mile, last mile, or invisible mile. **Annex 1** provides a more detailed set of indicators to assess the state of each segment of the value chain in a country. Potential data sources are also provided for each indicator while usual data sources include the following: ITU World Telecommunication/ICT Indicators Database[31] ; GSMA Intelligence https://www.gsmaintelligence.com/# ; TeleGeography https://www.telegeography.com/products/globalcomms, Budde Reports https://www-emis-com.libproxy-wb.imf.org/php/search/search

Table 1: Determining the Current State of Broadband Development

Core Indicators: Digital Infrastructure	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
OVERALL					
Individuals using the Internet per 100 inhabitants[32]					
Access					
Unique mobile-broadband subscriptions[33] (per 100 individuals)					
Quality					
Average Mobile Broadband download speed (Mbps)					
Affordability					

[30] Broadband Commission for Sustainable Development. (2019).
[31] The latest database can be obtained through the ITU contact point of the unit (as of Nov 2019: Kaoru Kimura).
[32] ITU/ICT for Development Partnership indicator of "Proportion of people using the internet" (HH7).
[33] An indicator defined by the World Bank which refers to the percentage of population who has access to mobile broadband after eliminating the multi-SIM connections. GSMA is providing (i) number of mobile broadband capable SIM connections and (i) SIMs per subscriber. Number of unique mobile broadband capable subscribers is calculated by dividing (i) by (ii). This was again divided by the total population (UN) to estimate the unique user penetration rate.

Mobile broadband basket (prepaid, 1GB) price per month (% of average monthly GNI per capita)					

- While these indexes are generally assessments that are not context-specific and serve as a general reference point for assessing a country's performance, the following database provides much detailed country information from political profile and economic development; regulatory overview and key legislation on mobile services, MVNO, fixed broadband, local loop, wireline, VoIP; mobile and fixed market condition with profiles of main players in each market; and directory of regulators and service providers: TeleGeography Country Profile:

  https://www.telegeography.com/products/globalcomms/data/country-profiles/af/index.html

- In addition to the set of indicators, mapping platforms are valuable tools which represent locations of network infrastructure components (fiber optic links, node locations, IXP locations, etc.) and network coverage (mobile network coverage as well as fiber reach). With the following resources, spatial information on network infrastructure is available at varying levels of specificity:

  - ITU Interactive Transmission Maps https://www.itu.int/itu-d/tnd-map-public/
  - NSRC African Undersea and Terrestrial Fibre Optic Cables Map https://afterfibre.nsrc.org/
  - TeleGeography Internet Exchange Map https://www.internetexchangemap.com/
  - GSMA Mobile Coverage Map[34] https://www.mobilecoveragemaps.com/
  - GSMA Network Coverage Map[35] https://www.gsma.com/coverage/

- **The efficiency of broadband provision and access, in particularly in the middle mile, depends on the robustness of supporting infrastructure such as Data Centers.** Data centers are important in ensuring the smooth running of the Digital Infrastructure supply chain by improving network security, reducing cost and improving latency of content access. The team may therefore review the status of datacenters in a country, supporting infrastructure and regulatory regime for promoting national and regional data center and cloud services.

- **The task team should complement the analysis by examining a country's telecommunications legal and regulatory framework by reviewing national ICT policy, plans and sector strategies.** It is a critical exercise to identify gaps in legal and regulatory frameworks, making a case for necessary reforms towards achieving universal access to affordable and good quality broadband. Again, global indexes can be used as a quick reference tool to benchmark a country's progress against that of peers and identify areas for policy, legal and regulatory reform:

  - ITU ICT Regulatory Tracker[36] https://www.itu.int/net4/itu-d/irt/

[34] GSMA Mobile Coverage Map platform provides detailed granular data on mobile coverage (2G/3G/4G) – merged coverage of all operators – for 8 countries: Ghana; Ivory Coast; Liberia; Nigeria; Rwanda; Tanzania; Uganda; Zambia.
[35] Baseline data for GSMA Network Coverage Map is submitted by the GSMA member mobile operators. It currently covers 230 countries and territories.
[36] The ICT Regulatory Tracker is composed of metrics based on a total of 50 indicators grouped into four clusters: i) Regulatory authority (focusing on the functioning of the separate regulator); ii) Regulatory mandates (who regulates what); iii) Regulatory regime (what regulation exists in major areas); and iv) Competition framework for the ICT

- Connectivity Pillar of the WBG's Digital Business Indicators https://www.worldbank.org/en/research/brief/digital-business-indicators-connectivity

TeleGeography country profile provides a solid foundation for the institutional, legal, and regulatory overview. Meanwhile, an in-depth analysis may further look into specific laws and regulations related to each component of access network, backhaul, backbone, and international connectivity. The analysis can also be divided into four areas: licensing & spectrum management (licensing framework; spectrum management rules and pricing; etc.); ii) Economic regulation and competition policy (interconnection, infrastructure sharing, and other ex-ante pro-competition regulations, conditions on operators with significant market power; USF); iii) Transparency, customer protection and rules to enhance trust (customer protection; data regulation, etc.); and v) Institutional governance, effective enforcement and dispute resolution (e.g. arbitration). Additional resource base a task team may refer to includes the following:

- TeleGeography Country Profile: https://www.telegeography.com/products/globalcomms/data/country-profiles/af/index.html
- ITU ICT EYE Country Profile https://www.itu.int/net4/itu-d/icteye/CountryProfile.aspx

- ***Once a country's digital infrastructure development situation is thoroughly reviewed, the Diagnostic may include an assessment of sector and market conditions as well as revenue and jobs created by the sector.*** Additional resource base a task team may refer to includes the following:

  - Alliance for Affordable Internet (A4AI) Affordability Drivers Index (ADI)[37] https://a4ai.org/affordability-report/data/?_year=2019&indicator=INDEX

2. Assessing hurdles

- ***The Diagnostic should next determine key hurdles inhibiting growth of high-speed internet in a country:*** **Table 2** provides broad areas of assessment for identifying hurdles that may be deterring the development of internet infrastructure in a country. For reference, the WB/IFC DII initiative has developed and tested a diagnostic framework that was used to assess digital infrastructure in over 50 countries.

Table 2: Assessing Hurdles in Internet Development

Market Analysis • Develop a summary of relevant broadband infrastructure in country, including submarine, mobile, long-haul, back-haul, selected metro, FTTX, and a geographic map showing access transmission links. Source information, as necessary, including through publicly available sources, and primary research through discussions with operators and / or other relevant stakeholders.

sector (level of competition in the main market segments). The benchmark for the scoring is what is considered the best possible scenario based on the internationally recognized regulatory best practices that were adopted by the global community of regulators at the annual ITU Global Symposiums for Regulators.

[37] While ADI is not particularly looking only at regulatory environment, it measures and the policy and regulatory frameworks in place to encourage growth and ensure provision of affordable and equitable access

- List all relevant operators in each segment (submarine cable, wholesale, metro rings, etc.).

- List all broadband products available in country, as carrier to carrier wholesale by provider (IRU's wholesale capacity).

- Develop a summary of broadband infrastructure currently in use for transmission (as well as spectrum), (e.g. microwave, aerial fiber, buried fiber) and their quantities. Broadband access transmission links data to be indexed according to provider, type of route infrastructure (e.g., road, rail, power lines), and deployment status.

- Are there fiscal incentives in place to accelerate broadband deployment (e.g., accelerated depreciation for connectivity infrastructure investments, tax credits for research and development, or loans or subsidies for connectivity infrastructure)?

- Are there policies/strategies to stimulate use of broadband (eg. National adoption targets, Rural/underserved community targets, Broadband speed targets, etc); what are the challenges to adoption/use of broadband?

- What taxes or fees (federal, state, local, etc.) are applied to telecom operators offering high-speed internet services?

- List all the regional institutions and the legal/regulatory frameworks in place for promoting competition, supporting market integration and facilitating regional infrastructure deployment.

- In the telecoms sector, is there an independent regulator? (e.g. Board members without political and industry appointees; subject to an objective selection; and without the possibility of early termination of their mandates)?

First mile: international connectivity

- Is the country connected to high-speed internet via undersea international links or cross-border terrestrial links? If so, please state the names of specific international or cross-border links and their ownership, if known.

- What is the total international bandwidth capacity available to the country? What is the annual growth rate for the last two years?

- What percentage of the total international bandwidth available is currently being utilized by the country? How does this compare to comparator countries? How many telecom operators have access to or are using this international bandwidth? Please list the names of telecom operators and amount of international bandwidth being utilized.

- Is access to international bandwidth open and non-discriminatory? If not, what are the specific terms for access to international bandwidth, including those that may be limiting access?

- Are there hurdles to high utilization of international bandwidth available to the country (for example due to high prices, limited terrestrial fiber infrastructure, or other factors)?

- Are gateways to international links (for both voice and data traffic) fully liberalized? If not, which gateways remain to be liberalized? Please list the names of controlling entities (whether firms or government agencies) for each of the gateways not liberalized.

- Are there levies or fees of any type on international traffic (whether for voice or data, and for incoming or outgoing traffic)? If so, what are the levies or fees, and what are the specific terms? Which firms or government agencies are collecting such levies or fees?

Middle mile: backbone networks

- Does the country have a nationwide fiber backbone(s)? If so, please provide a geographic map of the fiber infrastructure, where available. In case known, what percentage of the population is connected to the nationwide fiber backbone? Please list the names of operators (whether private or government agencies) that own a fiber backbone, along with the length of fiber deployed, average throughput capacity of fiber links, and technologies used for fiber links. Please include backbone networks owned by any utility (such as energy or transport).

- Is development of fiber backbone fully liberalized (i.e. any licensed operator may have authorization to build a fiber backbone)? If not, please list the names of firms or government agencies that may have exclusivity or authorization to develop a fiber backbone.

- Is access to the fiber backbones on an open and non-discriminatory basis? If not, please state the specific terms based on which access to fiber backbones is given.

- Is there cross-sector infrastructure sharing (with sectors such as energy, water, transport) in nationwide fiber backbone? If so, please specify the length of fiber built, and the distance for which fiber ducts are installed by each infrastructure sector, where information is available. What percentage of the fiber network or fiber ducts is currently being utilized? Who is managing or operating the fiber network or fiber ducts under each infrastructure sector? Is there is a dispute resolution authority for cross-sector disputes? Is there a legal framework for infrastructure sharing? Are there legal bottlenecks for infrastructure sharing per each sector?

- Are mechanisms in place for passive infrastructure sharing (such as of sites, towers, masts, etc.)? Please state whether operators do passive infrastructure sharing.

- Is there a single point of contact, and a streamlined, published process, for rights of way authorization? How long does it take to get rights of way authorized for building any segment of a fiber backbone? How long does it take to get a construction permit, on average, and how much does it cost, on average?

- Are wholesale markets (related to access to backbone networks) regulated? Was market analysis carried out for wholesale markets? If so, for which wholesale products? What is market concentration in wholesale markets? Was SMP identified? Were any obligations imposed?

- Are internet exchange points (IXPs) in place and being used to route internet traffic within the country or region? Are the IXPs fully liberalized? If not, please list the names of controlling entities (whether firms or government agencies) for each IXP.

Last mile: broadband internet services

- Is high-speed internet offered on a competitive basis? Is there any operator with significant market power (SMP)? Are actions being taken to address SMP? If so, please specify such actions. Please list the operators offering high-speed internet services, and their respective market share.

- Do operator licenses support technology-neutrality, and unified voice and data services?

- Are interconnection and access agreements in place and effective amongst operators?

- Are there mechanisms in place to extend internet access to rural and remote areas, including for women in rural and remote areas? If so, has this strategy included one of the following regulatory instruments: (i) passive infrastructure sharing, (ii) active infrastructure sharing, (iii) universal access fund (UAF), (iv) coverage obligations, (v) wholesale open access network? If there is UAF in place, what is the annual levy applied to operators? What is the current level of funds under UAF? What percentage of UAF funds are disbursed? What is the average amount of time for a UAF project to be successfully completed (from concept to completion)?

- What percentage of existing infrastructure in rural/remote areas is being used? What are the challenges to use of infrastructure?

Invisible mile: spectrum, cybersecurity, privacy, and robustness of policy and regulatory frameworks

Spectrum

- What is the institutional framework for spectrum management (at the regional and national levels)? Does the country have policies, laws and/or regulations governing unlicensed use of spectrum? If so, for which bands? Is there an established method to calculate mobile spectrum prices and fees? If so, which one?

- Do spectrum authorities assess the level of existing or future spectrum demand, particularly for mobile or broadband services (e.g. as part of a spectrum strategy document)? Is there currently any evidence of spectrum scarcity for mobile or broadband services?

- Has there been any form of pro-competitive spectrum regulation aimed at limiting the market power of incumbents or at bringing new operators into the market? If so, did it involve any of the following: (i) spectrum caps, (ii) spectrum set-asides, (iii) the creation of a wholesale open access network?

- Does the legislation allow for MVNO entry? If so, do they operate on the basis of a contract with the MNOs, or under a license or regulatory obligation imposed on MNOs?

Competition Policy and the Telecoms Sector[38]

- Does the country have a national (or regional) competition law in place with rules on: (i) anticompetitive agreements, (ii) abuse of dominance, (iii) merger control and (iv) state aid? If so, is the competition law applicable to the telecoms sector and to the mobile operators regardless of being private or State-owned?

- Which body (if any) is entrusted with applying competition rules to the mobile sector: competition agency, telecoms regulator, both?

- Are there mechanisms of collaboration in place between the telecom regulator and the competition agency?

- Have there been cases of anticompetitive behavior, merger review or advocacy actions in mobile telecommunications or related services?

Cybersecurity, privacy, and robustness of policy and regulatory frameworks

- Does the country assign spectrum on the basis of competitive auctions (e.g., evaluation of bid prices, speed of build-out, technology, or other criteria)?

[38] Without an effective competition law enforcement both *ex ante* (through merger control), and *ex post* (prohibiting abuses of dominance and anticompetitive agreements), operators can adopt anticompetitive behavior that can result in less spectrum available for smaller operators and in the reinforcement of incumbents' market power.

- Does the country have policies and regulations that allow any of the following practices for spectrum allocation: spectrum shortage evaluations, voluntary spectrum trading, voluntary spectrum leasing, spectrum caps, and secondary markets for unlicensed spectrum (TVWS or other relevant frequency bands)?
- How transparent is the country in publishing available spectrum bands and the process for distribution, especially for SMEs
- Is a legislation in place for cybersecurity and robustness to protect critical infrastructure (including critical information infrastructure, or CII), systems, data, and capabilities, based on international best practices? Was national CII identified? Were measures to protect CII implemented? What agency is nationally responsible for CII protection?
- Is a computer emergency response team (CERT) and security operation center (SOC) in place? If so, please list the government agency or firm managing and operating each CERT or SOC.
- Is certification for cybersecurity available, and are cybersecurity practices standardized within industry and government?
- Is there a good supply of skilled specialists in cybersecurity?
- Is there any cross-border collaboration or public-private collaboration in cybersecurity?
- Is a legislation in place for data protection and information privacy, based on international best practices?
- Is a legislation in place for consumer protection of online users?

B. Digital Public Platforms

1. Definitions

1. ***Digital public platforms are offered by government and public institutions, and have the potential to transform the way people, governments, and civil society interact with each other.*** The benefits of digital public platforms developed for public sector and as a public good, stem from their ability to virtually connect people and things, facilitating digital transactions, including the exchange of information, goods and services. Digital public platforms can serve people and government agencies in all aspects of life, such as healthcare, education, government business or services. Digital public platforms are provided by governments or in partnership with the private sector through hybrid models, and can help digitally enable and connect people and business to improve the access to, and the efficiency and quality of service delivery and core government operations. For the people who use these public platforms, for example, to receive their monthly pensions, to securely log-in to a government e-services portal, to pay their utility bills, to submit a complaint, or simply to access public information, these platforms can provide a seamless service delivery experience that increases user convenience, savings, and agency. For governments, digital platforms can increase the efficiency and effectiveness of core functions and services; reduce unnecessary duplication of systems; combat fraud and corruption by increasing the security and traceability of transactions; and improve civic engagement and accountability. Leveraging shared services and following a "whole-of-government" approach to digital transformation of government has the potential to revolutionize governments' internal business processes and the G2G, G2P and G2B services that leverage these interoperable

systems. ID systems, trust services and data exchanges with shared repositories can help reduce leakage and fraud by ensuring that services reach their intended beneficiaries or suppliers. Beyond service delivery, digital public platforms can provide new channels for public engagement, feedback and information sharing - including using CivicTech tools - that can increase civic engagement, transparency and accountability of government. Finally, when digital public platforms are built using open technology and standards, they not only foster new public-sector applications, but also provide a foundational layer and enabler that can catalyze private sector innovation, by supporting the ease of doing business, regulatory and tax compliance, broadening customer bases (e.g. through improved identification), generate new markets, and foster entrepreneurship.

2. ***The point of entry for digitalization in countries depends on country context and identified priority needs.*** Some countries, for instance, may regard digitizing taxes as important for digital economy, as a way to improve tax collection or streamline taxation. The specific context may be set by government's stated development priorities, or development challenges assessed through analytical work. For years, efforts to digitalize government services have mirrored the vertical silos of the government organization and, often, that of donors. Countries have invested in digitalizing core government back-office processes to address challenges relative to specific government functions, with the objective of increasing efficiency and automation of processes (for example, integrated financial management information systems, human resources management information systems, e-procurement, and so on). On the one hand, the silo approach results in systems that have their own structures, and which do not communicate with each other, resulting in reduced efficiency potential. On the other hand, it leaves citizens and businesses dealing with multiple government entities with their own separate processes and systems, which reduces the quality of the user experience of citizens. Citizen-facing platforms have also developed as use cases first for information provision purposes (government website) and second for two-ways transactional service delivery (E-tax, E-Health, etc.). The digital platform approach takes a "whole-of-government" approach to digitalization, with systems based on shared services and interoperable among them.

3. ***Government plays an active role in designing, overseeing and/or developing digital public platforms (frequently in partnership with the private sector) and an enabling role in supporting firms to operate digitally enabled businesses:*** In building digital public platforms, a government takes a direct role in funding and managing such work. Some governments may not run the services themselves and instead opt for partnership with private firms. Given low technical capacity, many African governments decide to partner with firms to alleviate cost, capacity, and sustainability challenges. This requires key capabilities needed within government to define, procure and manage these partnerships to mitigate risks such as vendor lock-in. In the short term, outsourcing e-services to the private sector can result in improved service levels; provide government with access to skilled talent that may be difficult to hire and retain; and increase demand for these needed skills. This in turn may lead to private sector growth and job creation. Partnering with private sector can foster new ideas and innovations, creating new value opportunities for job creation and the development of these ecosystems. Including through co-creation/participation in service design and implementation/management. But partnering requires strong governance frameworks and may require legal/regulatory reform –e.g. strengthening procurement rules and ensuring that solutions developed by private sector meet legal and regulatory requirements for ID/verification, data governance, privacy and protection and ownership; promoting legislative reforms such as for secure e-signature, eKYC regulations, remote account opening etc, and also strengthening oversight/monitoring mechanisms to ensure private sector compliance with legislation/regulation. In supporting growth of private sector digitally enabled businesses, a government plays a facilitating

role, by promoting a conducive environment for businesses to competitively operate with good investment climate, while also ensuring that there are clear and sufficient safeguards in place to protect users' data and ensure the integrity and resilience of the platforms put in place.

4. ***Digital public platforms include foundational elements and specific use cases.*** Widespread use cases include government core function back-office systems (financial management, human resources systems), and sectoral service delivery use cases (such as tax portal, e-health system, use of digital technology for transport etc.). Foundational elements are those components which by creating the basis for integrating different systems, foster the efficiency of the use-cases systems toward a whole of government and citizen centric platforms. Foundational elements of platforms contribute in decreasing the hassle of dealing with multiple siloed systems for the citizens. These foundational elements include interoperability and shared services, digital ID and trust services.

5. ***Digital public platforms share some common elements.*** Though governments may pursue different approaches to develop digital platforms, some elements are common and aim at supporting seamless, user-friendly, cost-effective, and secure interactions. Digital public platforms require digitalized systems and processes, shared and interoperable resources, interfaces for internal and external users, digital authentication capability and online trust. These functionalities are provided through four core components (see Figure 10):

   - **Digital identification (ID) and trust services.** Trust in a person or entity's identity is a cornerstone of economic and social transactions. In an increasingly globalized and formalized world, this trust has often been provided by official, physical forms of identification, such as ID cards, birth certificates and passports. Beyond these "traditional" forms of identification, the emergence of the digital economy has created a need for verifiable digital identity credentials and ability to prove identity digitally or "presencelessly". Digital ID systems facilitate the secure identification and authentication of a person, entity or device—both in person and/or online—and bind the user of an online transaction with their "real world" or legal identity. Combined with digital certificate services (for example, public-key infrastructure or PKI), they are also the basis for e-signatures, which enable knowledge, approval, acceptance, or obligation to be authenticated without requiring physical presence. More and more countries are now exploring an alternative approach to a single digital identity provider by adopting federated identity schemes which allows people to choose from a list of identity providers to access government services. This in turn provides additional avenues for private sector participation and fuels private sector driven solutions. Together, digital identity and e-signatures are essential foundations for the digital economy because they enable trusted transactions, streamline "doing business," and create opportunities for innovation.

   - **Interoperability layers and shared services.** Interoperability is the ability of different databases, systems, and devices—both within and across organizations—to communicate with and understand each other. This communication may involve multiple elements and layers of technology, including wired connections, application programming interfaces (APIs), web services, cloud services, and more. Interoperability layers are therefore the conduit through which governments, companies and people can exchange data and queries, which is crucial for implementing shared systems and services, reducing duplicate data collection, and automating business processes. Interoperability frameworks include both the technical and technological aspects allowing different systems to securely exchange information and queries, and a set of

regulations and institutional arrangements governing access to information among participating entities.

a. *Shared systems:* To be efficient as a corporate enterprise, each organization may need to set up shared systems for use across the enterprise. Through a whole-of-government approach, these resources can be developed as a set of interoperable systems that leverage common services and infrastructure. This "build once, use many" strategy—combined with digital functionality—allows governments to reduce the duplication of resources across agencies; streamline and automate business processes, reporting, and analytics; and leverage economies of scale. Shared systems may include cloud-based data centers (also known as government cloud), connectivity networks, payment networks, online portals, content management systems, certification authorities, and public key infrastructure.

b. *Data infrastructure and management:* With more data becoming digital, organizations need to use digital facilities to source, store, and share information with all constituents. For example, re-usable public-sector data or open data is not only a tool to keep government accountable, but also a resource for startups and firms to offer innovative products and services using open data. Big data analytics, when combined with publicly- and privately-held data used in accordance with strong data protection measures, can provide inputs to decisionmakers to design new programs and cater to individual needs of people.

c. *Interoperability and interconnectivity:* To achieve interoperability and interconnectivity across enterprise, organizations require connectivity bus, web services, application programming interfaces (APIs), and use of standards-based equipment and services. Interoperability facilitates the use of *shared data repositories* (for example, for land, businesses, property, vehicles, geo-spatial coordinates, and so on) and other shared services. These become more important for connecting fragmented systems or legacy systems across enterprise, particularly for government platforms, in a cost-effective manner.

- **Use cases systems.** These include applications for core government policy functions, digital service delivery and civic engagement[i]**.** Digital public platforms provide a new channel for governments, people, and business to interact—and web- and mobile-based sites, applications, and software provide the interfaces though which these interactions occur. These applications can be built to provide digital *business-to-business (B2B), business-to-consumer (B2C), digital government-to-person (G2P) and government-to-business (G2B) services* across a variety of sectors, including for e-commerce, E-payments, education, healthcare, taxation, transportation, social protection, and so on. In addition, they can support *civic technology (CivicTech)* innovations that provide an easy-to-use mechanism for public participation and feedback, and *data sharing* services that improve transparency and foster research and business innovation. Similarly, digital platforms provide the resources to digitally manage government back-office operations or government-to-government (*G2G)* services.

a. *Back-office systems (G2G).* Organizations use digital facilities to manage and operate back-office functions for day-to-day operations. These core government systems are essential for States to perform their essential functions of taxation, spending and policy

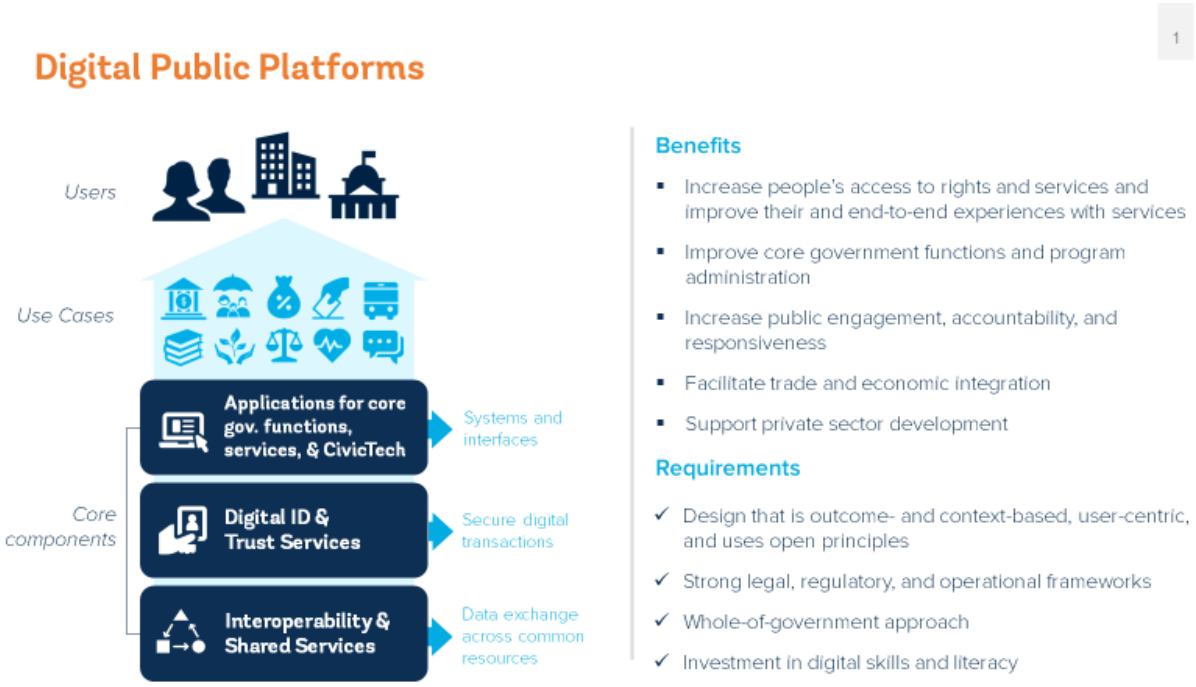
regulation. This includes *core IT applications,* such as those used for financial management, tax management, procurement, human resource management, and monitoring and evaluation.

b. *Service delivery (GtoC, GtoB, B2B, B2C).* Real change and value is achieved by making e-service fully transactional. Organizations may opt to use digital channels (such as online portals, mobile phones, social media) to offer client-facing services. By offering services digitally, organizations may improve cost and efficiency of such delivery, and offer ease and convenience to clients. These services may span all aspects of a person's or a firm's life. Digital services may span from education, healthcare, driver's license, taxation, vehicle registration, property registration, pension, social security, social protection, and death registration. For a firm's life, digital public services may span from starting to closing a business, including business registration, taxation, capital raising, initial public offering, financial reporting, and bankruptcy filing. As such, assessment should probe for specific public transactional platforms such as platforms to i) Register a business online ii) apply for a driving Permit or passport online iii) Obtain land title/ transfer land online iv) File taxes online v) Apply and obtain business permits online vi) Online government procurement. The team might want to determine the most important online transactional services for service delivery and specifically look for the presence and use of these platforms.

c. *CivicTech (CtoG).* Through the use of CivicTech, data sharing portals, and digital services that aggregate public feedback and monitor service quality, digital public platforms can improve public participation, accountability and oversight, and foster government responsiveness. By providing a new channel through which people can obtain information, voice concerns, and interact with their governments, these technologies can help strengthen trust and reinforce a positive social contract.

d. *Dynamic Social Registries.* **Social Registries** gather information on all applicants (individuals and households), supporting the processes of intake and registration and assessment of poverty, vulnerability, needs and conditions based on socioeconomic data, and interoperability with other administrative information systems across government. Social Registries are helping connect people to a range of public services including social protection, health, agriculture, pro bono judicial services, WASH programs, utilities, energy and financial inclusion, based on the principle of "progressive universalism", expanding coverage, and in the process, prioritizing the poorest people. This improves coordination of programs and creates savings. When linked to a unique ID, these platforms can reduce costs associated with inclusion and exclusion errors.

Figure 10: Broad scope of digital public platforms[39]



6. ***Core digital public platform components are supported by analog complements.*** Digital public platforms need to be supported by a framework of analog complements including institutional framework, legislations and regulations and governance structures that ensure trust, security, and efficiency of the use of technology. These comprise the following:

   i. **Framework for data protection, privacy and security.** Inherent in the processing of personal data—for example, for digital ID systems, trust services, data repositories, interoperability layers, and public and private sector applications—are risks associated with privacy violations, data and identity theft, cyberattacks, misuse, and discrimination. The emergence of new technologies and the increased collection and use of personal data by state and nonstate actors compounds these concerns and brings new threats. Digital platforms therefore require strong legal and regulatory environments, standards and frameworks, privacy- and security-enhancing design measures, advanced cyber resilience and security measures, and a high-capacity digital workforce (that is, with digital skills) to mitigate these risks.

   ii. **Framework for digital transaction.** Implementation of digital platforms require that digital transactions and digital signatures are given equal legal value as physical documents. It is then important to implement a legal and regulatory framework that ensure such legal value of digital transactions and signatures.

   iii. **Political support and institutional arrangement for effective coordination of digital transformation agenda:** Digital transformation requires a high level of political commitment and coordination across government entities. High-level political commitment is necessary to

[39] Note that the digital platforms given under government platforms are illustrative.

establish and implement a shared vision, define clear institutional and operational roles and mandates, and to strategically allocate resources and capacity across government entities. Fragmentation in the leadership of the ICT function in the public sector is one of the key obstacles to successful implementation of a whole of government approach to digitalization. Institutional organization and coordination are as important as the technological and technical aspects of government digitalization.

iv. **User centricity and addressing the digital divide.** In many developing countries, access to, capacity for use, and needs for digital systems can differ across groups of users and potential users. To avoid furthering the digital divide, digital applications need to be relevant to targeted users. Prioritization of services to be digitized should consider the needs of citizens, and their access to technology. Applications such as online tax payment platforms or permit applications may be relevant to middle-class users. Governments need also to consider ways to improve access to services for other categories of users, based on their service needs, and the accessibility of technologies. In the case of private platforms, the unequal access to telecommunication technologies might entail the exclusion of small firms and businesses in remote areas and vulnerable populations that could otherwise benefit from more efficient electronic transactions.

v. **Government procurement of IT for digital economy.** In many countries, governments are among the biggest procurers of goods and services. Recognizing their role as a key purchaser, governments in many countries have used public procurement policies to incentivize, support, and sustain the development of IT enabled solutions, including by local SMEs. However, the risk of dependency on a specific technology or vendor should be mitigated as that can result in "lock-in" and/or dependency, increasing costs and reducing flexibility of the system to meet a country's needs as they develop. This can occur, for example, through the adoption of a technology for which a limited number of suppliers are available, or contractual provisions in supply contracts or licensing agreements (e.g., for software) that restrict changes in technologies or vendors over time or may limit data ownership and access. Another cause of vendor dependency is when a vendor does not transfer knowledge or capacity to the government, which is a higher risk in poorly-designed public-private partnership and build-operate-transfer models. The risk of vendor and technology lock-in can be partially mitigated by the adoption of open, international standards and strong procurement practices that minimize unnecessary constraints in the choice of technology or supplier over unnecessarily long periods of time.

vi. **Human resources planning and digital skills.**

- **Civil servants.** Digital transformation requires that governments plan for fit-for-purpose IT human resources (that is, developers, programmers, IT project managers, data base managers, data scientists, cloud computing and cybersecurity experts, and so on) to support project implementation cycles across government. Externalization of IT services through contracted services is an option, especially in the early phases of digital transformation. Nonetheless, the long-term sustainability of government digital services requires governments to progressively build inhouse capabilities, at least in some specific IT skills, as digitalized segments of government increase. Digital transformation also requires that civil servants have the appropriate skills and knowledge to work in a digitalized environment.

- **Population:** The lack of digital skills and business skills among the population might entail risks of exclusion from the digital market as consumers, entrepreneurs and suppliers/contractors.

vii. **Change management and reforms***:* Digital transformation requires significant changes in the way a government or firm operates, depending on the nature of the platform. The exercise involves examining processes used and data exchanged within an enterprise, and with key clients or partners. Digital data (such as those used in registries or transactions) can offer strategic use and require robust safeguards for security and privacy. Developing platforms requires taking stock of key digital assets, and developing incentives, agents, and drivers for bringing about change with the use of platforms.

2. Determining the current state

7. ***The diagnostic should start by gauging the current state of digital public platforms including the main components and the analog complements.*** The task team carrying out the diagnostic should start by reviewing the current state of digital public platforms in a country. **Table 3** provides possible indicators to determine the level and use of digital public platforms in a country. These are relatively high-level indicators to clarify current status of online services and human capital constraints in a country. **Annex 2** provides a more detailed set of indicators for digital public platforms. Further analysis may be needed to identify problems in specific digital public platforms important for the country. The task team may further complement the analysis by gauging the government's priority or interest for specific digital public platforms, the potential need to kickstart or scale up adoption of specific platforms, and the makeup of domestic digital industry at the national or regional levels, as possible partner for such efforts.

Table 3: Determining the Current State of Digital Public Platforms

Core Indicators: Digital Public Platforms	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
Digital Adoption Index (DAI) (Government cluster)					
% ID coverage for adults					

8. ***To assess digital public platforms for a digital economy, the task team may focus on the related enabling environment, and any priorities as given by a country.*** The task team may begin by determining which digital public platforms, if any, are deemed priority for the country. For such digital platform, the team may examine the enabling conditions for the digital public platform, and recommend a deep-dive, as needed, to further understand hurdles inhibiting its development. The task team may additionally note priorities or hurdles that may be important or necessary for the country to develop all components of digital public platforms.

9. ***Assessment of any digital platform may require a separate deep-dive.*** Assessing the country's preparedness for any digital public platform may require a deep-dive analysis, necessitating a separate diagnostic study. For example, assessing the country's preparedness for use of digital identity may require an additional ID4A diagnostic and/or undertaking ID Enabling Environment Assessment (IDEEA). Other in-depth analysis could include institutional arrangements or technical feasibility studies for each identified entry-point (sectoral use case, core government functions,

government cloud, cybersecurity assessments etc.). As part of the diagnostic of digital economy, assessing the totality of digital public platforms in Africa may not be feasible.

10. ***The task team should also complement the analysis with evaluation of the analog complements and how they are conducive to the development of a digital economy***. The analog complements provide a framework that fosters the development of digital public platforms specifically and the digital economy more generally. This is being done through legal and regulatory framework, institutional arrangements, and reform processes. The assessment should also look into how the government develops its digital services, from internal development to different ways to collaborate with the private sector (local and international). However, depending on the results of the assessment, specific points may require additional dive-in, on the ways governments engage with private sector, that are outside the scope of the DE4A assessment (such as assessment of procurement systems, Public Private Partnership Framework, etc.)

3. Assessing hurdles

- ***The diagnostic should next determine key hurdles inhibiting growth of digital public platforms:*** **Table 4** shows broad areas of assessment for identifying hurdles that may deter the development of digital public platforms in a country. Depending on the country's economic maturity, and the interest and capacity of government, the assessment may be further focused on specific areas, such as service delivery, shared services, data management, or back-office systems. The assessment should also identify potential hurdles affecting government collaboration with private sector in developing digital public platforms. Since digital public platforms span a broad array of products or services, further refinement of suggested questions may be necessary to identify a few top priorities of the government that may be taken up early on. Hurdles may also comprise aspects related to the analog complements, and teams should highlight these as essential elements of the digital public platforms' assessment.

Table 4: Assessing Hurdles to Digital Public Platforms

ID and Trust services

[For more detailed questions for assessing the strength of a country's digital ID system and it's enabling environment, please consult the ID4D Diagnostic (https://id4d.worldbank.org/Diagnostic-Guidelines) and IDEEA tool (https://id4d.worldbank.org/legal-assessment) and Cybercrime assessment tool (www.combattingcybercrime.org).

- Is there government-recognized identity credential (i.e., a "foundational" ID) that is accepted by a wide range of service providers and used widely for identity verification/authentication? Please note that foundation ID is defined as "*An identification system primarily created to manage identity information for the general population and provide credentials that serve as proof of identity for a wide variety of public and private sector transactions and services. Common types of foundational ID systems include civil registries, universal resident or national ID systems, and population registers. S*ee ID4D Practitioners Guide at https://id4d.worldbank.org/guide

- In the absence of foundational ID, what is the most used and trusted form of ID in the country?

- What percentage of the population 15 years and above has the main government-recognized ID? Is there a significant gender gap in the coverage of the ID system? Please note that some of this info can be sourced from ID4D dataset at https://id4d.worldbank.org/global-dataset.

- What are the birth and deaths registration rates?

- Are civil registration systems currently interoperable with foundational ID? If not, are there plans to do so?

- Can the foundational ID system facilitate digital authentication of a person in the context of service delivery, without requiring physical presence?

- What identity verification and authentication mechanisms are available to (and used by) service providers? Is digital authentication currently possible without physical presence of a person? If yes, what is the underlying infrastructure? If not, is there a plan to put this in place?

- Is there a PKI infrastructure (or another mechanism) in place to underpin trust services?

- Are e-signatures currently being issued to both people and legal entities? In some countries, while PKI infrastructure exists, the e-signatures are only issued to legal entities or to select number of individuals who are required to perform on-line transactions that require high level of security, frequently as part of their job responsibilities.

- Are e-signatures easy to obtain for an individual?

- Are e-signatures affordable for a frequent and an infrequent user?

- Are there plans to put in place digital authentication and e-signature capability in the country?

- Is there any Mobile ID solution? If not, is there a plan to put in place Mobile ID?

- Is there any form of PPP arrangement in ID/digital authentication/Mobile ID? IF there is, please describe. If not, are there any plans to enter in any form of a PPP with private sector provider?

- Are there any plans for federated and decentralized authentication options? More and more countries are now exploring an alternative approach to a single digital identity provider by adopting federated identity schemes which allows people to choose from a list of identity providers to access government services, which in turn contributes to private sector development. Federated approaches to identity authentication may offer greater choice for individuals and relying parties and, through competition, incentivize innovation in system design, such as a 'race to the top' in terms of user experience and privacy. It also can help decentralize transactional information, which reduces the risk of surveillance.

- Is there any privacy by design features that have already been built or planned to be built into the digital identification system with the aim to enhance data protection and to provide people with greater control over their data? Some examples of privacy by design features can be found at http://documents.worldbank.org/curated/en/546691543847931842/pdf/Privacy-by-Design-Current-Practices-in-Estonia-India-and-Austria.pdf or http://documents.worldbank.org/curated/en/546691543847931842/Privacy-by-Design-Current-Practices-in-Estonia-India-and-Austria

Interoperability and Shared systems

- Has the government set up and is using shared systems or services across government agencies? If so, please indicate each shared system or service, the government agency/agencies managing such system or service, and the number of user agencies per system or service. How are capital expenses funded? How are operating expenses funded? Examples of shared services include cloud-based data centers (also known as government cloud), cyber-security solutions, government-wide SMS/notification solution, e-payment solution for e-services, on-line portals, digital authentication and e-signature capability (PKI infrastructure).

- Is there an adopted and widely used government enterprise architecture? If not, is there a plan to develop/adopt it in the nearest future?

- Is there a clear Government-wide IT Strategy? Who is in charge of enforcing it?

- Does the government partner with the private sector in managing or offering shared systems? If so, please indicate the terms and value of private sector partnership and state the names of the private partners involved.

- How does government ensure interoperability of digital government platforms offered across different government agencies? What are the main enforcement instruments?

- How does government ensure interoperability across government agencies, at federal, regional and local levels?

- What is the percentage of government services and solutions that have been developed using open source? Is there an open source policy or guidance available at a government level?

Back office systems

- What back-office government systems are fully digitized? For each back-office system, please specify the government agency that managed the development of the system, who operates the system (government agency or private sector). In addition, please specify the sources of capital expenses for development, as well as sources of operating expenses for day-to-day running.

- How does government regularly monitor and evaluate the level of usage and the quality of service of digital back-office systems?

- Did the government partner with the private sector in setting up or operating the back-office system? If so, please indicate the terms and value of private sector partnership, and state the names of the private partners involved.

- Are there any plans to upgrade or replace the back-end system/s? What are the sources of finance for that?

Service delivery

- What specific government services are currently being offered by the government digitally? Which specific digital channels are currently being used? Please list all digitally available government services including the number of subscribers, the types of digital channels used, and the level of regular usage.

- Does the government have an integrated corporate presence in the Web? Which agencies have websites? How often do agencies update their websites?

- How does government regularly monitor and evaluate the level of usage and the quality of service of government platforms?

- Does the government partner with the private sector in delivering any of the digitally enabled services? If so, please indicate the terms and value of private sector partnership and state the names of the private partners involved.

CivicTech and Transparency

- Does the government have a published policy on open data, based on international best practices[40]? Has the government adopted international data standards (including metadata standards)? Does the government promote mainstreaming of APIs to enable seamless data exchange?

- Does the government operate an open data initiative convening the effort for collecting, storing and sharing publicly available information? If so, does the government have specific processes in place, for collecting, storing, and sharing public sector data, in standardized and readable/reusable formats, instituted across government agencies?

- What agency is in charge of open data? Does it have an appropriate mandate needed for enforcement?

- Does the government have digital platforms for citizens to voice grievance, and a corresponding redress mechanism addressing the grievances?

Dynamic social registries

- Coverage: What is the percentage of the entire population included in/covered by the social registry, including share of poor, vulnerable, informal?
- Dynamic inclusion: Is access to registration open and continuous – usually with an on-demand application window – so that people can register and express interest when in need or update their information if their situations change?
- Integration and Interoperability: Does the social registry share or cross-check information with other systems using common standards?

Institutions

- Are there specific national priorities that require digital platforms or interventions?[41]

- What government agency has a lead role in digitalization of government? If so, is the agency's role given by law or published policy? What specific role does that government agency play in enabling other government agencies to run digital public platforms and shared services? How is that government agency funded?

- What other agencies in the ecosystem play a role in the digital transformation of government? (e.g: Information System departments within line ministries, departments and agencies.)

- How many full-time staff are employed for development or management of digital public platforms and shared services, either centrally or across government agencies? Of these, how many staff are permanent or contracted?

[40] https://opendatacharter.net/
[41] For example, the government of Ghana upon election prioritized offering a digital identity to every person in the country, and digitizing land records.

- Are fiscal funds used for developing or managing digital public platforms and shared services, allocated on a yearly basis? If so, please indicate the average amount of fiscal funds per year, and as a percentage of total funds spent on developing or managing digital government services.

- Are there any cost recovery/charge back mechanisms used to by the lead agency to re-coup the costs of shared services development?

- Are donor funds (i.e. grants, loans, etc.) used for developing or managing digital public platforms and shared services? If so, please indicate the average amount of fiscal funds per year, and as a percentage of total funds spend in developing or managing digital public platforms and shared services. Which any agencies have a CIO, CTO or permanent official positions dedicated to data management?

- How strong is the government's overall ICT skill base among senior government leaders and civil servants? How does the government plan and supports the availability of fit-for purpose ICT skills including specialized IT skills and general IT skills among civil servants?

- Do the government's procurement policies incorporate specific provisions that foster the development of local ICT firms and SMEs?

- Does the government own the source code of its systems, able to do their maintenance and/or able to freely and competitively contract services for their maintenance or upgrade?

Data management, sharing and secure access

- Does the government have a coherent vision and policy regarding the management of the data infrastructure?
    - What is the legal and policy framework for the protection of personal privacy (including institutions implementing and enforcing regulations)?
    - What rights of access to information exist?
    - What is the legal and policy framework for data security, data archiving and digital preservation (collection, storage, processing, analyzing, archiving, and destroying data)? What policies or standards exist for data quality, including provenance, accuracy, timeliness and completeness?
    - What is the policy on the ownership and licensing of government data?
    - How is data archived and digitally preserved once it has ceased to be used operationally? What are the standards, policies, responsibilities and procedures for data archiving and digital preservation? To what extent does they conform to international standards and best practice?

- Does the government use digital analytics to regularly analyze data and use for policymaking, governance, and private sector development purposes?

- Are there common data frameworks/data sharing protocols?

- Does one agency host the data centrally or does each MDA keep its own data?

- Is the government data hosted in centrally or does each MDA keep its own data? Are there data back up and disaster recovery arrangements in place?

C. Digital Financial Services

1. Definitions

- ***Digital financial services are a critical enabler of a digital economy, when supporting digital infrastructure is available.*** As defined by the G-20 High-Level Principles for Digital Financial Inclusion, the term "digital financial services" (DFS) covers financial products and services, including payments, transfers, savings, credit, insurance, securities, financial planning, and account statements. Digital financial services are delivered via digital/electronic technology, including through a payment card, online, or via a mobile phone; various instruments may be linked to e-money or traditional bank accounts. Digital financial services can provide individuals and households with convenient and affordable channels through which to make and receive payments, as well as to save and borrow. Firms can leverage digital financial services to more easily transact with their customers and suppliers, as well as to build digital credit histories and seek financing. Governments can use digital financial services to increase efficiency and accountability in various payment streams, including for disbursement of social transfers, and receipt of tax payments. Without effective regulatory and competition law, we are less likely to observe the development of a strong digital financial services market.

- ***The entry point for digital financial services is often through digital payments.*** Digital payments are at the heart of a digital economy. Without being able to pay remotely through digital channels, it would be difficult to conduct economic activities in a digital economy, such as to buy and sell goods or services online. This is particularly relevant for rural residents who may lack access to brick-and-mortar retail and financial infrastructure. Yet according to the World Bank's Global Findex 2017, just 34% of adults in Sub-Saharan Africa have made or received a digital payment in the past year.

- ***The ability to pay online may drive the uptake of a digital economy:*** Several African economies are leaders in digital payments, providing the infrastructure or "rails" through which additional products and use-cases can be developed. The use of financial technology, in particular mobile money, to expand access to and use of transaction accounts, has become increasingly relevant in some African countries. This is helping uptake of digital economy in these countries. Digital payments help to facilitate the transactions involved in other financial products and services (e.g., to deposit savings or make a loan payment). Transaction data produced by digital payments can also reduce informational asymmetries between borrowers and lenders, and serve as a useful input into credit decisions. For example, M-PESA and other mobile money products in Kenya have spawned a more comprehensive suite of digital financial services, including digital savings, digital credit, and digital insurance—all enabled by mobile money products. Outside the region, in China, Alipay, Tenpay, and other payment products provided by third-party payment providers, have similarly facilitated the provision of digital credit, digital insurance, and digital wealth management.[42]

- ***Conducive regulatory environment and robust digital infrastructure are necessary first steps to development of digital financial services:*** The multi-sectoral and cross-cutting nature of DFS requires strong collaboration between Central Banks (National and Regional) as well as Financial and Telecom Regulators to simplify market development processes and promote innovation. Likewise, regulatory institutions need to provide incentives for developing national backbones and international connectivity to ensure availability of fast, reliable and affordable internet for DFS. Task Teams are

[42] See World Bank Group; People's Bank of China. 2018. Toward Universal Financial Inclusion in China: Models, Challenges, and Global Lessons. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/29336

encouraged to assess the respective roles and interplay between regulatory agencies as well as their capacity to understand evolving technologies and businesses of DFS.

- ***Though the government's primary role is to foster an enabling environment for digital financial services, the government can play additional roles in facilitating digital financial services.*** At both national and regional levels, governments and relevant regional institutions can establish a policy direction and enabling legal and regulatory framework. A forward-looking, proportionate, and technology-neutral approach is critical to facilitate market entry and innovation while addressing relevant risks. For example, allowing innovative nonbank players to offer some digital financial services or to partner with banks, and allowing and incentivizing the deployment of low-cost delivery channels (e.g., agents, point-of-sale devices, automated teller machines, mobile phones). These agents may also help support development of relevant financial infrastructure, for example to support fast payments and interoperability of payment instruments, or integration of digital data into credit reporting systems. Finally, they can help stimulate demand, including by using government-as-a-customer, such as with government-to-person payments.

2. Determining the current state

- ***Gauging the state of play of digital financial services:*** A task team carrying out the diagnostic for digital economy should assess a core set of indicators as indicated in the High Level DE4A Scorecard, to initially determine the baseline state of digital financial services, and, in particular, digital payments (see **Table 5**). See **Annex 3** for a full list of indicators for digital financial services. The task team should make efforts to disaggregate and analyze indicators by key demographic and socioeconomic characteristics where possible, for example by gender, income, and rural/urban. In countries where digital payments are at a nascent stage, the focus of the diagnostic should be on enabling the development of a digital payments' ecosystem, which often begins with person-to-person payment flows. In countries where digital payments are more advanced, the task team should focus on a comprehensive set of digital payments use-cases (e.g. person-to-business, government-to-person, person-to-government) and leveraging digital technology to develop a broader suite of digital financial services

- ***Financial services are undergoing fundamental changes***, both with regards to incumbents as well as new market entrants disrupting not only payments but also lending, insurance, wealth management and capital markets. As a result, new business models, products and services emerge, and financial services providers are fundamentally changing the way they are doing business. Better and cheaper access to finance is available to individuals, Small Holder Farmers (SHFs) and MSMEs, fostering economic growth and mitigation of risks. MSMEs are fundamental drivers of the economy, yet many lack access to finance to trade and grow. There is a need to identify what advancements technological innovations offer to help MSMEs gain access to lending facilities and how private sector delivery of such solutions can be supported with appropriate regulation and government backing. Regulatory environments need to allow for market entry and growth of a diversity of providers, including those with business models that target SHF and MSMEs. To further expand access to financial services it is critical to understand who current players in a market are and what may be impairing their ability to expand. This in turn should feed into the regulatory recommendations. (e.g. leveraging digital data for lending, e-KYC, e-documentation). Towards this end the team shall also collect data on the change in number of FSPs operating in a market, tracking new licenses issued by national regulators on an ongoing basis.

Table 5: Determining the Current State of Digital Financial Services

Core Indicators: Digital Financial Services	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
% of adults with a transaction account					
% of adults making or receiving a digital payment in past 12 months					

3. Assessing hurdles

- ***Assessing hurdles to greater digital financial services:*** Depending on the state of play of DFS development, the task team may use the following areas of assessment (see **Table 6**) to determine key hurdles to further development of DFS in a country. To facilitate the analysis and recommendations, the task team should draw on a range of relevant data sources and technical guidance in this area, including:

  - 2017 World Bank Group (WBG) *Global Findex*
  - 2017 International Monetary Fund (IMF) *Financial Access Survey*
  - 2017 WBG *Global Financial Inclusion and Consumer Protection Survey*
  - 2017 WBG *Good Practices for Financial Consumer Protection*
  - 2016 CPMI-WBG *Payment Aspects of Financial Inclusion*
  - 2016 G-20 *High-Level Principles for Digital Financial Inclusion*

Table 6: Assessing Hurdles to Developing Digital Financial Services

Market Development

- Are traditional financial service providers (e.g. banks, credit unions, microfinance institutions) offering digital financial products (e.g. online/mobile banking, payment cards, digital credit) that are accessible to a broad range of consumers?

- Are other new or nontraditional financial service providers (e.g. e-money issuers, mobile network operators, peer-to-peer lending platforms, insurtech) offering digital financial products that are accessible to a broad range of consumers?

- Is there a fintech industry providing services to traditional or nontraditional financial service providers (e.g. to improve credit scoring, AML/CFT, fraud detection)?

Private Sector Engagement

- What institutions are providing DFS and what services do they offer?

- What business models do they follow? Who are the main providers of DFS in the country?

- What does the FinTech landscape look like?

- Which services are being disrupted?

- What is the demand for DFS?

- What are main impediments to the expansion of digital access to finance for SHFs, MSMEs and individuals?

- Does e-signature legislation exist?

- Does the regulatory framework enable paperless delivery of financial services?

- Does the regulatory environment encourage innovation (e.g. cloud-based CBS)? Is there a test and learn approach by the regulator or is everything not explicitly allowed prohibited?

- Is funding for start-ups or early stage small businesses available? If not, why not?

- Are there supply/ value chains in the country? How are payment and data streams along these supply and value chains?

Policy and Regulation: Overall

- Does a National Financial Inclusion Strategy (or similar instrument) and / or National Payments System Strategy (or similar instrument) exist to promote and coordinate efforts to create an ecosystem for digital financial services?
    - What is the relevance / status of implementation of key actions to promote digital financial services?
    - Are the relevant stakeholders included in the development and implementation of the strategy, e.g. telecom regular, fintech industry representatives?

- Is there a clear delineation of responsibilities among regulators for the legal and regulatory framework relevant to digital financial services?

- Is there a clear framework for coordination/collaboration between key oversight agencies such as Telecom Regulators, Central Banks and Competition Authority?

- Are laws, regulations, and standards updated as necessary to ensure they remain effective and relevant to market developments?

- Do the relevant supervisors have the capacity to supervise DFS, including with respect to understanding digital technologies and the use of technology to enable effective supervision (i.e. Suptech)?

- Do financial service providers offering digital financial services leverage regulatory technology (i.e. Regtech) to meet regulatory requirements?

Policy and Regulation: Market Entry

- Is there a legal/regulatory framework in place for e-money issuance, including by nonbanks (e.g. mobile network operators)?
    - If no, do e-money issuers exist in the market and is the regulator engaged, for example via active market monitoring, provisional licensing, use of sandbox approach?
    - If yes, does the legal, regulatory, licensing approach used for such providers create a level playing field for all providers offering similar products? For example, with respect to licensing, permitted activities, financial consumer protection requirements, AML/CFT requirements, access to financial infrastructure?

- If yes, does the legal/regulatory framework enable innovation with respect to product design and deployment, use of low-cost delivery channels, partnerships with other companies?

- Is there a legal/regulatory framework in place for other new or nontraditional players (e.g. online marketplace / peer-to-peer lending; insurtech) offering digital financial services in the market?
  - If no, do such players exist in the market and is the regulator engaged, for example via active market monitoring, provisional licensing, use of sandbox approach?
  - If yes, does the legal, regulatory, licensing approach used for such providers create a level playing field for other providers offering similar products? For example, with respect to licensing, permitted activities, financial consumer protection requirements, AML/CFT requirements, access to financial infrastructure?
  - If yes, to what degree does the legal/regulatory framework enable innovation with respect to product design and deployment, use of low-cost delivery channels, partnerships with other companies?

Policy and Regulation: Delivery Channel & Product Innovation

- Are various payment points of service interoperable?
  - If not interoperable, are the authorities taking steps to monitor the market and assess when interoperability requirements would be appropriate?

- Is there a legal/regulatory framework to allow FSPs to contract with agents (e.g. retailers) as third-party delivery channels?
  - If yes, what is the scope of permitted activities for agents?
  - Does the legal/regulatory framework create a level playing field for FSPs with respect to the use of agents?
  - Are FSPs permitted to sign exclusivity agreements with agents?
  - Are FSPs held liable for the actions and omissions of their agents?

- Is access to scarce infrastructure, channels and services such as unstructured supplementary service data (USSD), shortcodes, and payment switches regulated?

- Have the authorities applied a risk-based approach to AML/CFT regulations, including allowing the use of simplified Customer Due Diligence (CDD) for certain types of products (e.g. small-value transactional products) or customers (e.g. low-income)?
  - If yes, what is the approach to simplified CDD, e.g. can customers provide non-standard identification documents, can accounts be opened remotely?
  - How do providers engage with relevant authorities (e.g. Financial Intelligence Center) to seek approval of simplified CDD?
  - Are there any examples of DFS products on the market that are sold via simplified CDD?
  - To what degree do existing AML/CFT regulations present a barrier to financial inclusion, including with respect to DFS product innovation?

- To what degree are government-to-person, person-to-government payments, government-to-business, and business-to-government delivered/collected via electronic instruments?

- To what degree have financial service providers developed secure and simple user interfaces for DFS products that make them easier to use and minimize the risk of mistaken transactions and unauthorized or illegal use?

- Do product authorization requirements exist? What risks are assessed and are authorization processes executed in a timely manner?

Policy and Regulation: Managing Risks of Digital Finance

- Is cybersecurity considered a top priority for financial sector authorities and providers? For example:
  - Have financial sector authorities issued cybersecurity regulations and guidelines?
  - Are financial firms obliged to report to the regulator any cybersecurity incidents and to carry regular tests and simulations?

- What requirements are in place to protect customer e-money funds?
  - Is there a requirement that customer e-money funds be separated from the funds of the e-money issuer?
  - Are e-money issuers prohibited by law or regulation from using customer e-money funds for purposes other than redeeming e-money and executing fund transfers?
  - Are e-money issuers permitted by law or regulation to pay interest on customer e-money accounts or share profits with their e-money customers?

- To what degree does the legal/regulatory framework for financial consumer protection cover providers offering DFS (e.g. nonbank e-money issuers), delivery channels (e.g. agents), and products (e.g. mobile wallets) and address the unique consumer risks of DFS (e.g. data privacy, responsible lending, recourse for mistaken transactions) including with respect to:
  - Overall legal and supervisory framework
  - Disclosure and transparency
  - Fair treatment and business conduct
  - Data protection and privacy
  - Dispute resolution mechanisms

Financial Infrastructure: Retail Payments Infrastructure

- Is the national payment systems infrastructure in place, and what is the general level of compliance with international standards and best practices?

- To what degree do non-bank service providers have equitable (direct or indirect) access to relevant national payment systems infrastructures?

- To what degree are government payments processed through the national payment system infrastructure and to what extent are the underlying processes automated?

Financial Infrastructure: Credit Infrastructure

- To what degree are financial service providers offering DFS (e.g. mobile network operators offering digital credit) and other nontraditional sources of credit information (e.g. utilities, mobile airtime purchases) participating in credit reporting systems? Is the data collected via push or pull methods?

- Is a collateral registry in operation for both incorporated and non-incorporated entities, that is unified geographically and by asset type, with an electronic database indexed by debtor's name? To what degree can a range of movable assets be accepted as collateral? Does a movable collateral asset registry exist where registrations, amendments, cancellations and searches can be performed online? How much lending (as % of total) involves registered movable collateral?

- To what degree do credit providers leverage a range of digital data to evaluate customer creditworthiness? For example, mobile phone use, utility payments, e-commerce transaction data digitized information on small businesses (accounting, inventory, transactions collected in the value chain).

- What are the consent requirements needed to collect digital data, and to what degree do these requirements balance accessibility with data privacy?

D. Digital Businesses

1. Definitions

- ***Digital businesses in a digital economy can be divided into two distinct categories, each with their characteristics: 1) digital start-ups, and 2) established digital businesses.*** *They serve as a critical foundation to enable traditional offline businesses (both large and MSMEs) to adopt new digital business models and digital technologies, creating positive spillover effects in the rest of the economy.*

  1) **Digital start-ups** refer to early-stage ventures that create new digital solutions or business models as part of their core products or services. The growth and sustainability of these digital start-ups require a well-functioning entrepreneurship ecosystem and venture capital financing to turn ideas to viable new businesses and scale fast. Digital start-ups include firms that develop both routine technology solutions (e.g. software development), or more disruptive ones (e.g. platform-based and data-driven solutions).

  2) **Established digital businesses** are mainly large platform-based and data-driven firms that have passed the initial start-up stage, having acquired suppliers, contractors, and consumers rapidly. Commercial digital platforms[43] and data-driven technology firms[44] enjoy economies of scale to survive and grow, presenting a unique opportunity for African economies to break out from a sub-optimal steady state of markets dominated by inefficient MSMEs (and informal firms). Many of them in this process could gain market power due to economies of scale and expand into adjacent markets to gain economies of scope: e.g. telecom provider starts providing e-payment services or e-commerce platforms providing digital loans. A healthy contestable market is crucial to level the playing field for all new digital businesses to have a fair chance to enter, compete and scale (foreign vs. local, large vs. small, online vs. offline), and to ensure consumer and supplier welfare.

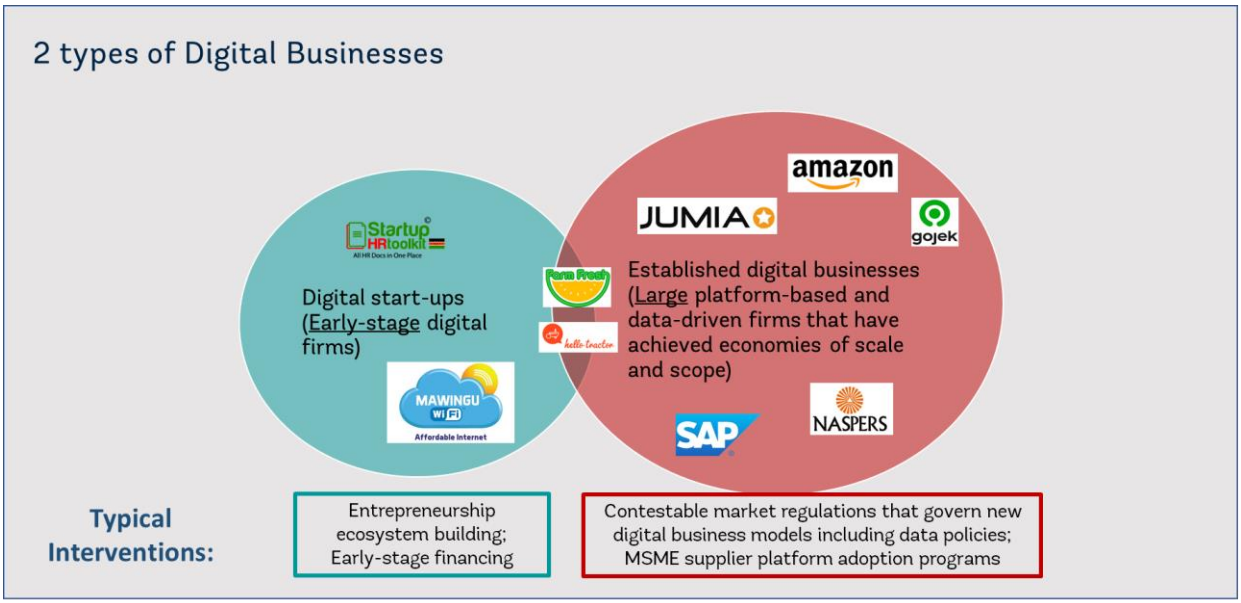
- **The objective of this pillar** is to nurture digital start-ups through entrepreneurship ecosystem building and venture capital investment and ensure a contestable market for new digital business models to enter, grow and compete fairly. The goal is to increase private sector competitiveness, economic

[43] Commercial digital platforms are multisided online marketplaces that enable producers and users to create value together by removing market frictions, facilitating interactions and matching, and by exploiting and managing direct and indirect network effects (Still, 2017; Evans, 2013). They offer distinctive benefits for users, for example, lower transaction costs, lower search costs, lower prices of intermediate and final goods, and better quality of products and services. However, they also present important risks, usually in the form of anticompetitive behavior and lack of consumer and contractor protection. Network effects and winner-takes all dynamics may foster market concentration, and incumbents may engage in collusive and discriminatory practices that affect new entrants and suppliers, usually by exploiting data as a source of market power, among other potential anticompetitive practices. When designing programs and policies to foster the proliferation of private digital platforms, governments should ensure a level playing field between incumbents and new entrants, as well balance the opportunities that are offered in the form of inclusion and efficiency vs the risks entailed by market distortions and potential job displacement.

[44] Data-driven technology firms systematically and methodically collect or aggregate large datasets and leverage advanced analytics to create value to customers. They tend to rely on data as a key resource in their business model (Hartmann, 2014). Data-driven technology firms can also help traditional industries upgrade through servicification to optimize production processes, increase sales, streamline decision-making and even re-think revenue models. Data-driven technology firms are increasingly observed in the AI era, and most digital platforms are also data-driven businesses (e.g. according to a survey by Latin American Venture Capital Association in 2018, 73% LAC digital start-ups are using big data, machine learning or AI).

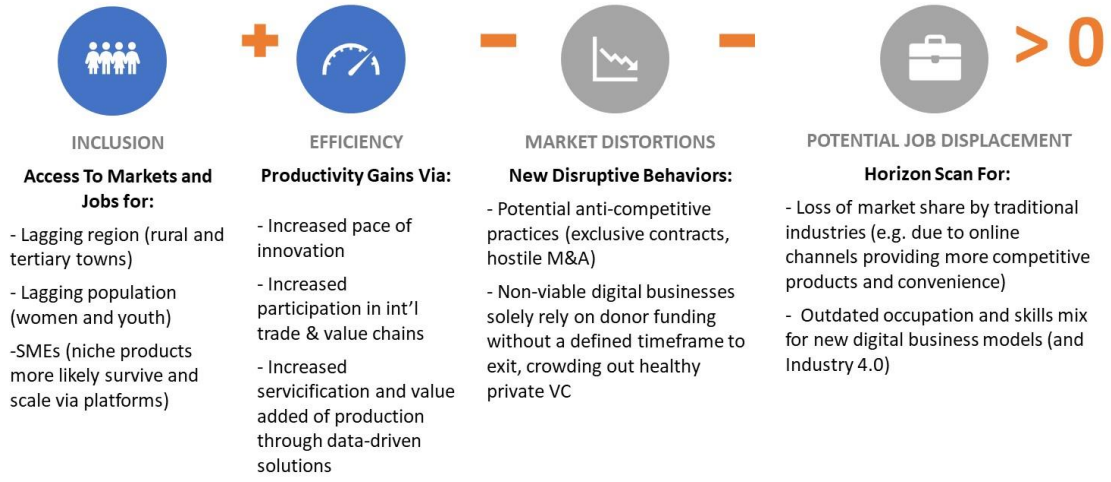
resilience, support inclusiveness and market integration, and unlock economic opportunities for all through digitalization.

Figure 11. Two types of digital businesses to unlock economic opportunities in the digital economy



The healthy creation, adoption, and proliferation of digital businesses require balancing the opportunities and risks. For example, digital private sector platforms present opportunities in the form of access to markets for lagging regions, inclusion of disadvantaged populations, especially for women and urban youth, helping SMEs survive and scale, and improving market integration via increased participation in value chains and trade. However, they also present new risks due to winners-take-all, and online-offline competition dynamics in the form of market distortions and potential job displacements that should be considered when designing policy and programs aimed at fostering the development of digital businesses. The same applies to data-driven firms: the more data a firm possesses and utilizes, the better the product and services, the more consumers will buy the products and services, which in turn create even more data for the firm.

Figure 12: Digital Business Brings Opportunities and Risks



- **The diagnostics and effects of digital businesses on the economy should be assessed against the four channels: inclusion, efficiency, market distortions, and potential job displacements to provide rationales for public interventions.**

    - **Inclusion:** By reducing search and transaction costs, new digital business models can broaden market access for products and services and provide access to jobs for lagging regions (especially rural and tertiary towns) and disadvantaged populations (for example, women and urban youth). Similarly, MSMEs (including informal businesses) that offer niche products can reach more customers and are more likely to scale up operations through adopting a platform-based and data-driven business model.

    - **Efficiency:** Participation in international and domestic trade enabled by new digital business models can generate productivity gains through increased pace of innovation due to network effects and lean prototyping processes, export growth and value chain participation. Platforms can also make commercial transactions more efficient by eliminating the need for third-party intermediaries, allowing producers to retain a larger portion of the value of the product or service sold. Transactions are more efficient when firms use data analytics to offer tailored services and products to consumers including after sales service and hence "servicification" gradually becomes a new revenue source.

    - **Market distortions:** Specific features of new digital business models (for example, economies of scale, network effects, and winner-takes all dynamics) can potentially give rise to anti-competitive behavior and market distortions. Large platforms and data firms may engage in exclusionary and collusive practices and mergers and acquisitions of competitors, increasing market concentration. Policies should be aimed at safeguarding competition in digital markets, preventing anticompetitive behavior, mitigating risks of dominance by a single player, and ensuring a level playing field for new market entrants. Additionally, analysis of financial statement data on digital businesses by the World Bank has shown that non-viable digital businesses persist, relying solely on donor funding for an unlimited time period and essentially crowding out healthy private venture capital. They do so by mechanically quoting evidence of "blitzscaling" in developed countries (or massively scaling a platform business to

obtain market share at the expense of long term sustainability of the business) and ignoring addressing the fundamental weaknesses of the business model.

- **Potential for job displacement:** New platform-based and data-driven business models have the potential to disrupt traditional industries and to cause them to lose market share. While the loss of market share could be viewed as creative destruction at play, governments and policy makers should take into consideration the real sources of competitive advantage of platforms vs traditional offline businesses when designing policies and regulations. In many cases, traditional businesses are subject to more stringent sector regulations, quality standards, and contractor/consumer protection regulations and hence "decrease their competitive edge" vis-à-vis a similar online business. Other potential sources of job displacement stem from the change in the skills demanded. For example, farmers who want to sell products through an e-commerce app need to have minimum digital literacy, inventory & financial management, language and consumer interaction skills.

2. *Determining the current state*

- ***Gauging the state of play of digital business.*** While determining the status of digital business can be a daunting task, there are resources that can help project teams get started[45]:
  - BriterBridges digital start-ups and ecosystem maps in Africa and MENA: https://briterbridges.com/innovation-maps
  - Pitchbook/ Crunchbase database for digital businesses
  - World Bank Enterprise Survey

- **Table 7** provides possible high-level indicators to determine the level of creation and adoption of Digital Businesses in a country. **Annex 4** provides a more detailed set of indicators.

Table 7: Determining the current state of digital businesses

Core Indicators: Digital Businesses	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
Digital start-ups					
Increase the number of digital start-ups (by size of firm, female vs male ownership; and by IDA, FCV) (Pitchbook, Briterbridges and other relevant datasets – contact FCI global Markets and Technology unit for data access)					
Established digital businesses					
Increase the number of platform-based or data-driven firms operating in the country (by local vs. foreign, founding year, size of firm; and by IDA, FCV) (Pitchbook, Briterbridges and other relevant datasets – contact FCI global Markets and Technology unit for data access)					

[45] Please contact FCI Markets and Technology global unit for accessing some of the following datasets, as it centralizes data access agreements with various data providers.

3. *Assessing hurdles*

The diagnostic should next determine key hurdles inhibiting the creation and growth of digital businesses.

Table 8: Assessing Hurdles to Digital Businesses[46]

Digital Businesses Landscape (desk research[47])

- How many digital businesses are currently operating in the country (preferably in time series)?
- Provide a breakdown by sector, by location, by years of operation
- Financial performance of digital businesses (revenue, net income)
- How many facilities, such as incubators, accelerators, and tech parks are available in the country (region)? What kind of services do they provide? What specifically exists for digital entrepreneurs?

Institutional Mapping of Digital Economy Policies and Programs (desk research)

- Are there any specific programs or policies aimed at digital economy/digital private sector development?
- Who are the main institutions in charge of those policies/programs?
- Are there any mechanisms in place for digital businesses to provide feedback to the government to develop appropriate regulatory frameworks (for example, a dedicated agency regulating the functioning of digital businesses)?

Regulatory responses to digital businesses (regulatory experts/lawyers/desk research)

- Are there regulations/rules/laws on: registration of digital businesses that engage purely online, e-documentation, e-payments, e-signature, e-transaction, intellectual property protection, cybersecurity/cybercrime, consumer data privacy, access, processing, sharing, deletion, and localization, domain name restrictions, equal access to government procurement contracts by digital businesses, foreign investor shareholding (even restrictions) of digital businesses? For each of the legal and regulatory items, specify the current state of the laws and regulations: 1) there are no substantial laws and regulations; 2) only a barebones framework or dispersed individual laws and regulations; 3) comprehensive legal and regulatory framework, but with major additions or amendments needed; 4) comprehensive laws and regulations in place, but small additions or upgrades recommended; 5) comprehensive and modern laws and regulations in place.
- Is there any general applicable tax for services/products offered through digital platforms?
- Are there any rules and laws on consumer and supplier protection, including provisions for cross-border disputes, intermediate liability, out-of-court complaint and redress mechanism, mandatory notification for modifications of the Terms and Conditions for suppliers, treatment of clauses demanding the supplier to provide the most competitive offer and limiting the supplier's freedom to offer better prices through other sales channels?
- Are there any rules and laws on merger control and appropriate thresholds for notification/killer acquisitions in digital markets?
- Do competition authorities have the mandate to provide opinions on draft regulations regarding digital businesses or state support for digital businesses?
- Is there an open data framework and initiative? What indicators does open data initiative cover? Who has access to the "open" data?
- Is e-customs and e-logistics taking place? Are these harmonized to any regional single market standards to enable digital trade?

[46] This assessment focuses on digital businesses that create markets through using new business models to achieve economies of scale, as they represent a unique opportunity for Africa in the digital age to create jobs and embark on economic transformation; please refer to digital business ecosystem annex 6 for entrepreneurship ecosystem assessment. Please contact FCI Markets and Technology Global Unit for a codified questionnaire to support fieldwork and data collection.

[47] Please contact FCI Markets and Technology Global Team for accessing these data.

Questions for intermediary organizations supporting digital start-ups

- What is the nature of the organization? Incubators, accelerators, investor network, educational and research institutions, industry associations, government agencies, donors or international organizations.
- Is the institution public, private, PPP, NGO, or other?
- What is the type of support provided by the institution?
    - Financing: grants, matching grants, vouchers, equity finance, credit guarantees, loans and credit, tax incentives for R&D and non-R&D innovation, incentives in the form of public procurement
    - Early-stage infrastructure and business advisory provided by co-working office spaces, lab testing space, technology extension services such as training for technology adoption, advisory for prototype design, business operations advisory such as accounting, business models, marketing
    - Collaborative networks (trade fairs, networking events, associations, digital platforms).
- Are there major gaps in the quantity and quality, as well as fragmentation in the type of support provided?

Questions for digital entrepreneurs and digital business owners

<u>Basic info about the firm</u>

- What is the core product or service that the firm is providing?
    - B2C (e.g. eCommerce, home-sharing), please write down:
    - B2B (e.g. sourcing platforms, software), please write down:
    - Hybrid, please write down: _____
- What is the efficiency gain potential of the new digital business in question?
    - Reduce transaction costs
    - Reduce informational asymmetries
    - Reduce search costs
    - Improve the quality of the matching
    - Tap into spare human capacity
    - Tap into spare physical capacity
    - Provide social value
    - Gather data
    - Financial inclusion for suppliers/contractors
    - Pool resources (e.g., money) for access to finance
- How many years has the firm been in operation?
- How many salary staffs in the company?
- What is the extent of female participation in the founder team?
- What is the extent of female participation in the contractor or supplier team, especially if this is a digital platform business?
- Does the business provide market access or employment opportunities to rural/urban poor and/or other disadvantaged populations?
- What is the main revenue source of the digital business: commission as a % of value transacted, subscription, advertisement, monthly fees, services (e.g., selling data)?
- What is the geographic scope of your major competitors? (local, regional, global)

<u>Legal and Regulations-related questions</u>

- Are there any sector-specific licensing requirements (e.g. taxi operating licenses for ride-sharing)?
- Are there any sector-specific quality and certification standards that you need to comply with?
- Is there any verification mechanism in place for new platform vendors/contractors/suppliers?
- Is there a specific registry for shared economy service/product providers (for example, registry of homeowners for tourist use)?

- Is there a taxation scheme applicable to the main activities and auxiliary activities (e.g. courier, logistics)? Who on a multi-sided platform is being taxed currently if this is a platform business (the owners, the suppliers, the consumers)?
- Are there any applicable labor market laws and regulations for platform-based work (for example contractor & e-labor protection law)?

Business operations questions

- What are the main sources of funding available for the digital business (own personal, own corporate, family and friends, incubators and accelerators, business angels, venture capital)?
- What are the main supporting elements needed for the platform business model? Are there any major gaps? For example, payments, logistics, fulfillment centers, third party certifications, software, (cloud) server management, HR service support systems, etc.
- What are the most important challenges to build and launch a platform in this country other than regulation?
    - Internet connection
    - Digital skills
    - Lack of trust in online transactions
    - Lack of supporting services and infrastructure (e.g. logistics)
    - Costs for supporting services and infrastructure (e.g. internet cost, logistics cost)
    - Early-stage funding
    - Lack of digital payment systems
    - Aversion to digital goods and services adoption among potential users
    - Lack of interoperability across software and data used in the industry
    - Lack of firm capabilities (human capacity, organizational structure)
- Has the digital business implemented any measures to ensure disadvantaged gender and racial groups are not being discriminated against (e.g. through concealing the sellers or suppliers' names, photos, locations)?
- Does the digital business have its own strategy to deal with competitors?
    - Exclusivity contracts with suppliers
    - Identification of niche markets to get a first-mover advantage
    - Avoiding multihoming by limiting consumers and suppliers accessing to multiple platforms
    - Loyalty rewards for customers, tie-in-sales,
    - Horizontal and vertical mergers/acquisitions
    - Offering competitive price-quality packages even incurring a loss temporarily
    - Buy or partner with other platforms to obtain user behavior data
    - Offering a lower price for platform use vs. offline,
    - Subsidizing logistics and delivery services.
- Who determines the final price of the good or service provided through digital platforms (the seller, the platform, the seller with advice from the platform, auction, or other mechanisms)?
- What type of support -if any- is the digital platform providing to suppliers/contractors to facilitate access to the platform? If the platform is not currently offering any support, which kind of support would it consider offering based on the needs of its current suppliers/contractors?
    - Quality standards certification
    - Training on digital skills
    - Training on accounting, marketing, pricing, and inventory
    - Training on how to use the platform
    - Call centers for after-sales services;
    - Incentives to increase consumer demand (e.g. online costs lower than offline costs)
    - Financial programs: e.g. merchant lending programs to suppliers
    - Investments in complementary infrastructure (e.g. warehouse, courier, fulfillment centers)
    - Hardware and software capacity (e.g. digital device for suppliers)

- Is the digital business engaged in strategies to build trust? For example, requirements of third-party certifications, authentications or background checks for suppliers or users, rating mechanisms, investment in customer service, money-back guarantees, etc.
- Is the digital business implementing actions to deal with bad behavior? For example, excluding platform users, penalizing users through rating mechanisms, imposing penalties, etc.
- How is the digital business using data? For example, sharing it (with whom), selling it (to whom), or using it for platform operations.
- Are there any signs of potential job-displacement in offline sectors providing similar products and services, according to your observations?[48]

Business Financial Performance Questions

- Does the firm cross-subsidize across different types of users or business lines (e.g. Uber Eats vs. Uber)?
- Is the business making profits now? If so, how many years have passed between initial launch and profit generation?
- What is the relationship between the digital businesses and network/telecom operators, if any (e.g. using data from network operators, sharing data with network operators or pricing arrangements)?

Question for suppliers/individual contractors of commercial digital platforms

- What type of products or services you are supplying to the digital platform?
- Have you seen income increases after working with a digital platform?
- Are you planning to continue working with a digital platform? If not, why?
- How many digital platforms in total you are providing products and services to?
- For manufacturing goods suppliers: Do you think the digital platforms are increasingly becoming your direct competitors offering similar products themselves, instead of as a partner to help your business grow?
- Are the businesses you are currently engaged with requiring third-party certifications, authentications or background checks for suppliers?
- What support programs below are the most helpful for suppliers/contractors interested in providing services or products to a platform-based business?
    - Quality standards certification
    - Training on digital skills
    - Training on accounting, marketing, pricing, and inventory
    - Training on how to use the platform
    - Call centers for after-sales services;
    - Incentives to increase consumer demand (e.g. online costs lower than offline costs)
    - Financial programs: e.g. merchant lending programs to suppliers
    - Investments in complementary infrastructure (e.g. warehouse, courier, fulfillment centers)
    - Hardware and software capacity (e.g. digital device for suppliers)

[48] The availability of empirical evidence behind potential job displacement as a result of the adoption of digital platforms is limited or non-existent, especially for developing countries. Proxies for this measure might be captured by the new skills required by traditional industries (see WB-LinkedIn Industry-Skills and Occupation-Skills Dashboard and Database and Impact Evaluation Papers on Piloting New Business Models: E-commerce).

E. Digital Skills

1. Definitions

Importance of digital skills

- ***Africa would benefit from expanding its pool of 'digitally competent workforce' and 'digitally literate citizens' to reap the wider benefits that the digital society brings to the economy and society.*** "*Digitally competent workers'* drive the development of vibrant digital economies. They can also raise labor productivity by enabling the application of digital tools and processes across diverse areas, including the informal service sector, agriculture, energy, transportation, health, education and government services, to name a few. '*Digitally literate citizens'* can better reap the wider benefits of a digital society by gaining access to more, better and safer information and engaging with the broader community. Citizens who lack the capacity to identify credible information from competing sources and make appropriate judgements may fall into the traps of the digital world, including financial fraud and (especially for young people and children) physical and other forms of abuse and exploitation.[49] Digital skills represents one of the five foundational pillars of the Digital Economy for Africa initiative and is essential to implementing the other four pillars.

- ***Digital skills represent a continuum of diverse skills which can be fostered through formal education and training as well as informal learning.*** Digital skills can be defined as the individual capacity to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately. Digital skills are often understood in simplistic terms as, the ability, for instance, to use a mobile phone for simple transaction or access and surf the internet; or, at the other end, to undertake coding and software programming. The concept of digital skills is much deeper and broader, encompassing diverse human capacities. Individuals may differ in their level of proficiency in these different competences. At the higher end of the digital skills continuum, individuals will have the ability to deploy digital technologies, to develop new applications and come up with solutions to new problems. It is important to highlight that access to digital devices does not necessarily translate into acquiring digital skills, even at the basic level, although they are an essential pre-condition for them. The kind of digital skills required for a digital economy needs to be acquired through education and training, both formal and informal. The quality and appropriateness of digital skills programs matter.

Digital skills frameworks

- ***Digital Skills Frameworks can help to classify digital skills and enable employers, education and training providers and individuals to assess the competences and proficiency levels that are required for different occupations and functions.***[50] Most African countries lack such frameworks. The UNESCO

[49] OECD (2019) shows approximately one in ten 15-year old students in OECD countries was not able to distinguish between facts and opinions.

[50] With respect to the digital skills that are required for all occupations (excluding the ICT professions), the diagnostic tool refers to varying digital skill "levels" that correspond to the proficiency levels in the UNESCO/EU framework. Digital skills encompass the 7 competence areas. In the broader literature, sometimes conceptual distinctions are made between skills and competences. For instance, some of the literature characterizes skills as being inherently linked to tasks, while competencies include not only task-specific skills but also knowledge, abilities, attitudes and values. In this note, the terms "skills" and "competences" are used

Digital Literacy Global Framework, which is based on the European Union's DigComp 2.1, provides a robust digital skills framework (see Figure 13, Panel 1). *Different levels of proficiency in 7 competence areas or domains indicate four broad levels of digital skills that are applicable to many occupations* (See **Annex 5.2** for details of the proficiency areas and levels). DigComp 2.1 is consistent with a more generic skills framework adopted by the World Bank, with three core components comprising cognitive, socio-emotional and technical skills (World Bank, 2018). The digital skills framework cuts across these three skills components. The digital skills framework for the Country Diagnostic Tool will follow the following 4 distinct levels of digital skills adopted in DigComp 2.1[51]:

- Foundational: With guidance, **deal with simple tasks** that involve remembering contents and instructions (75% of youths and adults should have acquired his level by 2030)
- Intermediate: Independently **deal with well-defined routine and nonroutine problems** that involve understanding contents
- Advanced: Independently **deal with and provide guidance to others** on different tasks and problems that involve applying and evaluating content in complex situations (6% of youths and adults should have acquired his level by 2030)
- Highly specialized: Independently **resolve complex problems with moving pieces**, **guide others**, **contribute to professional practices** and **propose new ideas** to the field

- ***For ICT professionals and technical workers***, who undergird the development and spread of digital technologies, the European Union has developed a more detailed framework, the EU e-Competence framework (see Figure 13, Panel 2). This is envisaged as a tool to articulate the competences required and deployed by ICT professionals (including both practitioners and managers). There are **5 e-Competence areas** derived from the ICT business processes PLAN – BUILD – RUN – ENABLE – MANAGE , and **5 proficiency levels** for each e-Competence. The e-Competence levels e1-e5 broadly correspond to the education levels of upper secondary to postgraduate education in ICT disciplines.

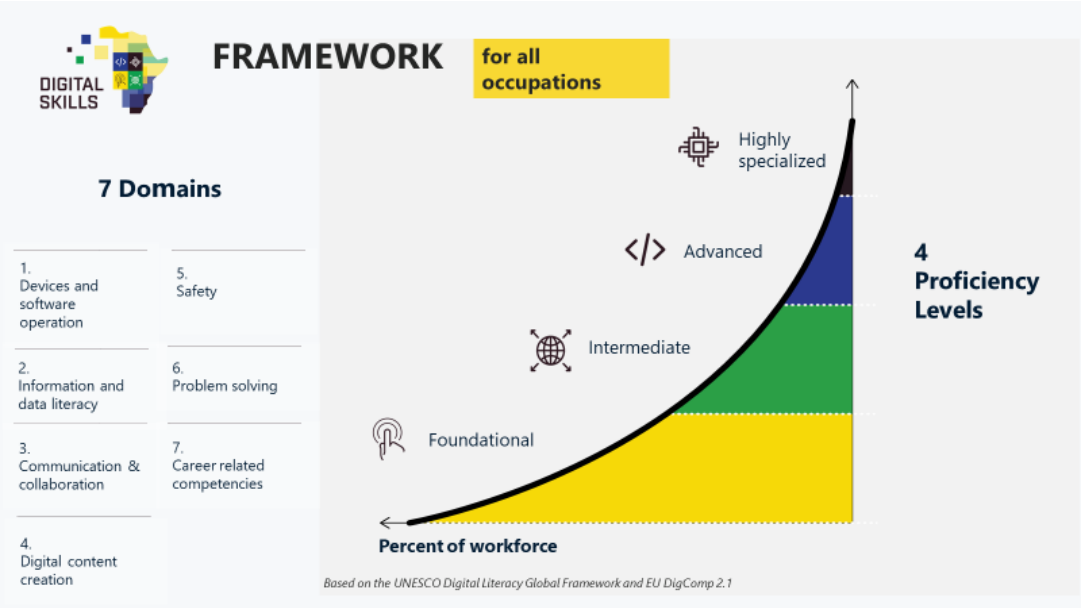
- ***These two digital skills frameworks will guide the Task Teams in identifying key policies, curriculum and programs designed to foster digital skills as well as frame the way in which the information will be presented in the country diagnostic***s. For instance, the framework can be used to: (a) assess the content (i.e., competency areas and proficiency levels) of the digital skills programs offered in universities, TVET institutions, schools and by NGOs); (b) check if the ICT curriculum at the school level has a clear definition of the competency and proficiency levels to be developed, (c) review some of the key programs/courses offered to ICT professions based using the e-competence framework for ICT professions, (d) have an understanding of where the country stands in relation to policies and institutions for fostering digital skills (e) identify the digital skills that are in demand and gaps in supply that need to be developed by education and training institutions and/or the private sector.

interchangeably. "Digital literacy" refers to the skills/competences that are required for all citizens and workers, to distinguish them from the competences that are required specifically in the ICT professions.

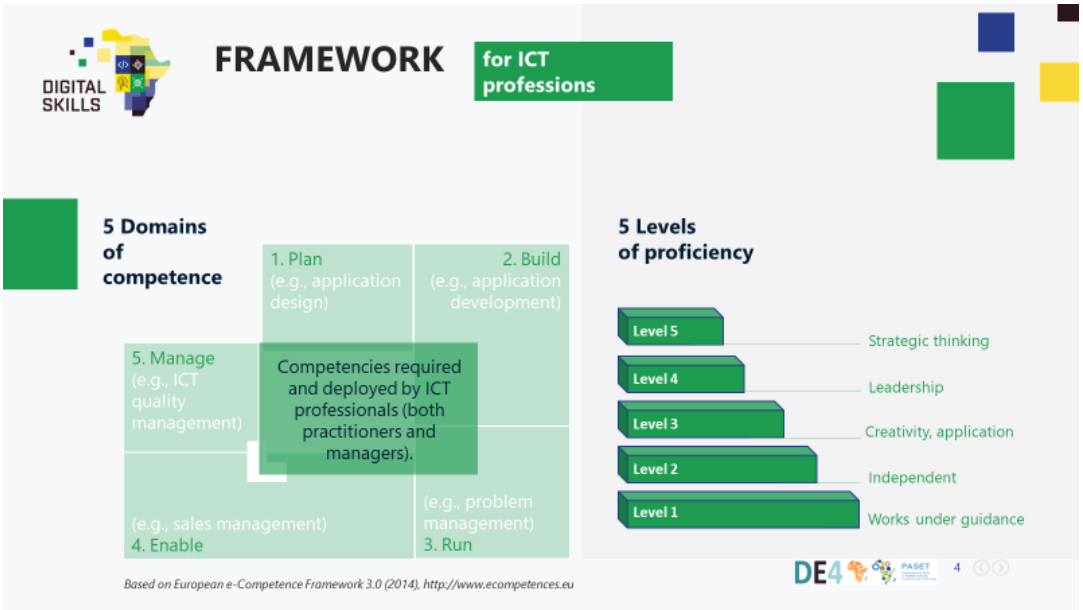
[51] The targets in brackets refer to the those adopted in the Digital Economy for Africa Scorecard.

Figure 13: Digital Skills Framework

Panel 1: Framework for all professions: 7 Competencies/Skills and 4 Proficiency Levels



Panel 2: Framework for ICT professions



Source: Prepared based on Carretero, et.al.(2016) and UNESCO (2018) for Panel 1, and the E-Competence framework by the European Commission (2017) for Panel 2.

The extent to which digital skills should be developed, and at what level, should be guided by the demand for digital skills in the economy. African countries are at different levels of development and demand will naturally vary. However, as digital technologies pervade different sectors, an increasing number of occupations will require at least foundational level digital skills and many will need intermediate level digital skills.

- ***This section provides guidance on the information that should be collected on digital skills as part of the Country Diagnostics for Digital Economy for Africa (DE4A)'s, the issues that should be considered and an outline of the digital skills report, including key tables.*** Given the considerable cross-country variations in the availability of information and data in Africa, not all country diagnostics can cover the diverse elements proposed in this diagnostics tool. In this case, it would be useful to mention the missing information. This would also help to encourage governments to enhance data collection efforts in the future.

2. Determining the current state

The policy framework for digital skills

- **The Country Diagnostic should assess whether there is an enabling policy environment for developing digital skills**. An important issue is whether the country has a Digital Skills Framework, or in the absence of one (which is very likely), whether digital skills are included in the overall Skills Qualifications Framework[52]. A Digital Skills Framework should be developed in consultation with employers and stakeholders, even if international frameworks are used as a starting point. Other policies that are important: (i) revision of curricula to update existing education and training courses or introduce new ones (ii) online courses, their quality assurance, accreditation and recognition (iii) intellectual property rights regarding online course content and related issues (iv) private sector provision of digital skills training, including in public schools, universities and training institutions (v) the regulatory framework for Online Program Managers (OPMs).

- General ICT policies also affect the development of the digital skills provision, including those relating to data management and privacy, electronic identification, the security of digital payments and related matters. Other areas of the country diagnostic can also provide information on these areas.

Assessing the demand and supply of digital skills

- **Table 9** presents a small number of indicators designed to summarize the current state of digital skills supply. In countries where there are more elaborate data source on digital skills, **Annex 5** presents an expanded set of tables with indictors that allow for a detailed assessment of the demand and supply of digital skills.

[52] Skills qualification framework is a competency-based framework that classifies existing qualifications according to a series of levels of knowledge, skills and aptitude.

Table 9: Determining the current state of digital skills supply

Indicators	Definition	Current'	Future²	Source
Connectivity and equipment				
% of government/public lower-secondary schools with access to internet for pedagogical purposes	-			UIS database National EMIS
Enrollment				
% of youth and adults with advanced digital skills	Advanced digital skills are equivalent to Proficiency Level 5 in DigComp2.1/UNESCO Framework			UIS database National EMIS

- ***The diagnostic should assess the demand for digital skills in the country, both current levels (number of users or jobs) and reasonable trends in demand over the medium term.*** A realistic assessment is required in order to compare the adequacy of supply and in order to differentiate between different countries. As there is little systematic, comprehensive data on the demand for digital skills in Africa, the diagnostic will have to rely on indirect measures of demand, focusing on sectors, industries and occupations that are being impacted by digital technologies. The diagnostics can capture 'the number of users of certain digital technologies (e.g., e-government services)' or 'the number of jobs that exists in a particular sector (ICT services). In most countries, the majority of the population is working in agriculture and in the informal sector (e.g., transport, retail…), and assessing the growth of digital technologies in these sectors will help to assess the overall demand. In addition to review of existing reports and data, discussions with key employers can provide insights, for instance on whether there are shortages of digital skills (which levels), how they fill current positions, whether expatriates are used and if so, for what positions, and how they expect demand to grow. Data from LinkedIn or other job platforms can provide insights into the occupations that are in demand. However, there are inherent biases as these platforms tend to serve the formal sector workers.

- There are also cases where it may be easier to collect information on the demand for digital skills at the occupation rather than the sectorial level. One example is the increasing demand for data scientists which is likely to cut across sectors. It would be useful to also explore using labor force surveys or occupational demand surveys and investigate skills demand at the least 3-digit ISCO level.

- Note that the geographical scope of digital skills demand can often go well beyond the national border. In this case, the analysis of labor demand must be international in scope.

- **Annex 5.1** presents a suggested template for collecting and synthesizing information to generate indicators of digital skills demand from the principal use sectors.[53] It presents a template for digital skills demand in the ICT professions in the ICT and telecommunications industries. It is useful to separate out these two tables as the first set of sectors (the "use sectors") will require skills corresponding to the Digital Skills framework, and the ICT and telecommunication industries will require skills corresponding to the e-Competence framework. Where there is paucity of quantitative

[53] Note that information from Table 1 can also be useful in the introductory paragraphs, which would help to motivate the importance of preparing a country diagnostics on digital skills.

data on digital skills demand, qualitative information (e.g., business owner's perceptions) could be used as well.

- ***Another factor that drives demand for digital skills is the extent of integration of the economy in regional trade or whether there is a single digital regional market, which can foster cross-border trade.*** This is particularly relevant for countries (e.g., Lesotho) that rely heavily on neighboring countries both in terms of access to digital services as well as jobs. Data on skilled migration by job category could help identify the scale of demand for digital skills. Moreover, data from LinkedIn or other job platforms can provide insights into the occupations that are in demand in the region. However, there are inherent biases as these platforms tend to serve the formal sector workers.

- ***The above information should provide a basis to identify the sectors, the scale and types of digital skills demand that are emerging in the country, which could be mirrored against the current levels of digital skills supply.*** This will provide as assessment of the nature of skills shortages that is hampering the growth of the sector.

- ***The diagnostic should probe whether there are digital skills assessments that have been done recently and what the findings are*.** Only a few African countries have done such assessments in a nationally representative manner. In the absence of such comprehensive surveys, information should be collected on tests and assessments that may have been done by (a) schools, universities and other institutions (b) NGOs and training providers (c) private telecommunications and ICT firms, such as Huawei, Google, Microsoft and others and (d) donor agencies. Although the information from different types of assessments may not be comparable, they can provide an insight into the level of digital skills. Special attention should be focused on the gender dimension and disparities between income levels and regions of the country. Note that it would be important to also rely on qualitative information especially when quantitative information is not available.

- ***A particular challenge African countries face is the low levels of basic cyber skills even amongst young people, which are essential prerequisites for the acquisition of even the most rudimentary digital skills.*** Information on literacy rates among the young and learning assessment result, as well as the number of children and young people who are out of school, would be useful. For, instance, recent studies in SSA countries have found that the majority of fourth grade students cannot read a paragraph and close to ninety percent could not solve a simple mathematics problem. Furthermore, over 50 million children under the age of 15 are estimated to be out of school[54]. This means that efforts to improve foundational digital skills for large sections of the population will need to be closely linked to the acquisition of basic literacy and numeracy.

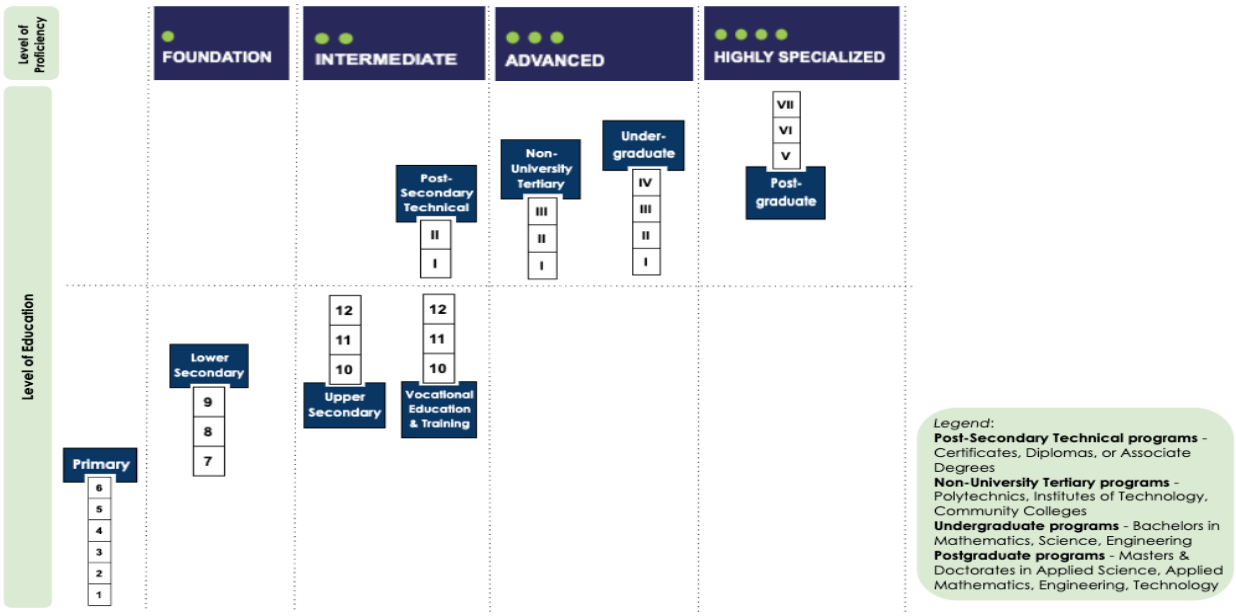
- ***Presenting the levels of foundational skills (i.e., basic literacy, numeracy and socio-emotional skills), will be important to contextualize the challenges in fostering digital skills.*** While this diagnostic tool makes a strong case for investing in digital skills, it must not be at the expense of the much needed investments to foster other critical skills. Digital skills are built on foundational skills such as literacy, numeracy and socio-emotional skills, as well as language skills. Note that certain domains of socio-emotional skills are explicitly mentioned as part of the competencies/skills of the Digital Skills Framework (e.g., 'communication and collaboration' and 'problem-solving' in Figure1). Increasing number of household and school-based surveys nowadays capture self-reported measures of socio-emotional skills. While these measures are prone to random and non-random errors, any information

[54] Bashir et al. (2018). Facing Forward: Schooling for Learning in Africa. Washington D.C: World Bank.

on individual's socio-emotional capabilities will be useful to better understand the challenges countries face in fostering digital skills. Literacy and numeracy measures are also essential and should be included in the diagnostics.

- ***The diagnostic should describe the provision of digital skills through formal education and training institutions.*** [55] **Figure 14** presents a rough mapping of different levels of digital skills to levels of education. This mapping should be taken as indicative as, especially in SSA countries, even students at the upper secondary level or in tertiary and university level programs may not have foundational or intermediate level skills, since they may not have acquired them at school. In a well-equipped and modern education system, foundational digital skills can be provided in school education (up to high school level); intermediate level skills at the upper secondary level, in TVET[56] institutions and technology programs in short-cycle tertiary institutions; advanced digital skills for the ICT professions in university undergraduate programs in engineering, sciences, mathematics and related fields; and highly specialized digital skills for the ICT professions in university postgraduate programs in the same fields.

Figure 14: Mapping education levels with 4 digital skills proficiency levels



Source: Authors' construction

- ***The diagnostics for formal education and training institutions can be guided through the following questions:***

[55] Country teams are encouraged to include Boxes in this chapter to illustrate good practices or examples of efforts made to foster digital skills development.

[56] In several African countries, TVET graduates specialized in ICT have huge problems getting a job. Apparently, not many employers need persons specialized in this field. It is a subject of debate whether the state or the private sector is in the best position to provide relevant, quality education and vocational training. Some argue that especially within TVET, resource constraints and bureaucracy mean that public TVET institutions will only in rare cases be able to deliver the level of skills training asked for by employers.

- ***Primary and lower secondary grades*** (approx. grades 1-6 and approx. grades 7-9): How many schools are connected[57] to the internet and have electricity? What is the average speed of connectivity? Is ICT/digital skills included in the official curriculum? From which grade level? What information is there on how the curriculum is delivered (including trained teachers, equipment, ICT labs, etc.)? If the govt is not providing this at scale (or even if it is), are NGOs involved in delivering content? The information should be provided separately for primary and secondary education, preferably. The purpose of this assessment is to see what proportion of students might be getting at least foundational digital skills, at least by the end of lower secondary.

- **Upper secondary grades** (approx. grades 10-12/13): Similar questions to the above, but also include those related to ICT course options in upper secondary; whether there are specialized schools etc. Identify the purpose of this assessment (e.g., how many get foundational/intermediate level of skills? Is there a pipeline for ICT/engineering/math courses in universities or TVET?).

- **TVET**: How many students are enrolled in certificate/diploma courses that are related to digital technologies? What are the course options for digital skills offered in TVET? What are the levels of digital skills covered through courses TVET? Are TVET institutions connected to broadband? At what speed? To what extent is digital technology used in teaching-learning?

- **Higher education**: How many students are enrolled in electrical engineering, computer science and related courses at the undergraduate level? What are the range of courses available? What is the quality of the courses? Which course options are particularly lacking? Are foundational digital literacy courses offered to all students? Are universities connected to broadband? At what speed? To what extent is digital technology used in teaching-learning? Does a National Research and Education Network (NREN) exist and what role does it play in providing connectivity to institutions?

- ***Information and data on the supply of digital skills in the formal education and training sector should be collected, using the proficiency levels of digital skills as presented in the Digital Skills Framework.*** The first step would be to study the literature and available data base from diverse sources (e.g., EMIS, UNESCO-UIS, ITU, etc.) to measure the average level of digital skills for different levels of digital skills (i.e., foundational, intermediate, advanced and highly-specialized). In the absence of a precise data on digital skills, which is likely to be the case in many African countries, **Figure 14** provides guidance on the rough equivalence between different digital skills levels with levels of education and programs. To the extent possible, data on digital skills supply should be disaggregated by gender, age-groups, educational levels and urban/rural. **Table 9** presents a proposed list of indicators. Note that it would be important to also rely on qualitative information especially

[57] Here, connectivity refers to access to internet for pedagogical purposes. It would be best to follow the UNESCO-UIS's approach, in which the: "Internet is defined as a worldwide interconnected computer network, which provides pupils access to a number of communication services including the World Wide Web and carries e-mail, news, entertainment and data files, irrespective of the device used (i.e. not assumed to be only via a computer and thus can also be accessed by mobile telephone, tablet, personal digital assistant, games machine, digital TV, etc.)". Therefore, connectivity can be via a fixed narrowband, fixed broadband or mobile network" (UNESCO, 2019).

when quantitative information is not available. See Annexes 5 and 6 for more detailed list of indicators.

Rapid Skilling Programs by the Private Sector and NGO initiatives

- ***The diagnostic should also include the provision of digital skills outside of the formal education system.*** While the main channels through which digital skills can be developed are likely to be through the formal education system, it is important to note that there are multiple pathways, including nonformal and informal learning. These channels can be particularly important for the out-of-school population. For instance, telecommunications companies often provide rudimentary digital skills training to individuals owning mobile telephones (these are below the foundational level, according to the digital Skills Framework presented earlier). Many large ICT firms also provide rapid skilling programs for secondary school graduates and undergraduates to provide training in specific skills (e.g., programming and coding). These are sometimes done in partnership with schools or universities. The country diagnostics should be clear about the nature of these interventions, including whether or not they are delivered as part of private or public-private partnerships, and should include integrated digital skills development and placement services.

- NGOs usually provide digital literacy skills to out-of-school children as well as youth and adults that have moved away from the formal education system, and in particular to disadvantaged groups. These are sometimes offered in partnership with schools and sometimes outside. **Annex 5.3** provides some examples of these programs.

- ***The diagnostics for outside of the formal education system can be guided through the following questions:***
    - What skills do they focus on?
    - Who are beneficiaries and how many are there?
    - Who is delivering and how?
    - What is the link to employability?
    - Who is paying?
    - Is there quality control?
    - Does it lead to certification that is valued by employers?
    - Can it be scaled up (or has this been scaled-up)?

- The knowledge-base on programs that cater to the out-of-school youth and adults is limited and available.

- ***Categorizing the information and data on the supply of digital skills outside the formal education system according to the Digital Skills Framework would be ideal, even if it is done in a qualitative manner.*** Data on proficiency among out-of-school children and youth/adults are likely to be sparse.[58] **Annex 5.1** presents a list of indicators that would be useful for the diagnostics if they exist.

[58] It may be possible to collect data on out-of-school population using household surveys.

3. Assessing hurdles

Adequacy of digital skills development and constraints in fostering digital skills

- ***The diagnostic should make an assessment whether there is a shortage of digital skills and at what level, or whether this is likely to emerge in the near future.*** This requires comparing the assessment of demand with the current level of digital skills and the supply of digital skills (both quantity and quality). Is the lack of digital skills likely to constrain the development of the digital economy in the country?

- ***The diagnostic can provide insights into factors that hamper digital skills development.*** The following outlines various potential factors that would be useful to analyze in this paper. Naturally, the identification of constraints would provide insights into policy recommendations presented in the last section of the diagnostics.

  Policy context
  - Lack of credible institutions or agencies driving the development of digital skills policies and programs
  - Lack of working groups in place by government ministries, private stakeholders, donor agencies, or others, focusing on the development of a digital skills agenda or program for nationwide disbursement?
  - Lack of coordination across ministries or agencies working on digital skills development.
  - Lack of a digital skills framework that guides government policies, programs, curriculum and standards for digital skills.
  - Lack of curriculum and standards for digital skills
  - Lack of legislation/regulations concerning cyber security and ICT ethics? Are these being enforced?
  - Availability of sustainable and predictable financial resources (both public and private) for developing, maintaining and improving digital skills (for all ages, including non-formal programs).

  Digital connectivity and digital skills programs
  - Insufficient connectivity and computers within educational institutions, especially in rural areas and vulnerable population groups
  - Insufficient digital skills programs that cater to out-of-school and adults
  - Insufficient number of relevant digital skills programs covering different skill levels

  Foundational skills
  - Lack of youth and adults with foundational literacy, numeracy and socio-emotional skills

  Private sector engagement
  - Lack of involvement of the private sector in preparing government policies, frameworks, curricula and programs
  - Lack of private- and public-sector led rapid-skills training programs on digital skills, such as coding bootcamps or other similar experiential-basis learning models? How many students do they graduate every year and how many domestic companies recruit from them?

- Lack of university-industry learning platforms providing real-work digital skills learning experiences for university students? Insufficient private sector initiatives that provide apprentices programs for digital skills jobs?

Information

- Lack of information on the digital skills supply and demand as well as skill needs, for each competency areas and levels of digital skills
- Lack of platforms for online job opportunities in the country

Implications for policy and programs

- ***The diagnostics will provide guidance for policies and programs in light of the findings from previous.*** Table 10 provides how an outline of what the policy analysis can be made. The key is to distinguish policies with short-term impacts (1-4 years) and policies with longer-term (5+ years) impact. It would also be useful to note which policy areas are of high priority to the country. Lastly, it would be useful to provide indications of fiscal implications for the proposed policies and actions.

Table 10: Implications for policy and programs

Areas	Constraints	Policy response with short-term impact	High priority (x)	Policy response with longer-term impact	High priority (x)
1. Improve policy contexts					
2. Expand and improve digital skills programs					
3. Expand and improve broadband connectivity and					
4. Expand and improve the use of digital technologies in teaching-learning					
5. Raise foundational skills					

6. Improve private sector engagement					
7. Enhance information and data					

Annex 1: Indicators for Digital Infrastructure[59]

1. DE4A Scorecard indicators

KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
OUTCOMES			
Increased access to the Internet	Percentage of population covered by mobile broadband network signal (%) (by gender, income group, education level, urban/rural; and by IDA, FCV)	For the measurement, it uses 3G equivalent network coverage (e.g. WCDMA, HSPA) as a percentage of the total market population. for baseline and interim target, 4 G equivalent network (e.g. LTE, WiMAX) as a percentage of the total market population, for the final target.	GSMA, ITU, Facebook (case by case)
	Fixed broadband Internet subscriptions per 100 inhabitants (by gender, income group, education level, urban/rural; and by IDA, FCV)	'Fixed broadband' is defined as a fixed network service having a downlink speed of 256kbps or greater. It includes services provided via DSL, cable modem, fibre and fixed wireless broadband/WiMAX technologies. It excludes cellular-based services, such as those offered via W-CDMA and LTE. 'Broadband subscribers' includes both residential and business subscribers.	TeleGeography
	"Unique" mobile-broadband subscriptions per 100 inhabitants (by IDA, FCV)	Total unique mobile broadband users who have mobile broadband SIM cards that have been registered on a mobile network in a device capable of download speeds of 256 kb/s or greater, including 3G (e.g. WCDMA, HSPA) and 4G (e.g. LTE, WiMAX) network technologies	WB analysis based on GSMA, UN
	Fiber to the premises broadband penetration	Fiber to the Premises broadband penetration	TeleGeography
High quality	Average Mobile broadband download speed (Mbit/s)	Average over the last 12 months	Ookla, (STEAM, Facebook, and cable.co.uk[60] in case Ookla data is not available)
	Tracking national-level Internet outage/shutdowns (Number of days per year)	Number of days when internet is shutdown per year at national level. National level shutdown refers to the situation affecting more than one	AccessNow initiative[61]

[59] The initial source of the data would be operators or telecom regulator in a country. Supporting sources are provided to complement the initial source.
[60] Cable.co.uk Worldwide BB speed table: https://www.cable.co.uk/broadband/speed/worldwide-speed-league/
[61] AccessNow initiative webpage: https://www.accessnow.org/keepiton-shutdown-tracker/

		state, province, or region in a country. Internet shutdowns refer to all means to connect to the internet, including fixed line as well as mobile data internet connections.	
Affordability	Fixed broadband basket price per month (% of a country's average monthly GNI per capita)	Monthly affordability measure following ITU's fixed and mobile price basket methodology	World Bank research, ITU
	Mobile broadband 500 megabytes price per month (absolute price of service in USD, as well as % of a country's average monthly GNI per capita)	Monthly price of service in USD, also measure % of a monthly average GNI per capita. Team might want to consider presenting this indicator in PPP$. ITU publishes this indicator in PPP$ as well as USD.	ITU, Affordable Internet for all (AI4A)[62]
	Mobile broadband 1 gigabyte price per month (absolute price of service in USD, as well as % of a country's average monthly GNI per capita)	Monthly price of service in USD, also measure % of a monthly average GNI per capita. Team might want to consider presenting this indicator in PPP$. ITU publishes this indicator in PPP$ as well as USD.	ITU, Affordable Internet for all (AI4A)
Adoption			
	Percentage of individuals using the Internet by frequency	It measures the percentage of adult individuals (age 15-49) who use the Internet in the last past month. Breakdown data will be also collected (frequency of Internet use- never, less than once a month, a few times a month, a few times a week, every day).	Afrobarometer and Demographic and Health (DHS) surveys
	Percentage of households with internet (by urban/rural location and household composition; by IDA and FCV)	It measures percentage of households with internet at home in the past month. Breakdown data will be also collected (urban/rural, composition of household with/without children under age 15).	ITU
	Digital Adoption Index (DAI) (by IDA and FCV)	The DAI is a worldwide index that measures countries' digital adoption across three dimensions of the economy: people, government, and business. The index covers 180 countries on a 0–1 scale, and emphasizes the "supply-side" of digital adoption to maximize coverage and simplify theoretical linkages.	World Bank (based on WB and UNDESA data)
	International internet bandwidth, per capita	It measures international internet capacity/speed by country divided by the number of populations	TeleGeography, ITU

[62] AI4A website: https://a4ai.org/extra/mobile_broadband_pricing_usd-2018Q4

	Volume of data exchanged on IXP, per capita	It will be proxy to measure the efficiency of middle-mile traffic by monitoring the traffic of Internet Exchange Points (IXPs)	Packet Clearinghouse IXP Directory[63]
Market Competition	Mobile market concentration index (HHI index)	A commonly accepted measure of market concentration represented on a scale of 0 (evenly distributed competition) to 10,000 (no competition). Median value is used for regional average.	GSMA
	Fixed broadband concentration index (HHI index)	Same above	TeleGeography

2. Other possible indicators

Assessment dimensions and measures/indicators		Data Source
1 Digital Infrastructure		
1.1 First Mile		
Access	International internet bandwidth, per capita (Inbound/Outbound)(Mbps)	TeleGeography, ITU
Adoption	Total international traffic (in gigabit per month)	
Quality	Latency between two cable landing stations (in terms of Round Trip Delay) (ms)	TeleGeography
Affordability	International bandwidth monthly lease prices for a 10Gbps link	TeleGeography
Affordability	International bandwidth monthly lease prices for a 100Gbps link	TeleGeography
Affordability	Average cost of 100Mbit/s circuit to London /Singapore/Amsterdam/Miami/San Francisco/New York (whichever is lowest cost) from main or most efficient IXP in country	
Affordability	Average monthly wholesale price of international E1 capacity link from capital city to Europe (2 megabits per second, in US$)	National authorities
1.2 Middle Mile		
Access	Presence of a nationwide fiber backbone	
Adoption	Volume of data exchanged on IXP, per capita	Packet Clearinghouse IXP Directory[64]
Affordability	10 GigE IP Transit Price ($/Mbps per month)	TeleGeography
Affordability	PoP-to-PoP 10 Gbps Price	
1.3 Last Mile		
Access	Percentage of population covered by at least 3G mobile network signal (%)	GSMA/ ITU/ Facebook
Access	Percentage of population covered by at least 4G mobile network signal (%)	GSMA/ ITU/ Facebook

[63] https://www.pch.net/services/internet_exchange_points
[64] https://www.pch.net/services/internet_exchange_points

Access	Fixed broadband subscriptions per 100 inhabitants	TeleGeography
Access	Fiber to the premises broadband penetration	TeleGeography
Adoption	Percentage of households with internet	ITU
Adoption	Smartphone penetration rate	GSMA
Adoption	Unique mobile-broadband subscriptions (per 100 individuals)	WB definition, using GSMA and UN data
Adoption	3G mobile-broadband subscriptions (per 100 individuals)	GSMA/ ITU
Adoption	4G mobile-broadband subscriptions (per 100 individuals)	GSMA/ ITU
Adoption	Total data traffic in country (in gigabit per month; from end user until local termination or international gateway; avoid double counting traffic)	
Quality	Average mobile broadband download speed (Mbit/s)	Ookla/ STEAM/ Facebook/ cable.co.uk
Quality	National-level internet outage/shutdowns (Number of days per year)	AccessNow initiative
Affordability	Fixed broadband basket price per month (% of a country's average monthly GNI per capita)	ITU/ A4AI
Affordability	Mobile broadband 500 megabytes price per month (absolute price of service in USD, as well as % of a country's average monthly GNI per capita)	ITU/ A4AI
Affordability	Mobile broadband 1 gigabyte price per month (absolute price of service in USD, as well as % of a country's average monthly GNI per capita)	ITU/ A4AI
1.4 Invisible Mile		
	Spectrum Assignment per operator	
	Frequency Band	
	Radio-relay costs (spectrum usage costs)	
1.5 Other Supporting Infrastructure		
	Cost of internet enabled devices (% of monthly GNI per capita)	
	Average colocation pricing per kilowatt per month	
	Number of large companies and SMEs that are customers of data centers	
	Number of website hosts who are customers of the data centers	
	Number of hosted banking and insurance institutions	
	Access to electricity (% of population)	
	Number of towers per 100,000 inhabitants	
	Cost of Internet enabled devices	
1.6 Sector and Market Structure		
	Mobile market concentration index (HHI index)	GSMA
	Fixed broadband concentration index (HHI index)	TeleGeography
	Market share distribution of relevant technologies for consumer: DSL/Cable/FTTH/FWA/other and business:	

	DSL/Cable/FTTH/FWA/B2B specific product (Ethernet VPN, PDH, etc.)/Other	
	Market share distribution of operators by consumer, business and wholesale (carrier to carrier) (which operators are serving which segment and what is their market share in the segment)	
1.7 Policy & Regulation		
	ICT Regulatory Tracker	ITU
	Affordability Drivers Index (ADI)	A4AI
1.8 Revenue and Jobs		
	Telecom Revenue (% of GDP)	
	ARPU for mobile broadband, consumer broadband, small business broadband, midmarket, corporate.	GSMA
1.9 Preparedness for 4IR Technologies		
	Percentage of population covered by at least 5G mobile network signal (%)	GSMA
	5G mobile-broadband subscriptions (per 100 individuals)	GSMA
	Investments in cloud infrastructure services for the supply of server and storage infrastructure resources in a cloud environment (% of GDP)	
	Spending on IoT solutions and deployment (% of GDP) (e.g. systems, sensors, modules, infrastructure, networks, specialized devices, security, software, IT and installation services, etc.)	
	Investment for the deployment of AI solutions (hardware, software, and professional services) by private and public institutions (% of GDP)	

Annex 2: Indicators for Digital Public Platforms

1. DE4A Scorecard indicators

KEY RESULTS	RESULT INDICATOR	DEFINITION	DATA SOURCE
OUTCOMES			
Increased digitalization of public operations and services (G2C, G2B, G2G) with digital platforms operated on a whole-of-government level addressing each of businesses and citizens life events	Digital Adoption Index (DAI) (Government cluster)[65]	DAI (Government cluster): DAI is a composite index that measures the depth and breadth of adoption of digital technologies in 171 countries. The index comprises three clusters: government businesses, and people. The Government cluster measure the adoption of technology by governments across three averaged sub-indices: core administrative systems (Financial Management system, HR management system, E-Tax, E-customs, E-procurement), digital identification (access to services, digital signature and card features), and online services. Data for online public services are provided by the UN's Online Service Index. **(baseline and targets to be revised based on new methodology for the ID component of the indicator)[66]**	World Bank (based on WB and UNDESA data)
	E-participation Index (UN 2018)	The e-participation index (EPI) is derived as a supplementary index to the UN E-Government Survey. It focuses on measuring the use of online services to facilitate provision of information by governments to citizens ("e-information sharing"), interaction with stakeholders ("e-consultation") and engagement in decision-making processes ("e-decision-making;"	UNDESA
	%/number of people using online government services (as a % of the	Estimated total number of internet users reporting using online government services (sample based). [baseline and targets to be	National authorities (*current proposal*

[65] The Digital Adoption Index (DAI) (Government cluster) has a broader more relevant coverage than the EGDI as regard to the core components of digital public platforms. The EGDI covers only online services. Other aspects of the EGDI such as telecommunication infrastructure and human capital may already be measured in other pillars of the DE4A and may seem redundant. In contrast, the DAI (Government cluster) covers the adoption of core government back-office systems, online services and adoption of digital ID, which better reflect the core elements of digital public platforms. Furthermore, unlike the EGDI, the DAI is not a relative measurement, so it is easier to track "real" progress. Given this, the DAI may be a better measurement for the Digital Public Platform pillar than the Online Services Index (OSI). However, data collected under the work for the World Development Report 2016 are limited to 2014 (released 2016) and updated for 2016 (released in 2018). To be a realistic alternative to the EGDI/OSI, it would require investing in further data collection cycles.

[66] The choice of dataset to measure the digital signature component of the indicator no longer reflects current best practices of ID management, as identified by the ID4D team. The team will provide a separate indicator on ID, and only the sub-indices will be considered under the DAI. Consultation with the DAI team will be conducted to define the methodology for computing the new index, as well as mitigate comparability issues when measuring progress across data before and after the change in methodology.

KEY RESULTS	RESULT INDICATOR	DEFINITION	DATA SOURCE
	total number of internet users) **(by gender, socio-economic level, urban/rural to capture digital divide)** **CORE INTERMEDIATE INDICATOR**	developed in conjunction with national authorities when data becomes available]	*based on a review of UN, ITU, Pew Research and Eurostat data—see explanatory notes below for further details*)
	Volume of contracts formed through e-GP (as a % of the total number of contracts)[67] **CORE INTERMEDIATE INDICATOR**	This is defined as the average of (i) total number of e-submitted goods over the total number of goods contracts, (ii) total number of e-submitted services contract over the total number of services contract and (iii) the total number of e-submitted work contracts over the total number of work contracts. A high percentage reflects a high adoption rate of electronic procedures, focusing on outcomes rather than inputs (i.e. whether the system is being used, instead of just measuring whether it exists and is functional. [baseline and targets to be developed in conjunction with national authorities when data becomes available]	National authorities – data retrieved from e-Procurement system and other sources
	Proportion of government agencies with Internet-based online services available to citizens		National authorities
	Share of tax revenue received through online platforms (Share of total tax revenue)	This indicator can capture the total tax revenue receipts that are paid through digital methods (online public platforms) as share of total tax revenue	National authorities
INTERVENTIONS			

[67] For more metrics to measure e-procurement, see public procurement indicators proposed in the World Bank's e-procurement toolkit, "Accelerating e-procurement solutions" (September 2016). Available at: http://eprocurementtoolkit.org/sites/default/files/2016-10/Public%20Procurement%20Indicators-Rapid_e-Procurement_Toolkit.pdf
For another interesting indicator to measure the outcomes of introducing e-procurement on reducing barriers to entry for SMEs, consider "Value and volume of contracts with SMEs as contracting parties or awardees (% of total public procurement", where a high percentage reflects an SME friendly environment.

KEY RESULTS	RESULT INDICATOR	DEFINITION	DATA SOURCE
Enabling legal and regulatory environment for transactional online services	**% of countries with data privacy and protection legislation**[68][69] **CORE INTERMEDIATE INDICATOR**	Tracking of countries that enacted legislation to secure the data protection and privacy.	UNCTAD Global Cyberlaw tracker[70]
	% of countries with cybercrime legislation **CORE INTERMEDIATE INDICATOR**	Tracking of countries which had enacted cybercrime legislation	UNCTAD Global Cyberlaw tracker
Interoperability layers and shared services	% of country governments adopting Interoperability framework operating for at least 4 core services.	Interoperability allows for government databases and systems to communicate and exchange data. The indicator will count the share of countries in the continent that have an interoperability framework working between at least 4 core services. **[baseline and targets to be developed in conjunction with national authorities when data becomes available]**	National authorities
Leadership and coordination of digital governance	% of country with a government digital service coordination unit	The platform approach is a whole of government approach which requires that digitalization of government be coordinated. The indicator measures the share of country that formally adopted and tasked one central unit to strategically coordinate the development of government digital services. **[baseline and targets to be developed in conjunction with national authorities when data becomes available]**	National Authorities
Digital identification and authentication	**% ID coverage for adults**	**Percent of the 15+ population with an officially-recognized identity credential (i.e., a "foundational" ID)**	WB Findex Data (2017) or, if unavailable, directly reported administrative data from the ID4D Global Dataset (forthcoming).

[68] Although indicators measuring legislation usually remain outside the scope of investment projects (due to our inability to control the legislative process to mandate the passage of a particular law), this indicator remains useful in the context of defining DLIs. The scope is suggested to be narrowed from enacted and draft legislation to enacted only since having the laws on the books is a necessary (though insufficient) condition for legal protection
[69] Note that while output indicators such as these are necessary in the first instance to ensure legal protection, there are often lags in drafting and adopting implementing regulation (implementation gap)
[70] The UNCTAD Global Cyberlaw Tracker provides a global mapping of cyberlaws. It tracks the state legislation in the field of e-transactions, consumer protection, data protection/privacy and cybercrime adoption in the 194 UNCTAD member states. It indicates whether a given country has adopted legislation, or has a draft law pending adoption. Data are updated on a rolling-basis.

KEY RESULTS	RESULT INDICATOR	DEFINITION	DATA SOURCE
	Percent of countries with digital authentication enabled	Whether the country's officially-recognized ID system (i.e., foundational ID system) can facilitate the digital authentication of a person. **[*Regional baseline and target values based on preliminary analysis with incomplete data. For individual countries, baseline and targets to be developed in conjunction with national authorities when data becomes available]**	ID4D Global Dataset (forthcoming)

2. Other possible indicators

Assessment dimensions and measures/indicators	Data Source
Government Platforms	
E-Government Development Index (EGDI) – ranking and score (UN, 2018)	UN
Online Service Index (OSI) within EGDI – ranking and score (UN, 2018)	UN
Number of government services available online	National authorities
Number of users of online government services (per year, unique users)	National authorities
Number of online transactions for government services (per year)	National authorities
Value of online transactions for government services (US$, per year)	National authorities
Number of digitally-enabled unique identity proofs issued (per 100 people)	National authorities
Open Data Implementation Score (0-100)	Open Data Barometer

Annex 3: Indicators for Digital Financial Services

1. DE4A Scorecard indicators

KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
OUTCOMES			
Increased access to digital financial services	Percentage of adults with access to a transaction account	Refers to adults (as a percentage of all adults 15 years of age and older) that have access to a transaction account which enables them to initiate and receive electronic payments	WB Findex
	Percentage of female adults with access to a transaction account	Refers to female adults (as a percentage of all female adults 15 years of age and older) that have access to a transaction account which enables them to initiate and receive electronic payments	WB Findex
	Percentage of 40% bottom income adults with access to a transaction account	Refers to adults of the bottom 40% income bracket (as a percentage of all bottom 40% income adults 15 years of age and older) that have access to a transaction account which enables them to initiate and receive electronic payments	WB Findex
	Percentage of rural resident adults with access to a transaction account	Refers to rural adult residents (as a percentage of all rural resident adults 15 years of age and older) that have access to a transaction account which enables them to initiate and receive electronic payments	WB Findex
	Percentage of adults with access to a mobile money account (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all adults 15 years of age and older) that have access to a mobile money account which enables them to initiate and receive mobile money payments	WB Findex
	Percentage of adults that own a debit card (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all adults 15 years of age and older) that own a debit card with payment and cash withdrawal functions	WB Findex
	Percentage of firms with access to a transaction account (by size of firm, female vs male ownership)	Refers to firms (as a percentage of all firms) that have access to a transaction account which enables them to initiate and receive electronic payments	WB Enterprise Survey
Increased usage of digital financial services	Percentage of adults who made a digital retail payment in the past year (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all adults 15 years of age and older) that made at least one digital payment during the past year	WB Findex
	Percentage of female adults who made a digital retail payment in the past year	Refers to female adults (as a percentage of all female adults 15 years of age and older) that made at least one digital payment during the past year	WB Findex

KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
	Percentage of 40% bottom income adults who made a digital payment in the past year	Refers to adults of the bottom 40% income bracket (as a percentage of all bottom 40% income adults 15 years of age and older) that made at least one digital payment during the past year	WB Findex
	Percentage of rural residents who made a digital retail payment in the past year	Refers to rural adult residents (as a percentage of all rural resident adults 15 years of age and older) that made at least one digital payment during the past year	WB Findex
	Percentage of adults who received salary through a transaction account in past year (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all salary recipient adults 15 years of age and older) that received their public or private sector salary directly into transaction account	WB Findex
	Percentage of adults who paid a utility bill through a transaction account (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all utility bill payer adults 15 years of age and older) that initiated at least one utility bill payment through their transaction account	WB Findex
	Percentage of adults who received domestic remittances through a transaction account (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all domestic remittance recipient adults 15 years of age and older) that received domestic remittances into their transaction account	WB Findex
	Percentage of adults who received agricultural payments through a transaction account (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	Refers to adults (as a percentage of all agricultural payment recipient adults 15 years of age and older) that received agricultural payments into their transaction account	WB Findex
	Number of cashless transactions per capita	Refers to the average number of payments/transfers per capita made via cashless instruments (i.e. cards, credit transfers, direct debits, e-money), both interbank and intrabank	WB Global Payment Systems Survey (GPSS)
	Borrowed from a financial institution or used a credit card (by different groups- gender; in and out of labor force; age; education level; income (poorest 40%) and rural-urban)	The percentage of respondents who report borrowing any money from a bank or another type of financial institution, or using a credit card, in the past 12 months	World Bank Findex
	Percentage of annual sales from customer payments received using mobile money (by size of firm, female vs male ownership; rural vs urban)		WB Enterprise Survey

KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
Increased market entry, delivery channels and product innovation	Number of bank branches per 100,000 adults	Refers to the number of commercial banks that exist for every 100,000 adults (15 years of age and above)	IMF Financial Access Survey (FAS)
	Number of registered mobile money agent outlets per 100,000 adults	Refers to the number of agent outlets that conduct business on behalf of mobile money operators and that exist for every 100,000 adults (15 years of age and above)	IMF FAS
	Number of ATMs per 100,000 adults	Refers to the number of Automated Teller Machines (ATMs) that exist for every 100,000 adults (15 years of age and above)	IMF FAS
	Remittance costs as a proportion of the amount remitted (SDG 10.c.1)	Refers to the average cost of sending cross-border remittances (from country A to country B) as a percentage of a $200 value remittance sent	WB Remittance Prices Worldwide (RPW)
Reduced information asymmetry	Percentage of adults covered by credit registry	Refers to firms and adults (as a percentage of all adults 15 years of age and older) listed in a credit registry	WB Doing Business
	Percentage of adults covered by credit bureau	Refers to firms and adults (as a percentage of all adults 15 years of age and older) listed in the largest credit bureau	WB Doing Business
INTERVENTIONS			
Strategy	Percentage of countries with National Financial Inclusion Strategy adopted	Refers to the percentage of countries in the African continent that have already adopted a National Financial Inclusion Strategy	NATIONAL AUTHORITIES
	Percentage of countries with National Payment Strategy adopted	Refers to the percentage of countries in the African continent that have already adopted a National Payment Strategy	NATIONAL AUTHORITIES
Enabling Environment[71]	Percentage of countries with a dedicated structure for financial education	Refers to the percentage of countries in the African continent that have a dedicated coordination structure for financial education	WB Global Financial Inclusion and

[71] **Regulatory Index** to consider: GSMA the mobile money regulatory Index: This Index analyses six broad enabling dimensions. Individual indices capturing these dimensions as well as a consolidated regulatory index is available for 84 countries including African countries.

1. Authorisation: This dimension examines the eligibility criteria to provide mobile money services; the relevant authorisation instruments such as legislation, regulation, guidelines and circulars; and the proportionality of capital requirements;
2. Consumer protection: This dimension examines the general consumer redress and disclosure mechanisms; and the provisions for the safeguarding of customer funds, including deposit insurance measures;
3. Transaction limits: This dimension examines the proportionality of account balance and transaction limits (entry-level and ceiling)
4. Know Your Customer (KYC): This dimension examines the permitted identification requirements; the proportionality of Know Your Customer (KYC) requirements; Anti-Money Laundering and Combating the Financing of Terrorism (AML/CFT) reporting obligations; and the guidance provided by regulators on ID requirements;
5. Agent networks: This dimension examines the eligibility criteria for agents; their authorisation requirements; their permitted activities; and the agent network condition, e.g. whether formal notification or authorisation is required for the appointment of individual agents; and

KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
			Consumer Protection Survey (GFICPS)
	Percentage of countries with a harmonized legal and regulatory framework for DFS	Refers to the percentage of countries in the African continent that have adopted a comprehensive legal and regulatory framework pertaining to digital financial services (i.e. innovation, AML/CFT, cybersecurity, oversight)	NATIONAL AUTHORITIES
	Percentage of countries with legal and regulatory framework for consumer protection adopted	Refers to the percentage of countries in the African continent that have a dedicated legal and regulatory framework in place for consumer protection	NATIONAL AUTHORITIES
	Percentage of countries where non-bank financial institutions can offer payment instruments and services without having to partner with commercial banks	Refers to the percentage of countries in the African continent which enable non-bank financial institutions to provide electronic payment instruments, products and services on their own, without having to partner with a bank	NATIONAL AUTHORITIES
Financial infrastructure	Percentage of countries with RTGS established	Refers to the percentage of countries in the African continent that have a Real Time Gross Settlement (RTGS) system to process large value payments	WB Global Payment Systems Survey (GPSS)
	Percentage of countries with ACH established	Refers to the percentage of countries in the African continent that have an Automated Clearing House (ACH) to process direct debits, credit transfers and cheques	WB Global Payment Systems Survey (GPSS)
	Percentage of countries with a national card switch established	Refers to the percentage of countries in the African continent that have a national payment infrastructure that processes all debit and credit card transactions that are conducted domestically	WB Global Payment Systems Survey (GPSS)
	Percentage of countries with a Faster Payment system established	Refers to the percentage of countries in the African continent that have a national system which processes payments in close to real time (real time settlement for payer and payee)	WB Global Payment Systems Survey (GPSS)
	Percentage of countries where e-money is offered	Refers to the percentage of countries in the African continent that allow e-money providers to operate and provide e-money products	WB Global Payment Systems Survey (GPSS)

6. Investment and infrastructure environment: This dimension examines the external factors which are likely to affect the regulatory environment such as sector-specific taxation; ID verification infrastructure, interoperability infrastructure, provisions on the utilisation or distribution of interest income and national financial inclusion policies. These six dimensions comprise 27 indicators, each weighted according to its importance in contributing to an enabling regulatory environment.

KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
	Africa-Wide Payments Platform established	Refers to the establishment of an Africa Wide Payment platform which will process cross-border payments among African countries	WB AND NATIONAL AUTHORITIES
	Percentage of countries with interoperability of ATM networks established	Refers to the percentage of countries in the African continent that have interoperable ATMs (any debit/credit card can be used at any ATM within the country, regardless of the bank issued)	WB Global Payment Systems Survey (GPSS)
	Percentage of countries with interoperability of POS terminals established	Refers to the percentage of countries in the African continent that have interoperable POS terminals (any debit/credit card can be used at any POS terminal within the country, regardless of the bank issued)	WB Global Payment Systems Survey (GPSS)
	Percentage of countries with credit bureau/credit registry established \	Refers to the percentage of countries in the African continent that have credit bureau/registry established in order to capture financial data of borrowers in the country	NATIONAL AUTHORITIES
	Percentage of countries with collateral registry established	Refers to the percentage of countries in the African continent that have collateral registry established in order to register collaterals created by borrowers to secure credit facilities provided by lenders	NATIONAL AUTHORITIES

2. Other possible indicators

Assessment dimensions and measures/indicators	Data Source
Digital Financial Services	
Uptake & Usage of Digital Financial Services	
% of adults with a store-of-value transaction account	Global Findex
% of firms with a store-of-value transaction account	Enterprise Surveys
% of adults using internet or mobile phone to access transaction account	Global Findex
% of adults making or receiving a digital payment in past 12 months	Global Findex
% of adults who used the internet to pay bills or to buy something online in the past year	Global Findex
% of agricultural payments made via digital channels	Global Findex
% of domestic remittance senders/receivers using digital channels	Global Findex
% of wage earners receiving wage payments via digital channels	Global Findex
% of Firms accepting digital payments	Enterprise Surveys (proposed) or national authorities
# of retail electronic/digital transactions per capita	Global Payments Systems Survey (GPSS)
Volume of electronic/digital transactions per capita	GPSS
Policy & Regulation	
Market Entry	

% of retail electronic/digital transactions per capita facilitated by nonbanks	National authorities
Delivery Channel & Product Innovation	
% of G2P social transfers disbursed via digital channels	National authorities / Global Findex (proxy)
# of non-branch access points per 100,000 adults (e.g. agent, PoS, ATM)	IMF Financial Access Survey / GPSS
% of accounts opened via remote channels	
Managing Risks of Digital Finance	
4.2.3.1 % of consumer complaints linked to digital financial services	National authorities
Financial Infrastructure	
Retail Payment Systems	
Volume of transactions processed by retail payment systems	GPSS
Value of transactions processed by retail payment systems	GPSS
Credit Reporting Systems / Secured Transactions	
Strength of legal rights index (selected components, tbd)	Doing Business
Depth of credit information index *(selected components, tbd)*	Doing Business
Credit registry coverage (% of adults)	Doing Business
Credit bureau coverage (% of adults)	Doing Business

Annex 4: Indicators for Digital Businesses

DE4A Scorecard indicators KEY RESULTS	RESULTS INDICATOR	DEFINITION	DATA SOURCE
OUTCOMES			
Increased number of digital start-ups	Number of digital start-ups (by size of firm, female vs male ownership; rural vs urban)	Number of Information and Technology startup firms graduating from incubators/accelerators and/or receiving private funding (including Angel, early stage VC, Product crowdfunding, and seed round)	PitchBook & Briterbridges
	New business entry density	Number of newly registered corporations per 1,000 working-age people (those ages 15–64)	WB - Entrepreneurship Index
	Green-field FDI on ICT, R&D, and Business Services	Value of green-field FDI (ICT & internet infrastructure, R&D, Business Services) per 100,000 people in the working population	FT
	Number of Private Equity (PE) deals	Number of reported African PE/VC deals, 2018	AVCA
	Value of Private Equity (PE) deals	Total value of reported. African PE/VC deals,2018	AVCA
	Total value of funding provided to early-/growth-stage firms [since 2015]	Total deal size to early/later-stage companies headquartered in Africa with a digital-related activity, since 2015	PitchBook
	Number of completed VC deals in the digital space since 2015	Number of VC deals completed by a company headquartered in Africa with a digital-related activity.	PitchBook
Increased number and usage of platform-based or data-driven business models	Number of platform-based or data-driven firms operating in the country (by local vs. foreign, founding year, size of firm; and by IDA, FCV)	Number of domestic or international firms, start-ups or mature firms as long as they are platform-based or using data as a key input to create value	Pitchbook & Briterbridges.com
	Number of consumers, contractors trading goods or services on digital platforms	Google Play allows downloading statistics on # of installs by users for each app	Digital platforms/ Google Play
	Value of online transactions for goods and services (US$, per year)	Some country statistics include this as eCommerce activities	National statistics
	B2C E-commerce index	Data available globally, including sub-indices	UNCTAD
	Total number and value of payments initiated via internet (e.g. e-commerce platform) with credit cards/ Total number and value of payments initiated via internet (e.g. e-commerce platform) with debit card	Data currently available for the following AFR countries: Cabo Verde; Mauritius; Moldova; Mozambique; Nigeria	Global Payments System Survey (GPSS) World Bank
	Impact of ICTs on business models	To what extent do ICTs enable new business models? [1 = not at all; 7 = to a great extent]	GCI - WEF, Executive Opinion Survey

	ICT use for business-to-business transaction	To what extent do businesses use ICTs for transactions with other businesses? [1 = not at all; 7 = to a great extent]	GCI - WEF, Executive Opinion Survey
	Companies embracing disruptive ideas	To what extent do companies embrace risky or disruptive business ideas?" [1 = not at all; 7 = to a great extent]	GCI - WEF, Executive Opinion Survey
Economic impact of digital business models	Price of goods purchased online vis-à-vis in traditional retail outlet (average price)		Billion prices project
	National sales (online channel vis-à-vis traditional channel)		Data from National Ministries
	National annual earnings (Traditional retail outlets vis-à-vis online/e-commerce)		Data from National Ministries
Increased number of digitally-enabled traditional businesses	Share of formal firms with own website or online presence (by size of firm, female vs male ownership; rural vs urban)	Percentage of formal firms with their own website	WBES
	Share of formal firms using email to interact with clients/suppliers for business purpose (by size of firm, female vs male ownership; rural vs urban)	Percentage of formal firms using email to interact with clients/suppliers for business purpose	WBES
	Share of firms that use internet to connect with clients or suppliers (by size of firm, female vs male ownership; rural vs urban)	Percentage of formal firms reporting the use of internet for business purposes	WBES
	Business-to-consumer Internet use	To what extent do businesses use the Internet for selling their goods and services to consumers? [1 = not at all; 7 = to a great extent]	GCI - WEF, Executive Opinion Survey
INTERVENTIONS			
Enabling legal and regulatory environment for transactional	% of countries with data privacy and protection legislation[72][73]	Tracking of countries that enacted legislation to secure the data protection and privacy.	UNCTAD Global Cyberlaw tracker[74]

[72] Although indicators measuring legislation usually remain outside the scope of investment projects (due to our inability to control the legislative process to mandate the passage of a particular law), this indicator remains useful in the context of defining DLIs. The scope is suggested to be narrowed from enacted and draft legislation to enacted only since having the laws on the books is a necessary (though insufficient) condition for legal protection

[73] Note that while output indicators such as these are necessary in the first instance to ensure legal protection, there are often lags in drafting and adopting implementing regulation (implementation gap)

[74] The UNCTAD Global Cyberlaw Tracker provides a global mapping of cyberlaws. It tracks the state legislation in the field of e-transactions, consumer protection, data protection/privacy and cybercrime adoption in the 194 UNCTAD member states. It indicates whether a given country has adopted legislation, or has a draft law pending adoption. Data are updated on a rolling-basis.

online services and the development of digital business models	% of countries with e-transaction legislation[75]	Tracking of countries with e-transaction laws that, at a minimum, recognize the legal equivalence between paper-based and electronic forms of exchange.	UNCTAD Global Cyberlaw tracker
	% of countries with cybercrime legislation	Tracking of countries which had enacted cybercrime legislation	UNCTAD Global Cyberlaw tracker
	% of countries with online consumer protection law	Tracking of country which had enacted online consumer protection laws,	UNCTAD Global Cyberlaw tracker
	Bankruptcy	Resolving insolvency distance from frontier	WB Doing Business
	Intellectual property protection	In your country, to what extent is intellectual property protected? [1 = not at all; 7 = to a great extent]	WEF Global Information Technology Report
Start-up ecosystem	Ease of Doing Business	Doing Business distance to frontier (DTF)	WB Doing Business
	Venture capital availability	"In your country, how easy is it for start-up entrepreneurs with innovative but risky projects to obtain equity funding?" [1 = extremely difficult; 7 = extremely easy]	GCI - WEF, Executive Opinion Survey
	Start-up procedures to register a business, Men	Start-up procedures to register a business, Men (distance to frontier - DTF)	WB Doing Business
	Start-up procedures to register a business, female	Start-up procedures to register a business, female (distance to frontier - DTF)	WB Doing Business
	Cost of business start-up, Men	Starting a business: Cost, Men (distance to frontier - DTF)	WB Doing Business
	Cost of business start-up , female ownership	Starting a business: Cost, female (distance to frontier - DTF)	WB Doing Business
Other proxy indicators			
	Availability of the latest technology	Availability of the latest technology	GCI - WEF, Executive Opinion Survey
	Exporting firms (number)	Number of exporting firms per 100,000 people in the working age population	WB Export Dynamics
	Percent of firms exporting directly at least 1% of sales	Percent of formal firms exporting directly at least 1% of sales	WBES
	ICT service exports (% of exports BOP)	ICT service exports (% of exports)	WITS

[75] The UNCTAD Cyberlaw tracker has currently been selected for this exercise because of constraints regarding data availability and the importance of existing and accurate baselines. However, this indicator is an imperfect proxy for measuring the strength of the legal/regulatory enabling environment for digital transformation, as it covers only whether a country has enacted legislation, without either focusing on whether it has been enforced through implementing regulations or including a measure of the quality of the law. As such, project teams may wish to consider proposing that national authorities track their progress in relation to the following indicator: "% of countries with e-transaction legislation that granted legal equivalence to on-line transactions, signatures, and documents". The definition of the indicator could be further specified to include a requirement for the legislation to have "clear non-repudiation dispatch/receipt rules" and that it "recognizes the probative value of e-evidence".

	ICT service imports (% of imports BOP)	ICT service import (% of import)	WITS
	Firms with internationally-recognized quality certification	% of firms with an internationally-recognized quality certification	WBES
	Percent of firms identifying access to finance as a major constraint	Percent of firms identifying access to finance as a major constraint	WBES
	Level of managerial capabilities	Managerial Capability Index (1-5)	World Management Survey
	Share of firms with an internationally-recognized quality certification	% of firms with an internationally-recognized quality certification	WBES
	Share of firms using technology licensed from foreign companies	% of firms using technology licensed from foreign companies	WBES
	PCT ICT patent applications	ICT PCT patents, applications/million pop.	WEF; World Intellectual Property Organization (WIPO) PCT Data; WDI
	Growth of innovative companies	To what extent do new companies with innovative ideas grow rapidly?	GCI - WEF, Executive Opinion Survey
	Quality of scientific research institutions	Quality of scientific research institutions (1-7 index)	GCI - WEF, Executive Opinion Survey
	University-industry collaboration in Research & Development	University-industry collaboration in Research & Development	GCI - WEF, Executive Opinion Survey
	Share of workforce employed in knowledge-intensive	Share of workforce employed in knowledge-intensive activities (%)	CGI; WEF, Executive Opinion Survey International Labour Organization (ILO), ILOSTAT Database
	Share of New business female ownership	Share of newly registered with female ownership	WBES
	Share of formal firms with majority female ownership	Percent of firms with majority female ownership (manufacturing and services)	WBES
	Share of permanent fulltime production workers that are female in formal firms	Share of permanent fulltime production workers that are female in formal firms (manufacturing and services)	WBES
	Share of firms with a female top manager	Percent of firms with a female top manager	WBES

Annex 5: Indicators for Digital Skills

1. DE4A Scorecard indicators

KEY RESULTS	RESULTS INDICATOR	DEFINITION	ASSUMPTION	DATA SOURCE
OUTCOMES				
Increased access to advanced digital skills	**Proportion of youth and adults with advanced digital skills** ***(High-level Scorecard Indicator)***	Advanced digital skills are equivalent to Proficiency Level 5 in DigComp2.1/UNESCO Framework	ITU's figures are based on data from Botswana (2014), Cabo Verde (2015), Côte d'Ivoire (2017), Djibouti (2017), Niger (2017), Egypt (2016), Morocco (2017), Sudan (2016), Togo (2017), Zimbabwe (2014). ITU's figures also assume that an individual has advanced digital skills if he/she has engaged in the following computer-based activities during the last 3 months: writing a computer program using a specialized programming language. This task behavior broadly corresponds to DigcComp2.1/UNESCO's proficiency level 5 in the Competency areas '0: Devices and software operations', and '3: Digital content creation. The assumption is that individual's proficiencies in DigComp2.1/UNESCO's Competence areas 0 and 3 are correlated with those in other 5 Competence areas. Another assumption is that the data from 10 countries represent data from the African continent.	International Telecommunication Union (ITU)
Increased access to basic digital skills	Proportion of youth and adults with basic digital skills	Basic digital skills are equivalent to Proficiency Level 2 in DigComp2.1/UNESCO Framework.	ITU's figures are based on Botswana (2014), Cabo Verde (2015), Côte d'Ivoire (2017), Djibouti (2017), Niger (2017), Egypt (2016), Morocco (2017), Sudan (2016), Togo (2017), Zimbabwe (2014). ITU's figures also assume that an individual has basic digital skills if he/she has engaged in at least one of the following four computer-based activities during the last 3 months: (1) copying or moving a file or folder, (2) using copy and paste tools to duplicate or move information within a document, (3) sending e-mails with attached files, and (4) transferring files between a computer and other devices. These task behaviors broadly correspond to DigcComp2.1/UNESCO's proficiency levels 2 in the Competency areas '0: Devices and software operations', and '2: Communication	International Telecommunication Union (ITU)

KEY RESULTS	RESULTS INDICATOR	DEFINITION	ASSUMPTION	DATA SOURCE
			and collaboration', and proficiency levels 1 and 2. The assumption is that individual's proficiencies in DigComp2.1/UNESCO's Competence areas 0 and 2 are correlated with those in other 6 Competence areas. Another assumption is that the data from 10 of countries represent data from the African continent.	
Increased access to basic digital skills for lower-secondary school students	Percentage of lower secondary-school students in the terminal year of the cycle with basic digital skills	Basic digital skills are equivalent to Foundation Level 2 in the DigComp Framework.	- All basic digital skills programs for lower secondary-school students are based on the DigComp Framework, and assessments test this level of proficiency. - All lower-secondary school curriculum will include basic digital skills programs. - Completion of these programs can be treated as an indicator of acquisition of basic digital skills.	National EMIS, National skills assessment or HH survey (sample based) [76] ITU
	Number of lower secondary-school graduates produced annually with basic digital skills	Basic digital skills are equivalent to Foundation Level 2 in the DigComp Framework.	- All basic digital skills programs for lower secondary-school students are based on the DigComp Framework, and assessments test this level of proficiency. - All lower-secondary school curriculum will include basic digital skills programs. - Completion of these programs can be treated as an indicator of acquisition of basic digital skills. - The baseline target assumes 25% of those enrolled in the programs have skills in 2020 (ITU). - The interim target and final targets assume 60% and 95% of those enrolled in the programs will complete (or have skills) in years 2025, and 2030.	UNESCO-UIS National EMIS
Increased access to basic digital skills for out of school children	Percentage of out of school children aged 15 years-old with basic digital skills	Basic digital skills for out-of-school-children are equivalent to Foundation Level 2 of the EC's DigComp Framework.	- All basic digital skills programs for out-of-school children are based on the DigComp Framework, and assessments test this level of proficiency. - The completion of these programs can be treated as an indicator of acquisition of basic digital skills.	National skills assessment or HH survey (sample based) [77] ITU

[76] Countries will be encouraged to include relevant measures in national assessments.
[77] Countries will be encouraged to include relevant measures in national assessments.

KEY RESULTS	RESULTS INDICATOR	DEFINITION	ASSUMPTION	DATA SOURCE
	Number of out of school children aged 15 years old produced annually with basic digital skills	Basic digital skills for out of school students are equivalent to Foundation Level 2 of the EC's DigComp Framework.	- All basic digital skills programs for out-of-school children are based on the DigComp Framework, and assessments test this level of proficiency. - The completion of these programs can be treated as an indicator of acquisition of basic digital skills. - The baseline target assumes 25% of those enrolled in the programs have skills in 2020 (ITU). - The interim target and final targets assume 60% and 95% of those enrolled in the programs will complete (or have skills) in years 2025, and 2030.	UNESCO-UIS
Increased access to intermediate digital skills	Percentage of upper-secondary-school students in the terminal year of the cycle with intermediate digital skills	Intermediate digital skills are equivalent to Level 3 of the EC's DigComp Framework.	- All intermediate digital skills programs for upper secondary-school and TVET students are based on the DigComp Framework, and assessments test this level of proficiency. - All upper-secondary school and TVET curriculum will include intermediate digital skills programs. - The completion of these programs could be treated as an indicator of acquisition of intermediate digital skills.	National EMIS, National skills assessment or HH survey (sample based) [78]
	Number of upper secondary-school graduates produced annually with intermediate digital skills	Intermediate digital skills are equivalent to Level 3 of the EC's DigComp Framework.	- All intermediate digital skills programs for upper secondary-school and TVET students are based on the DigComp Framework, and assessments test this level of proficiency. - The completion of these programs could be treated as an indicator of acquisition of intermediate digital skills. - The baseline target assumes 15% of those enrolled in the programs have skills in 2020 (ITU). - The interim target and final targets assume 50% and 95% of those enrolled in the programs will complete (or have skills) in years 2025, and 2030.	UNESCO-UIS National EMIS
Increased access to	Percentage of university	Advanced digital skills are equivalent	- The indicator will be limited to graduates of undergraduate level	National EMIS, National skills

[78] Countries will be encouraged to include relevant measures in national assessments.

KEY RESULTS	RESULTS INDICATOR	DEFINITION	ASSUMPTION	DATA SOURCE
advanced digital skills	undergraduate students in the terminal year of the cycle with advanced digital skills.	to Level 5 of the EC's DigComp Framework.	programs in engineering, computer science, mathematics and physics. - All advanced digital skills programs for university students are based on the DigComp Framework, and assessments test this level of proficiency. - The completion of these programs could be treated as an indicator of acquisition of advanced digital skills.	assessment or HH survey (sample based) [79]
	Number of university undergraduates produced annually with advanced digital skills	Advanced digital skills are equivalent to Level 5 of the EC's DigComp Framework.	- The indicator will be limited to graduates of undergraduate level programs in engineering, computer science, mathematics and physics. Inclusion of graduates of online, blended and rapid skills training programs is more problematic because of the differences in content and duration. - The baseline, interim target and final target assume at 50% (or less), 75% and 100% of those enrolled in the programs will complete (or have skills) in years 2020, 2025, and 2030.	UNESCO-UIS Ministries of Education
Increased access to highly specialized digital skills	Percentage of university postgraduate students in the terminal year of the cycle with highly specialized digital skills	Highly specialized digital skills are equivalent to Level 7 of the EC's DigComp Framework.	- The indicator will be limited to graduates of postgraduate level programs in engineering, computer science, mathematics and physics. - All highly specialized digital skills programs for students are based on the DigComp Framework, and assessments test this level of proficiency. - The completion of these programs could be treated as an indicator of acquisition of highly advanced digital skills.	National skills assessment or HH survey (sample based) [80]
	Number of university postgraduates produced annually with highly specialized digital skills	Highly specialized digital skills are equivalent to Level 7 of the EC's DigComp Framework.	- The indicator will be limited to students in the terminal year of post-graduate level university programs in engineering, computer science, mathematics and physics. - The baseline, interim target and final target assume 50%, 75% and 100% of those enrolled in the programs will complete (or have skills) in years 2020, 2025, and 2030.	UNESCO-UIS Ministries of Education
INTERVENTIONS				

[79] Countries will be encouraged to include relevant measures in national assessments.
80 Countries will be encouraged to include relevant measures in national assessments.

KEY RESULTS	RESULTS INDICATOR	DEFINITION	ASSUMPTION	DATA SOURCE
Increased connectivity in education institutions	**Percentage of lower-secondary schools with access to internet for pedagogical purposes** ***(High-level Scorecard Indicator)***		UIS figures are based on data from Burkina Faso (2016), Cameroon (2016), Cabo Verde (2017), Egypt (2016), Eswatini (2016), Ghana (2018), Madagascar (2018), Mauritius (2018), Rwanda (2018), Senegal (2018), Sierra Leone (2018), Tunisia (2018), Burundi (2018). Average figures for Northern and Sub-Saharan Africa is 66.47% and 27.85% (respectively). We calculated the weighted average of these two figures based on enrollments. The assumption is that the data from the above 13 countries represent data from 54 African countries.	UNESCO-UIS National EMIS
	Percentage of lower-secondary schools with access to computers for pedagogical purposes		- The baseline figure is acquired from the UIS database - The interim target and final target will be updated based on National EMIS	UNESCO-UIS National EMIS
	Learners to computer ratio (LCR) in lower-secondary schools			UNESCO-UIS National EMIS
	Percentage of upper-secondary schools with access to computers for pedagogical purposes		- The baseline figure is acquired from the UIS database which uses Learner-computer ratios (LCR). - The interim target and final target will be updated based on National EMIS	UNESCO-UIS National EMIS
	Percentage of upper-secondary schools with access to internet for pedagogical purposes		[The baseline, interim target and final target will be updated based on information collected from the Ministry of Education]	Ministry of Education
	Learners to computer ratio (LCR) in upper-secondary schools			UNESCO-UIS National EMIS
Policy, regulatory framework,	Proportion of countries with designated		[The baseline, interim target and final target will be updated based on	Global Partnership for Education 2019, UIS 2015

KEY RESULTS	RESULTS INDICATOR	DEFINITION	ASSUMPTION	DATA SOURCE
curriculum, and capacity	ministries or agencies to foster digital skills		information collected from the Ministry of Education]	Ministry of Education
	Proportion of countries with a digital skills framework that guides policies and programs	A digital skills framework describes the definition and scope of different levels of digital skills to be fostered through national programs.	[The baseline, interim target and final target will be updated based on information collected from the Ministry of Education]	Ministry of Education
	Proportion of countries with a digital skills curriculum in lower and upper secondary schools		[The baseline, interim target and final target will be updated based on National EMIS]	Ministry of Education
	Proportion of new lower-secondary schools teachers trained (or qualified) using ICT for pedagogical purposes	Teachers who have received formal training or demonstrated minimum skills in ICT.	[The baseline, interim target and final target will be updated based on National EMIS]	Ministry of Education
	Proportion of new upper-secondary schools teachers trained (or qualified) using ICT for pedagogical purposes	Teachers who have received formal training or demonstrated minimum skills in ICT.	[The baseline, interim target and final target will be updated based on National EMIS]	Ministry of Education
	Proportion of university teachers trained (or qualified) using ICT for pedagogical purposes	Teachers who have received formal training or demonstrated minimum skills in ICT.	[The baseline, interim target and final target will be updated based on information collected from the Ministry of Education]	Ministry of Education

Annex 5.1: Indicators of demand and supply for digital skills from principal use sectors

Key Use Sectors	Indicators of demand for digital skills			Potential to expand in next 5 years (Very likely, somewhat likely, not likely)	Types of digital skills that will be required (Indicate which of the four proficiency levels from the Digital Skills Framework	Source
	Area	Specify whether users or jobs	Number of users or number of jobs			
Government	e-Government services	Users				
	Government jobs requiring digital skills	Jobs				
	Public enterprises	Users				
Telecommunications	Smart phones	Users				
	Mobile Internet	Users				
	Fixed Internet	Users				
Agriculture	Smart irrigation	Users				
	Drones	User				
	Other technologies	User				
Health	Jobs requiring digital skills	Jobs				
Education	Jobs requiring digital skills	Jobs				
Banking	Jobs requiring digital skills	Jobs				
	Mobile-banking	Users				
Transport and logistics	Jobs requiring digital skills	Jobs				
E-Commerce	Jobs requiring digital skills	Jobs				
Business processing outsourcing	Jobs requiring digital skills	Jobs				
Media, entertainment	Jobs requiring digital skills	Jobs				

Indicators of demand for digital skills in ICT and Telecommunications industries

Sector	Sub-sector		Potential to expand in next 5 years (Very likely, somewhat likely, not likely)	Source

		Current number of jobs	Technician	Professional	Senior professional	Advanced	Highly specialized	
ICT	Software development							
	Hardware							
	Add others							
Telecomms	Mobile towers							
	Fibre optic networks							
	Add others							

Indicators of supply of digital skills in formal education and training institutions

Indicators	Current'	Future[2]	Source
Connectivity and equipment			
% of government/public lower-secondary schools with access to computers for pedagogical purposes			
% of government/public lower-secondary schools with access to internet for pedagogical purposes			
Learners to computer ratio (LCR) in lower-secondary schools			
% of government/public upper-secondary schools with access to computers for pedagogical purposes			
% of government/public upper-secondary schools with access to internet for pedagogical purposes			
Learners to computer ratio (LCR) in upper-secondary schools			
% of government/public TVET institutions with access to computers for pedagogical purposes			
% of government/public TVET institutions with access to internet for pedagogical purposes			
Learners to computer ratio (LCR) in TVET institutions			
Status of connectivity to NRENs in tertiary education (specify Level 0-6 as defined in the Michael Foley, 2016 report)			
Enrolment			
% of lower secondary-school students in the terminal year of the cycle with basic digital skills			
Number of lower secondary-school graduates produced annually with basic digital skills			
Number of out of school children aged 15 years old produced annually with basic digital skills			
% of upper-secondary-school students in the terminal year of the cycle with intermediate digital skills			

Number of upper secondary-school graduates produced annually with intermediate digital skills			
% of TVET students in the terminal year of the cycle with intermediate digital skills			
Number of TVET graduates produced annually with intermediate digital skills			
% of youth and adults with intermediate digital skills			
% of university undergraduate students in the terminal year of the cycle with advanced digital skills.			
Number of university undergraduates produced annually with advanced digital skills			
% of university postgraduate students in the terminal year of the cycle with highly specialized digital skills			
Number of university postgraduates produced annually with highly specialized digital skills			
Number of, proportion of and enrolment in formal higher education programs in the country specifically focused on ICT/digital skills/computer programming, etc.			
Number of apprenticeships available in organizations for students in computer/ICT themes			

Note: ' or most recent year, [2]Specify if it is likely to decline, remain the same, increase, increase substantially)

Indicators of the supply of digital skills outside the formal education system

Indicators	Current'	Future[2]	Source
Enrolment			
Number of and enrolment in informal/short programs for digital/computer skills acquisition, such as hackathons, coding bootcamps, competitions			
Number of and enrollment in government programs to foster digital skills among out-of-school youth and adults, by levels of digital skills			
Enrollment in international online learning courses, by levels of digital skills			
Proficiency (levels and tasks)			
% of out of school children aged 15 years-old with basic digital skills			
Number of out of school children aged 15 years old produced annually with basic digital skills			
% of youth and adults with basic digital skills			
% of youth and adults with intermediate digital skills			
% of youth and adults with advanced digital skills			
% of youth and adults with highly specialized digital skills			
Number (or %) of adults (working ages of 15-64) using computers as part of their daily work/studies – by level (basic, intermediate, advanced) if possible			
Number of adults who send emails as part of their daily work – by gender			
Number of adults who use internet searches as part of their daily work – by gender			
Number of adults who use simple software programs (such as word processing, digital calculations, spreadsheets, databases) as part of their daily work			
Number of adults using higher order computer programming for their work on a daily basis			

Annex 5.2: Summary of Digital Competences, based on EU DigComp 2.1 and Digital Literacy Global Framework (DLGF)

Competence Areas	Competences	Proficiency Levels
1. Devices and software operation [a]	Identify and use hardware and software tools and technologies.	*Foundation* (Levels 1 and 2)- Can deal with simple tasks that involve remembering content and instructions but also requires some guidance to execute. ●●●●●●●●●● *Intermediate* (Levels 3 and 4) - Can independently deal with well-defined, routine and nonroutine problems that involve understanding content. ●●●●●●●●●● *Advanced* (Levels 5 and 6) - Can deal with and provide guidance to others on different tasks and problems that involve applying and evaluating content in complex situations ●●●●●●●●●● *Highly specialized* (Levels 7 and 8) - Can resolve complex problems with few or several moving pieces, guide others, contribute to professional practice and propose new ideas to the field.
	2 competences involving physical and software operations of digital devices.	
2. Information and data literacy	Search for, judge the relevance (including its source) and organize digital content.	
	3 competences involving browsing, evaluating, and managing digital content.	
3. Communication and collaboration	Interact and engage in citizenship through digital technologies while adhering to netiquette and managing one's digital identity.	
	6 competences involving communicating, collaborating, and engaging in citizenship through digital technologies as well as netiquette and digital identity management.	
4. Digital content creation	Create new or modify existing digital content while correctly applying copyright and licenses as well as programming.	
	4 competences involving developing and integrating digital content as well as understanding copyrights, licenses, and programming.	
5. Safety	Ensure security measures while safeguarding against risks threatening devices, privacy, health, and the environment.	
	4 competences involving protecting devices, personal data, privacy, and health as well as the environment.	
6. Problem-solving	Solve problems in digital environments and use digital tools to innovate and keep abreast of the digital evolution.	
	5 competences involving resolving digital issues, creatively using digital technologies, bridging personal gaps in digital skills as well as computational thinking.	
7. Career-related competences *	Use specific career-related digital technologies and content to have access to opportunities in the digital economy.	
	2 competences involving operating specialized digital technologies as well as working with digital content for specific career-related fields.	

Source: Based on Carretero *et al.* 2017, and UIS 2018.
Note: a. Proposed by UIS as additions to the DigComp 2.0 framework, which was subsequently updated to DigComp 2.1.

Annex 5.3: Examples of digital skills programs for out-of-school youth and adults

Basic digital skills

The **International Computer Driver's License (ICDL)** offers courses that are for beginners with no prior computer or internet experience (intermediate level courses are also offered – see below). The ICDL is a computer literacy program which is based entirely on the European Computer Driver's Licence (ECDL) program, operated by the EDCL Foundation, and its syllabus, content and assessment methods have not been adapted to country contexts. More than 14 million people in over 150 countries have engaged with the ICDL program through a network of over 24,000 ICDL Accredited Test Centers (ATCs). ICDL is present in almost all African countries. For instance, in South Africa, there are more than 50 ATCs, in Kenya more than 80, in Uganda 14 and in Rwanda 8. Given the extremely low level of literacy especially in SSA countries, even the introductory courses of ICDL may need to be adapted for use in schools. *Box 4* provides information about the implementation of ICDL in Kenya.

The **Digital Doorway (DD) project,** launched in 2002, provides freely accessible ICT centers in the form of "containers". They encourage digital upskilling and computer literacy in rural areas of South Africa through unassisted- and peer-assisted learning. Container DDs are placed in disadvantaged localities to improve the digital and informational literacy of disadvantaged children, youth and adults through experimentation and exploration by allowing them to "learn without formal training and minimal external input"[1]. DDs come equipped with internet and local wireless hotspots for the content to be accessible to anyone with a browser. A joint initiative of the government and private sector in South Africa, more than 240 systems have been deployed across all 9 provinces of South Africa as of 2013 with the latest installation being in 2019. Each DD has the potential of reaching hundreds of users. 70% of users are below the age of 21 years. They have also been deployed across other African countries like Ethiopia, Lesotho and Uganda while also being deployed in Australia and Solomon Islands.

Intermediate digital skills

The **ICDL** also offers intermediate digital skills modules. Although the content was originally oriented at the skills a general office worker needs (word processing, spreadsheet, database and presentation), in 2013 ICDL was broadened when a number of modules were added like project planning, 2D computer aided design, health information systems usage, ICT in education, web editing, image editing and digital marketing. The ICDL Profile Certification allows candidates and organizations to decide on the combination of programs they wish to implement, according to individuals academic, business and job needs. The ICDL Profile Certificate is issued to the candidate to demonstrate the various modules he or she has successfully completed.

The **Microsoft Digital Literacy Certification** is a popular course which is free and open-source. This is targeted to all users with basic reading skills who want to learn the fundamentals of using digital technologies, such as working with computers, accessing information online, communicating online, participating safely and responsibly online, creating digital content in word processing, collaborating and managing content digitally. The course can be delivered online self-paced individual study or face to face classroom delivery. To obtain the digital literacy certificate, users require to pass 70 percent or higher. The biggest advantage of this course is that it is free and is an open-source, unlike the first two examples where user fees are charged. However, a limitation is that the course is linked to a particular vendor's software and may not give sufficient breadth of understanding to the student.

Advanced Digital Skills

Advanced digital skills training outside the education system (or in partnership with universities) are provided by a variety of for-profit providers through *on-line and blended programs*, and also through *rapid skills training* ("bootcamps").

Rapid training in advanced digital skills[1] outside the education system, particularly in the software industry, have recently become very popular. Such training sessions are usually on current topics that are in sudden high demand. Because the standard courses take more time to prepare graduates, universities, even in advanced countries, are unable to respond to spikes of demand in certain areas, particularly in coding. Universities can themselves offer such bootcamps over a summer session, but more recently many for-profit companies have become active in this type of training, especially when the need is in some of the most popular high-level computer languages such as Python, C++, PHP, Java, etc.

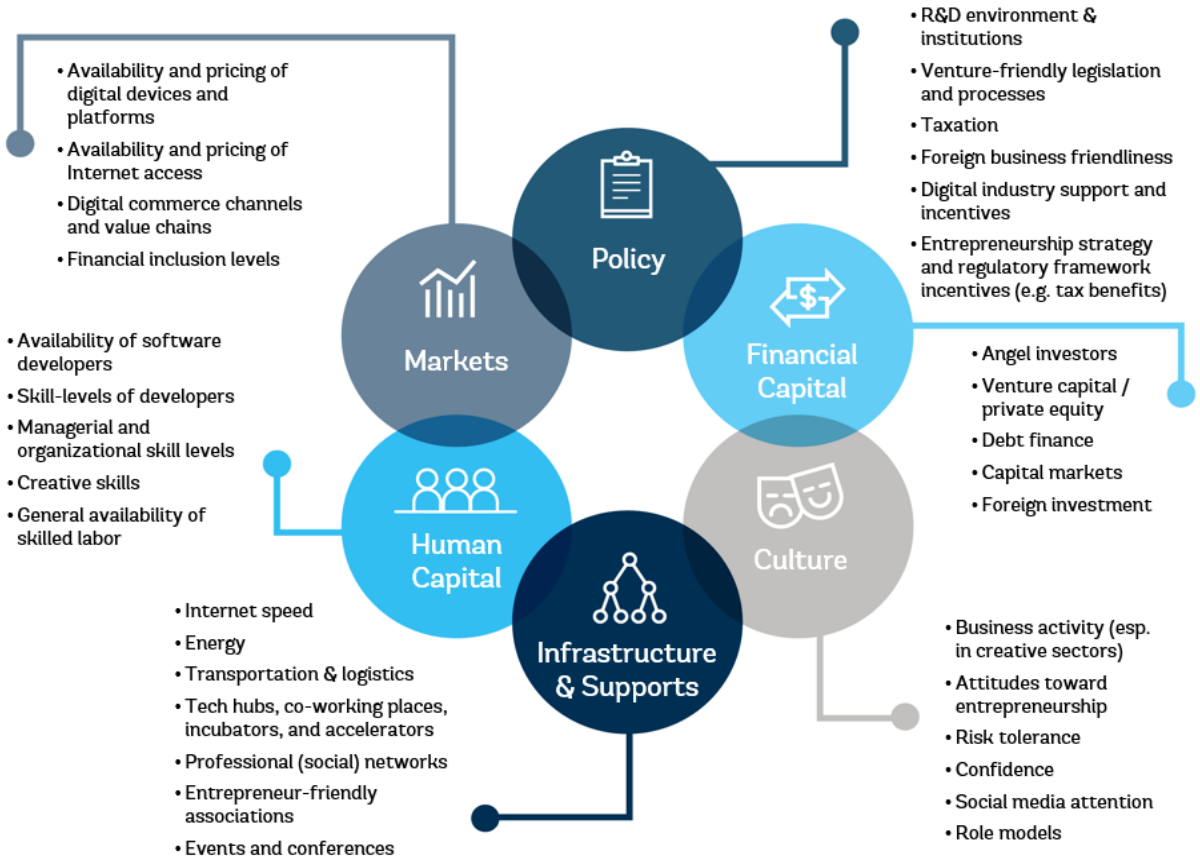
Another area where bootcamps are popular is **machine learning**—a subarea of artificial intelligence; again, rapid training courses in this area tend to be more useful for individuals who have the mathematical background relevant to machine learning. This background is found in algebra, particularly in the field of matrices. Concepts in manipulating large (two and three dimensional) matrices are key to machine learning. The coding of algorithms (into software applications) for performing the manipulations can be meaningless if one does not have the conceptual framework on matrices.

Annex 6. Digital Business Ecosystem

- A robust entrepreneurship ecosystem is crucial for the development and growth of the digital economy in Africa. This requires harnessing the potential of disruptive technologies to drive Africa's transformation and addressing the main barriers to digital businesses. While countries in Africa have made great strides in fostering entrepreneurship ecosystems, progress is mostly clustered in a few countries and urban centers.

- The digital business framework and approach is based on a more comprehensive Entrepreneurship Ecosystem Diagnostic methodology developed within the FCI GP. The framework is structured on the Babson Entrepreneurship Ecosystem model,[1] which captures the most widely held understanding of what entrepreneurial ecosystems consist of and how they work. The model has six domains, each with several subcomponents to capture the most important dimensions of an ecosystem that are interdependent on each other. The six complementary domains within an ecosystem determine entrepreneurial opportunities and thereby drive digital businesses in a city or country (note that digital skills and infrastructure are addressed by corresponding pillars of the DE4A diagnostic tool):
    - Policy – Laws and regulations affecting digital businesses.
    - Financial Capital – Sources of capital available for digital entrepreneurs, including debt, equity, grants and blended financing.
    - Infrastructure and supports - professional services available through incubators and accelerator including entrepreneur friendly associations and other non-governmental institutions.
    - Markets – Existence of early customers, distribution channels, new business models and services (including those used in the sharing-economy) and connectivity of entrepreneurial networks.
    - Culture – Societal attitudes toward entrepreneurship, gender aspects and availability of role models.
    - Human Capital – State of educational institutions and access to skilled labor.

Six Pillars of Babson's Ecosystem Framework, Applied to Digital Businesses



- ***An ecosystem for digital businesses consists of many players:*** An entrepreneurship ecosystem is essentially a collection of stakeholders, which include government agencies, financers such as venture capitalists; educators and R&D agencies; service providers and support agencies; and entrepreneurs themselves. Well-developed entrepreneurship ecosystems provide the bedrock for a robust private sector, by facilitating the creation, growth, and, where relevant and possible, exit of businesses. These ecosystems are central to the way digital businesses operate today, and effective policies need to reflect accordingly. A successful digital business ecosystem (Please see **Annex 6** for more detailed information) would help realize the full potential of digital transformation, support entrepreneurial experimentation, and re-allocate human capital and resources to promising start-ups, SMEs, and high-growth technology companies.

- ***The role of the government should not be over- or underestimated:*** Government policy plays an important role in creating good conditions in which businesses thrive – if the policies are fit for purpose. In the fast-moving digital space, figuring out how to regulate activities and players not yet known—created by rapidly evolving technologies and emergence of new applications—requires a fine balancing act. It would be important to strive for consistency and harmonization of rules governing digital businesses, while also limiting regulatory change and uncertainty going forward (at times, the mantra of "do no harm" is most appropriate, until changes are better understood).

- ***Gauging the state of play of digital businesses.*** There is currently scarcity of data for digital businesses (digital and non-digital), and particularly on Africa, but a task team carrying out the diagnostic for digital economy may examine the following areas (see **Figure 11**) to determine the level of development of digital businesses, covering the ecosystem pillars.[1] Current indicators also include external sources as proxy data but building systematic ways by which entrepreneurs and innovators can be supported, and successful enterprises can take form, are areas of ongoing work. For example, FCI GP is further improving the list of entrepreneurship metrics and the tools to automate the data collection[1]. In addition, digitization across industries and wide adoption of technology for internal processes are not well covered in the framework, even though these efforts will unlock productivity gains more broadly. There are ongoing efforts to improve the availability of data to measure technological adoption and diffusion in developing countries, and additional tools and metrics will be included to the DE4A tool once available[1].

- ***Assessing hurdles to greater digital businesses:*** Depending on the state of play of digital businesses, the task team may use the following areas of assessment (see **Table 8)** to determine key hurdles to further development of internet services in a country. To facilitate the analysis and recommendations (or to conduct a deep-dive diagnostic), the task team should draw on a range of relevant data sources and technical guidance in this area, including:

    - Digital Entrepreneurship Ecosystem Diagnostics Toolkit (includes guidelines on how to identify the appropriate population for the questions and procedures for obtaining and processing information)
    - *TC360 Digital Entrepreneurship Indicators (*http://tcdatadev.worldbank.org/Reduced%20App/Testapp/)
    - Global Entrepreneurship Monitor's methodology on Startup Ecosystem Mapping (which includes data on start-up founders and the connections between themselves and other key stakeholders in their ecosystem)
    - Doing Digital Business methodology
    - Technology Adoption Survey
    - Internal Gender Consultations Guide, developed by the Gender Group

Policy

- Could you describe 3 facilitative interventions or policies that could improve the business climate, make digital industry more competitive, and accelerate technology adoption? PROBE: What would be the potential roles of specific institutions currently available in the country in leading these interventions. What are the binding constraints to market entry for start ups and early stage firms?

- In a rank from 0 to 10, where 0 is the worst and 10 the best, how would you rank the average effectiveness of existing initiatives related to making the country more business/entrepreneurship friendly? PROBE: What is in place to monitor and evaluate the effectiveness of various programs? Stories about successful and not so successful experiences (failures)? If so, how can we get access to this information?

- Could you describe 3 specific restrictions on digital business models (such as sharing economy), treatment of gig-economy workers, online service provision and/or payment processing (including international trade)?

Infrastructure and Supports

- How many facilities, like incubators, labs, and tech parks are available in the country (region)? PROBE: What kind of services do they provide? What specifically exists for digital entrepreneurs? How many entrepreneurs take part in these programs and what is the ratio of female founders?

- In a rank from 0 to 10, where 0 is the worst and 10 the best, how would you rank the quality, scope, and scale of the existing infrastructure and services in the country? PROBE: Are there any missing services or infrastructure that are hindering the growth of the market in the most developed regions of the country? Is there any ranking or effort in place to monitor and evaluate the quality of infrastructure? If so, how can we get access to this information?

- Would you have a good example of ecosystem support initiatives (private or government programs, BPCs, etc) that are doing particularly well? Would you have a counter example of ecosystem support initiatives (private or government programs, BPCs, etc) that are doing particularly poorly?

Financial Capital

- What is the general availability of early-stage financing to digital entrepreneurs? PROBE: How can the scope, scale and quality of early-stage finance be improved?

- List the main sources of funding indicating share of private vs public funding and respective sizes

- Are there specific financing instruments or government incentives that accelerate technology adoption and R&D? PROBE: How many of these instruments are available? Provide examples.

- Are there any special financing initiatives aimed at women? PROBE: Do women face different or additional financing challenges? Are there more regulatory burdens for women entrepreneurs?

NB It would be important to understand the size of public and private financing or at least of main private funds, government programs, donor programs and get numbers of reach to get a sense of the relative importance of each source of funding

Markets

- What is preventing a faster pace of technology adoption and the rate of digitizing key industries?

- Does the regulatory framework support digital trade within the region (i.e. existence of a single digital market)?

Culture

- In a rank from 0 to 10, where 0 is the worst and 10 the best, how would you rank the willingness of an average entrepreneur to take risk in your country?

- Are there more regulatory burdens for women entrepreneurs than for men? PROBE: Provide an example.

- What is the academia's track record in attracting and supporting women entrepreneurs through its programs? PROBE: Are there any special initiatives or support services for women? Have universities engaged in, or is aware of, any research on women's entrepreneurship in the country?

Human Capital

- Is it difficult finding and hiring high-skilled workers, either technical or managerial? PROBE: Evaluation of the talent/skills level of local workers (and talent graduating from universities)?

- Do people have access to any type of entrepreneurship education, either at the primary, secondary, or tertiary level? How can the level of talent of digital entrepreneurs with respect to their technical skills, business acumen, management capabilities, and innovativeness be described? PROBE: Where could the talent in the ecosystem improve?

- Are there any program that stimulate further exposure of children and young workers towards digital technologies, entrepreneurship, and innovation?

PROBE: Provide specific examples. Is the effectiveness of these initiatives monitored or evaluated? If so, how can we get access to this information?

Annex 7: Decision-Making tools for considering state interventions in Broadband Infrastructure Deployment

A Decision-making tool developed jointly by World Bank and IFC experts considers seven scenarios, as well as a **"null" scenario** where the state should reconsider any proposed intervention. Where there is no demonstrable market or regulatory failure to address, state action is generally not justified. There are at least three examples in the list of reviewed projects where the state may have been unnecessarily ambitious in its objectives—the second phase of Rwanda NBFON (involving the pursuit of a single wholesale mobile network for 4G), Peru RNDOFO, and South Africa's Broadband InfraCo. In the latter two, state investment was made in national backbones in markets in which the private sector was capable of delivering infrastructure on its own. **Scenario 1** results when there is no inherent market failure, but counterproductive regulation, unnecessary legal constraints, or unduly burdensome financial obligations are imposed by the state. In this scenario, the state's role is simply to eliminate or minimize the self-created cause of infrastructure inadequacy. In most cases, this amounts to improving licensing—simply authorizing the entry of new players, ensuring spectrum is available, and so on. **Scenario 2** is the case of market failure primarily arising from dominance in the market. Here more active regulatory intervention may be required. This may take the form of more active encouragement of private sector competitors, for example, the creation of WIOCC in the cross-border market of East Africa, mandated access of dominant player networks, or more radical solutions such as structural separation. Before addressing other, more interventionist, roles that the state may play in infrastructure development, the state has to answer the question of whether it is capable of taking on such a role to create missing markets or infrastructure. The vast majority of states are in some way capable of playing a constructive role; however, there are states that have severe institutional issues, or an inability to commit to required policy or provide appropriate leadership. In these cases (**Scenario 3**) dealing with fundamental governance weaknesses must be a central part of any development program implemented. Consistent with the principle of promoting competition, the next question is whether a more active role for the state can be used to create service-based competition. If the market cannot even support service-based competition (**Scenario 4**), then it is probably very thin. These cases tend to be remote local markets. There are a number of innovative technologies and business models discussed in this report that address these particular circumstances. Scenario 5, 6, and 7 address state action that is progressively more interventionist. In each case, the state's financial commitments should be justified on the basis of a robust cost-benefit analysis. **Scenario** 5 is the case where the state can limit its intervention to subsidy, preferential financing, or sales commitments, which offset low or uncertain nonstate revenues. In this case, the state can stay out of the management or ownership of the entity undertaking the project. Ideally, incentives would be competed for through an appropriately structured tender process. **Scenario 6** represents those cases in which the subsidy required to interest the private sector in taking up the opportunity is too high for the state to afford. In these cases, the state must take on more of the project risk in order to attract the private sector. **Scenario 7** is limited to those instances in which the state cannot build a sufficiently attractive offer of financial incentives and risk-sharing to interest the private sector. This would be a very small set of cases indeed.