



**Digital Economy for Africa (DE4A)**

*Diagnostic Tool and Guidelines for Task Teams*

Version 1.0

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## I. PURPOSE

- ***The 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 government and stakeholders on priority areas of development, with a mix of possible policy reforms and financing needs. 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, such as the entrepreneurship ecosystem, or financial inclusion.
- ***The tool emanates from cross-GP and cross-WBG collaboration:*** Following presentations on digital economy to the World Bank's regional management team of Africa in December 2017, a technical team was convened to prepare this diagnostic tool. The technical team comprised of experts from Finance, Competitiveness and Innovation (FCI), and Digital Development (DD) Global Practices of the World Bank; and Telecom, Media and Technology (TMT) team of the International Finance Corporation (IFC). Governance and Education GPs are also expected to be part of the DE4A agenda.
- ***The tool builds on work previously done by World Bank Group teams on digital economy and related areas:*** To date, teams at the World Bank Group (WBG) have worked on different aspects of a country's digital economy. Key among these include the Digital Economy Country Assessment (DECA) tool by DD; Digital Infrastructure Initiative (DII) assessment tool by DD/IFC; the Financial Inclusion Guidance Note for the Financial Sector Assessment Program, the Payment Aspects of Financial Inclusion Principles, and the Digital Entrepreneurship Ecosystems Diagnostic developed by FCI; and Digital Identification diagnostic tool developed by the Identification for Development (ID4D) program. This document builds on and learn from these tools, and tailors the approach to produce an integrated diagnostic tool to assess digital economies in Africa. The diagnostic exercise would benefit from Digital Business indicators being prepared for a select group of countries by DEC team.
- ***The output of the DE4A diagnostic exercise is expected to be a report providing an assessment of a country's digital economy, along with specific, actionable recommendations:*** A multi-GP task team is recommended to carry out the diagnostic. The task team should at the minimum constitute of experts from DD GP, FCI GP, and Gov GP, and, as needed and budget-permitting, may include experts from Education GP, IFC's TMT team, and others. The diagnostic would involve desk research of the areas comprising digital economy in a country, and an in-country mission for consultations with counterparts, government, the private sector, and user representatives. The diagnostic should focus on key hurdles that inhibit the development and growth of digital economy in the country, and provide specific, actionable recommendations for the government and stakeholders. The diagnostic should be carried out on a quick turnaround basis, with a timeline of 3-6 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.
- ***The tool is expected to be refined based on insights gained from its use in an initial set of 3-4 countries.*** Revisions are expected to be made in indicators as well as assessment questions. It is expected that the implementation of the diagnostic will provide insights on: a) adding and removing indicators, including new indicators for which data may have to be collected; b) complementarities across pillars and options for improved treatment of cross-cutting areas such as data privacy,

cybersecurity, competition, gender, and cross-cutting risks; c) capacity constraints on key regulatory areas and possible policy responses; and d) sequencing of reforms depending on country context.

## 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.<sup>1</sup> Mobile money, driving financial inclusion, doubled the number of accounts to 21% between 2014-17 in Sub-Saharan Africa.<sup>2</sup> This digital revolution has spurred the development of a small but rapidly growing digital sector, with innovative entrepreneurs launching new digitally-enabled 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 overall economy.<sup>3</sup> 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—enabling them to use critical services such as e-commerce. Governments require enabling policies and investment climate for digital infrastructure, services, skills and entrepreneurship to help develop robust digital economies.
- ***Tomorrow’s economies would be driven by digital transformation across sectors:*** 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. This change mirrors 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). Technology is redefining how economic activities occur across countries, and paving the way towards digital economies, at national, regional, and global levels.
- ***Disruptive technologies further deepen possible impact of technology on economic development:*** Today’s disruptive technologies, such as artificial intelligence, robotics, blockchain, drones, internet of

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<sup>1</sup> <https://www.gsma.com/mobileeconomy/sub-saharan-africa/>

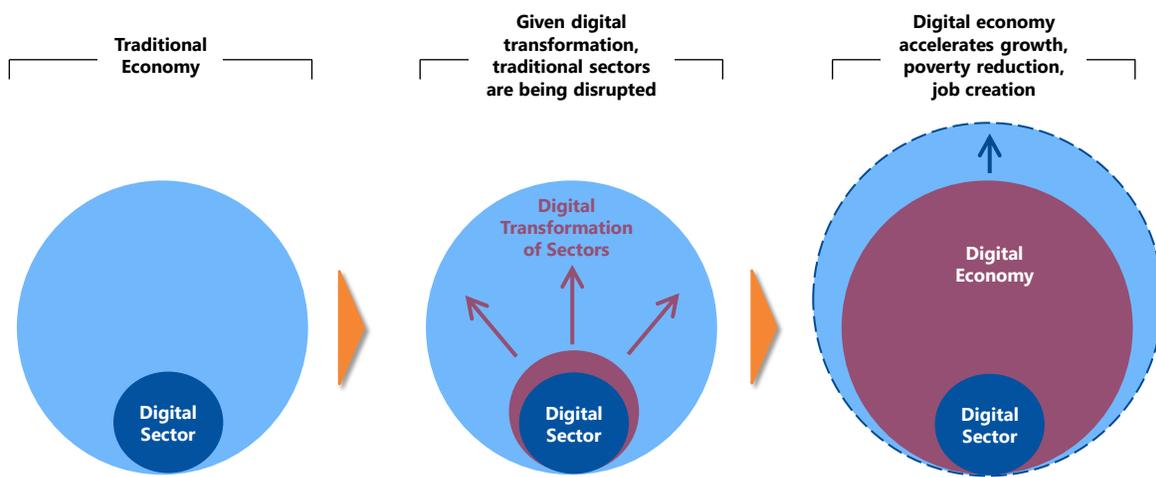
<sup>2</sup> Global Findex 2017

<sup>3</sup> 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](https://www.huawei.com/minisite/gci/en/digital-spillover/files/gci_digital_spillover.pdf).

things, big data, and software-enabled industrial platforms, denote the scale and speed at which disruption may affect traditional sectors. Digital money in several African countries has disrupted and significantly increased financial inclusion. Though today’s disruptive technologies may bear results in coming years, these technologies by themselves evolve or change over time. In preparing for tomorrow’s digital economies, countries, sectors, and organizations in Africa would need to brace for continuing change and learn to exploit disruptive technologies and business models as those evolve. At the same time, they may require understanding how to mitigate related downside risks.

- **For countries in Africa, digital economy offers a leapfrogging opportunity, or the risk of being left behind:** The traditional path to economic development, from agriculture to industrialization, through stages of light and heavy manufacturing, appears increasingly less relevant to Africa. With digital economy, developing countries in Africa may be able to skip the traditional model, and transition from an agriculture-based economy to a digital economy, leaping over intermediate steps, while building core infrastructure, systems, and competencies (see **Figure 1:**). The result may be newfound growth and poverty reduction. The downside of not doing so may deepen digital divide, creating leaders or laggards, or worse, winners or losers, in the global digital economy.

**Figure 1: Traditional Economies Becoming Digital Economies**

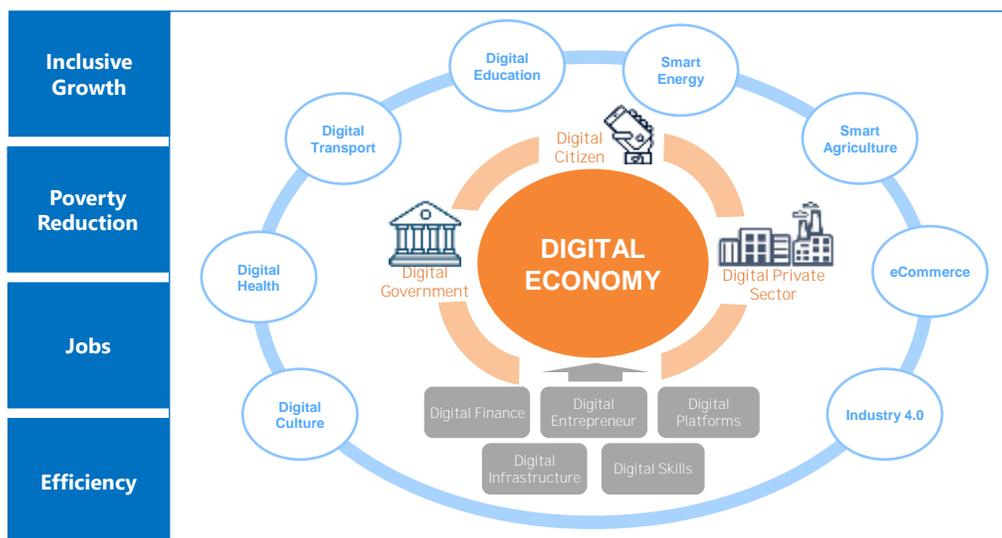


- **A well-functioning digital economy can help accelerate achievement of twin goals of shared prosperity and reduced poverty:** With a well-functioning digital economy, countries in Africa can achieve faster economic growth, offer innovative products and services, create jobs and export revenue, and achieve greater international competitiveness. Digitization of tasks and information may enhance productivity of labor and capital and reduce transaction costs. The approach may affect all segments of the economy (see **Figure 2:**). According to a McKinsey study, about 75% of the benefits of internet are captured by companies in traditional industries.<sup>4</sup> Digital economies can also help accelerate poverty reduction. 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.

<sup>4</sup> 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](http://www.mckinsey.com/insights/high_tech_telecoms_internet/internet_matters).

- ***A digital economy has potential to enhance productivity gains in multiple ways.*** 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 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.

**Figure 2: Digital Economy can bring Shared Prosperity and Reduced Poverty**



- ***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 key area of concern has 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.<sup>5</sup> 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 such skills are tied to meaningful jobs. This can help strengthen the country’s competitiveness in the global marketplace. Additionally, 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 may need to be prioritized as part of an overall development strategy.

<sup>5</sup> 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](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_618168.pdf)

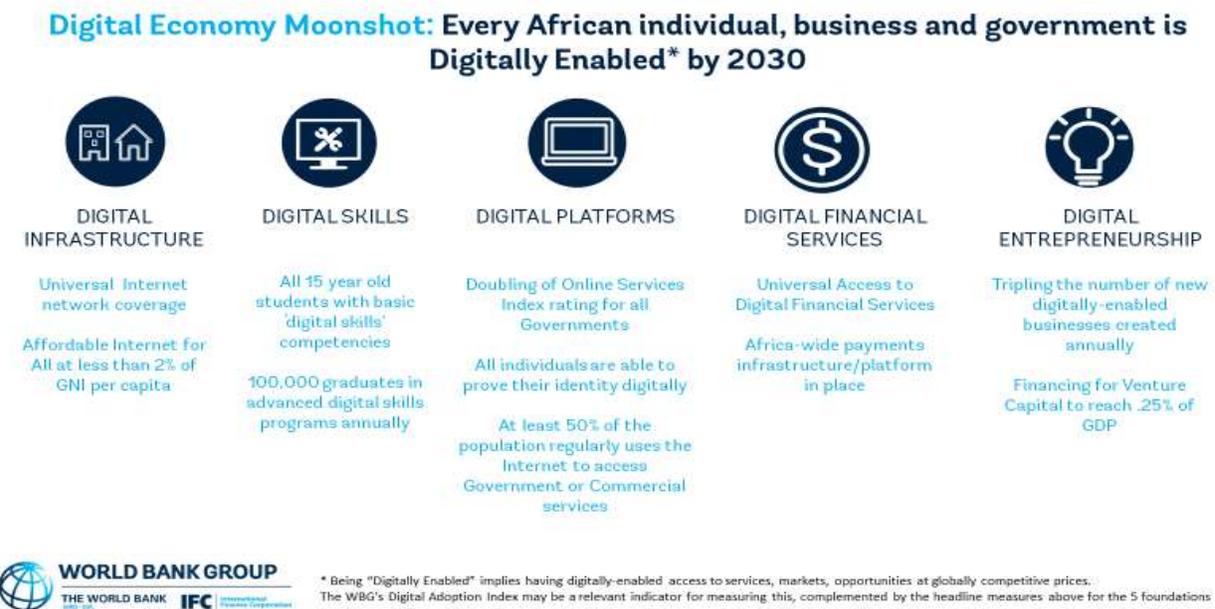
- ***Measuring progress and evaluating impact are critical.*** While there is increasing consensus on the potential of a digital economy for productivity gains leading to shared productivity and reduced poverty, it is critical that the progress towards established targets are measured rigorously and 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 MOONSHOT

***At present, the African Union (AU) and the WBG are discussing a “Digital Economy Moonshot” for Africa.*** The moonshot calls for every African individual, business and government to be digitally enabled by 2030. Measurable goals towards this moonshot have been proposed (see **Figure 3**). The WBG’s support to the initiative is expected to include the following:

- ***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 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.
- ***Digital economy investment program:*** The WBG aims to complement TAs and DPOs with a Multi-Phased Approach (MPA) of Investment Project Financing (IPF) 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 would support development of an action plan for Digital Economy Moonshot by helping prepare blueprints for priority sector reforms and investments in foundational areas of DE4A. Individual donors may opt to partner with and support specific aspects of such an action plan. The WBG is currently working to publish a flagship report on digital economy in Africa based on the DE4A framework.

Figure 3: High-level Targets of Digital Economy Moonshot

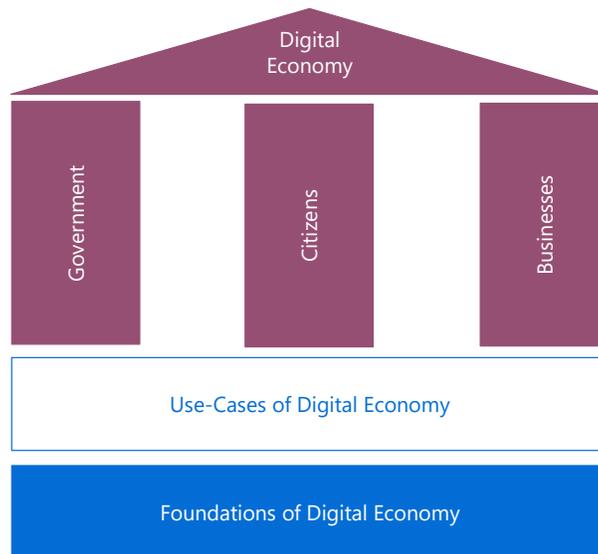


#### IV. ANALYTICAL FRAMEWORK FOR DIGITAL ECONOMY

- 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:** 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 4**). 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. 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 that form digital economies, those foundations are taken to be: the availability of internet or broadband which brings people online, the ability to identify 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 4: Ways of Assessing a Digital Economy**



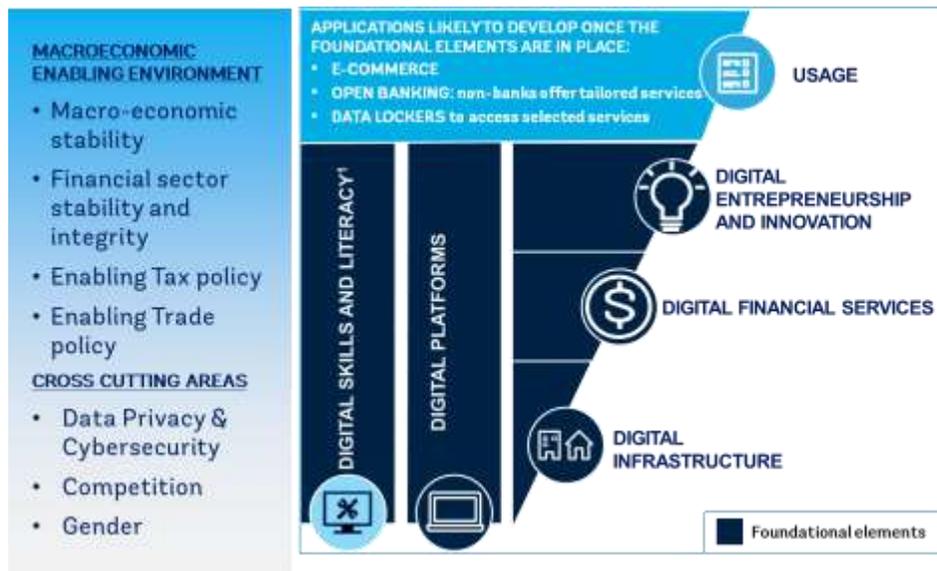
- **The diagnostic tool proposes focus on key foundations of digital economy:** For a successful and inclusive digital economy, African countries would require building key foundational elements of a digital economy (see **Figure 5Error! Reference source not found.**). These foundations are synergistic 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),<sup>6</sup> 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).<sup>7</sup> With a growing digital economy, the role and importance of information and cybersecurity also increases, adding security functions to protect critical information and infrastructure. For digital economy, good connectivity given by internet or broadband is a critical foundation.
  - **Digital platforms:** Digital platforms offer products and services, accessible by digital channels, such as mobile devices, computers, and internet, for all aspects of life. Governments operate digital platforms to offer citizen-facing government services (such as online facilities to pay taxes, renew a driver’s license, validate a digital identity, etc.), share information (such as with open data or reusable public-sector data), and run back-office systems (such as by digitally managing government’s accounting information, human resource information, etc.). Governments can stimulate usage of digital platforms by digitizing some of its own operations

<sup>6</sup> Connectivity includes mobile and fixed access networks, metro and backhaul networks, national backbone networks, and international connections.

<sup>7</sup> Service enabling infrastructure include private or independent datacenters, and, increasingly, Infrastructure-as-a-Service and Software-as-a-Service cloud platforms.

- or processes, such as procurement, invoicing, or communications. Commercial firms operate digital platforms to offer a growing array of products and services (such as social media, digital mapping, data analytics, digital commerce, digital education, digital health, streaming services, gamification, augmented virtual reality, ride-sharing applications, etc.). Global connectivity allows users to use services and access information regardless of geographic location, leading to global services, such as Google Search, Facebook, or Amazon Web Services. For digital economy, some digital platforms may constitute a critical foundation, while others serve as use-cases driving the uptake and use of digital economy.
- *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 entrepreneurship:* Digital entrepreneurship and innovation create an ecosystem to bring the digital economy to life—with new, young ventures, and transformation of existing businesses—contributing to net employment growth and helping enhance competitiveness and productivity of an economy. Digital entrepreneurship offers new products and services, leverages new technologies and business models, and opens new markets. Vibrant digital entrepreneurship ecosystems encompass skill development (through, for example, business mentoring networks), ecosystem support infrastructure (such as accelerators, incubators, innovation hubs, and co-working spaces), and access to markets and early stage-financing (such as seed financing, venture capital), while they require a conducive business environment that motivates the creation and use of novel digital technologies.
  - *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 the larger population.

Figure 5: Foundational Elements of a Digital Economy



- **Foundations of digital economy involve several cross-cutting areas, including competition policy, gender, cybersecurity, and privacy:** 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. Free market forces can help drive down prices and ramp up usage. All aspects of digital economy need to be inclusive, giving equal opportunity to men and women, and to the disadvantaged. 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 privacy of people’s information across sectors similarly requires robust safeguards. Additional areas, including taxation, trade, 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.

## 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, digital 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 6**). 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 (per Error! Reference source not found.). Please note that countries do not mature linearly and have an opportunity to leapfrog using digital economy. 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 6: Areas of Assessment Based on Maturity of Economy**

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

- Government agency responsible for digital economy may vary by country:** Given the cross-cutting nature of digital economy, no single government agency in a country may have the mandate within government to oversee the development of digital economy. For dialogue on digital economy, the task team may need to engage with a higher-level government agency, such as the Office of the President, Office of the Prime Minister, or the Ministry of Finance. Alternatively, it may do so with a designate government agency, if one exists. 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, the use of technology may help address political economy challenges, without the process of digital transformation itself becoming hostage.
- 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 bring out penetration dynamics, where possible, especially as they relate to gender, the bottom 40% of the population, or disadvantaged communities.

## A. Digital Infrastructure

- ***Within digital infrastructure, the need and urgency to offer high-speed internet (or broadband) for a country's digital economy runs high:*** Broadband internet is a prerequisite for many aspects of a digital economy. Without being connected to the global internet, countries in Africa may not be able to kickstart a digital economy. Today, most countries in Africa have good coverage of mobile networks (for primarily voice and text communications).<sup>8</sup> Mobile networks are often limited to urban, or more densely populated areas in Africa. Coverage and quality of mobile networks used for internet (such as with 3G or 4G technologies) varies extensively amongst countries. “Mobile internet,” or the use of high-speed internet via mobile or smart devices, is the principal way by which people in Africa use internet today. “Fixed internet,” or dedicated, physical links of high-speed internet, connected to homes, offices, and governments,<sup>9</sup> are often lacking. 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 networks are also essential to enhance mobile networks. Fixed networks are a pre-requisite for new technologies, such as 5G. Most advanced mobile networks are supported by strong fixed networks on backbone and backhaul parts. In addition, the availability, coverage, reach and cost of backbone networks forming the internet value-chain are critical.<sup>10</sup>
- ***For developing high-speed internet, the value-chain of internet needs to be incrementally built:*** Developing high-speed internet in Africa requires four steps (see **Figure 7**).
  - *First mile:* Countries in Africa require being linked to undersea internet cables or cross-border terrestrial links (particularly for land-locked countries). Many countries in Africa have access to undersea internet cables (i.e. submarine cable systems), either directly through local landing points or through terrestrial connections, especially for smaller and landlocked countries. There may still be limitations caused by capacity constraints, competitive/fair access to landing points, regulatory hurdles, and cost/price. Cross-border links between countries remain work in progress.
  - *Middle mile:* 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,<sup>11</sup> and backhaul or metro networks to extend further.<sup>12</sup> Good, functioning fiber backbones are lacking in most countries in Africa.<sup>13</sup>

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<sup>8</sup> Mobile networks using 2G technology offer voice and text communications and can be used for mobile money.

<sup>9</sup> Fixed access networks use fiber-to-the-home (FTTH), digital subscriber line (DSL) or cable technologies.

<sup>10</sup> These include metro and backhaul infrastructure, backbone infrastructure and submarine/international infrastructure.

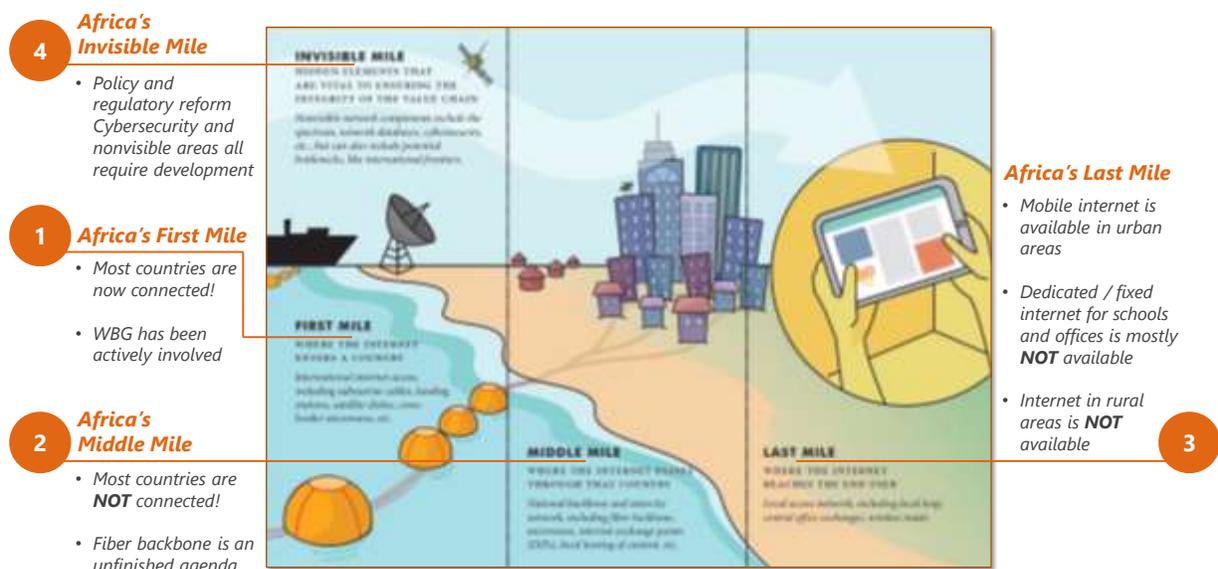
<sup>11</sup> Backbone networks transport broadband traffic over long distances (10-1000km) between major network nodes, often major population centers. These networks are largely based on fiber and may be operator-owned dedicated fiber or leased/shared capacity between operators. Sharing of backbone networks is still not common, increasing the cost for expanding network reach.

<sup>12</sup> Backbone networks bring connectivity to an area of service, metropolitan or backhaul networks bring that connectivity to network access nodes, commonly mobile base stations but also corporate links and fixed access nodes.

<sup>13</sup> Technically, good fiber backbone networks exist but they are often lacking in reach/extent and market dynamics. Regulatory hurdles or economics are often factors inhibiting further expansion. Due to insufficient backbone and metro networks, telecom operators have historically relied upon satellite links to provide connectivity to access networks. This is still common in rural mobile networks and constrains capacity and quality. Microwave links may

- *Last mile*: Once high-speed internet arrives at a population center, via the first and middle miles, telecom operators use that internet to provide internet services (such as “mobile internet” or “fixed internet” services) to people, businesses, and governments. In Africa, due to missing first and middle miles, telecom operators have historically relied upon satellite links to provide internet services to people. The approach causes high prices and low quality of service. With undersea internet cables being built for the first mile in Africa, and fiber backbones slowly emerging for the middle mile, telecom operators are starting to tie their networks with these new developments to offer higher quality and affordable internet services.
- *Invisible mile*: Policy 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. Additional policy considerations, such as for cybersecurity,<sup>14</sup> data privacy, and physical robustness of networks, are now needed to build trust in digital environment and ensure secure, reliable access to internet.<sup>15</sup> Today, cybersecurity plays a role across industrial sectors, such as energy, manufacturing, and transportation, as well as sectors critical to economic development.

**Figure 7: Developing the internet value-chain in Africa**



- **For high-speed internet, the government’s role is ideally to foster a good policy and regulatory environment, with limited, catalytic public-sector investments:** Developing internet requires good policies and regulatory approach, and private sector investment. The government’s role is to create the enabling conditions that allow the private sector to take the lead in developing infrastructure and

also be used in mobile networks. Both satellite and microwave are limited in providing sufficient capacity. Economic issues, rights of way and market dynamics are often factors inhibiting growth.

<sup>14</sup> 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.

<sup>15</sup> For detailed diagnosis of cybersecurity, cybersecurity maturity model (CMM) can be used, as done in over 10 countries, in partnership with Oxford Cyber Security Center.

offering high-quality internet services. Limited government intervention, for instance in form of public-private partnerships (PPPs), where appropriate and necessary, may be used to attract private sector participation, and expedite development of internet infrastructure.

- **The diagnostic should start by gauging the state of development of high-speed internet in a country:** The task team carrying out the diagnostic should start by reviewing the scale of internet services available in the country. **Table 1** provides core indicators to determine penetration levels and affordability of internet services in a country. **Annex 1** provides a more detailed set of indicators. The task team may further complement the analysis by examining sector structure, market structure, and regulatory environment.

**Table 1: Determining Current State of Internet Development**

Core Indicators: Digital Infrastructure	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
Number of active mobile broadband subscribers (per 100 people)					
Number of active fixed broadband subscribers (per 100 households)					
Percentage of population covered by at least 3G mobile network signal (%)					
Average monthly wholesale price of international E1 capacity link from capital city to Europe (2 megabits per second, in US\$)					
Average monthly retail price of high-speed internet service (1 megabits per second per month, in US\$)					

- **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. Depending on the country’s economic maturity, the assessment may be further focused on specific areas of the internet value-chain, such as first mile, middle mile, last mile, or invisible mile. For many countries in Africa, the middle mile is often the “missing middle.” The invisible mile is a common area of development for most countries. 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**

<p><i>Market analysis</i></p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• List all relevant operators in each segment (submarine cable, wholesale, metro rings, etc.).</li> <li>• List all broadband products available in country, as carrier to carrier wholesale by provider (IRU’s wholesale capacity).</li> <li>• Develop a summary of broadband infrastructure currently in use for transmission (as well as spectrum), e.g. microwave, aerial fibre, buried fibre, and their quantities. Broadband access transmission links data to be</li> </ul>
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indexed according to provider, type of route infrastructure (e.g., road, rail, power lines), and deployment status.

*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 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?
- 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.

*Second 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?

*Last mile: 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?
- What mechanisms are in place to extend internet access to rural and remote areas, including for women in rural and remote area? Is there a universal access fund (UAF) in place? If so, 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)?

*Invisible mile: cybersecurity, privacy, and robustness*

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

- **Digital platforms span every aspect of life and are offered by government and firms:** Digital platforms represent the use of digital technology in all aspects of life, such as healthcare, education, commerce, or government services.<sup>16</sup> Both governments and firms operate digital platforms, serving people, businesses, or government (see **Figure 8**).<sup>17</sup>
- **Digital government platforms:** Governments use digital platforms to improve the delivery of government services, or to improve the effectiveness of its functions. For example, a government operates digital identity as a government platform to offer a unique identity to every person in a country, and for use by most, if not every, sector in the country. Firms use digital platforms to offer new products or services. For example, a firm operates an e-commerce platform to offer retail services online, or by connecting buyers with sellers. Governments and firms at times use public private partnerships to run platforms or offer services. Some platforms, such as for healthcare and education, are offered by both government and firms.
- **Digital private sector platforms:** Firms use digital platforms to offer commercial products and services, such as e-commerce (e.g. Amazon, Alibaba), search engines (e.g. Google, Bing, Baidu), or ride-sharing applications (e.g. Uber, Lyft, Careem). A digital marketplace helps create economies of scale and capitalizes on the network effects of digital products or services to strengthen a country's competitive edge. This is particularly relevant in context of a digital economy, where tech start-ups have potential to scale up and capture market share. Digital platforms can achieve exponential growth and value, as increasing numbers of users adopt the services offered, and generate more data and content. In building and boosting a digital economy, countries have potential to create larger markets within which companies may offer digital products or services (whether online or by mobile phone), while removing barriers to cross-border e-commerce, incentivizing investment, and increasing the competitiveness and dynamism of each region's or country's digital economy. It is particularly beneficial for digital products and services due to the "network effects" they create. Many digital products and services that connect people, such as online vendors, and social media, become more valuable as more users adopt or use the service. Increasing the size of the digital marketplace may thus help amplify these network effects in Africa and may offer the opportunity for locally developed applications, platforms and content providers to grow.

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<sup>16</sup> Digital platforms may be defined as "multisided marketplaces with business models that enable producers and users to create value together by interacting with each other" (Still et al., 2017), and by facilitating matching, searching, exchanging, transactions, etc. (Evans, 2013). They provide the place for collecting, sharing and aggregating data, performing analytics and delivering new and improved services. Digital platforms may help eliminate traditional data-sharing barriers between organizations and transform the way businesses, governments, citizens and civil society interact.

<sup>17</sup> Note that for government platforms, "additional applications" can include e-Procurement, e-Health, Citizen Service Centers, National Single Windows, etc.

**Figure 8: Broad Scope of Digital Platforms<sup>18</sup>**

Enabling Environment	Government Platforms	Private Sector Platforms
Policies & Regulations	Digital Identity	Digital Payments
Systems & Infrastructure	Digital Financial Management	Digital Commerce
Standards & Protocols	Digital Taxation	Digital Marketplaces
Skills & Capacity Building	Additional Applications	Additional Applications

- In a digital economy, digital platforms may be both a foundation and use-cases, or simply use-cases:*** Country context would determine which digital platforms, if any, may be foundational for digital economy of a country. For example, most countries may consider the use of digital identity as foundational for digital economy. While other countries, for instance, may regard digitizing taxes as important for digital economy, as a way to improve tax collection or streamline taxation for digital economy. Country context may be given by government’s stated development priorities, or by assessed development challenges of a country. Most digital platforms would be use-cases of a digital economy in a country—areas to be developed once foundations of a digital economy are in place.
- Assessment of any digital platform may require a separate deep-dive:*** Assessing the country’s preparedness for any digital platform, whether a government platform or a private sector 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 diagnostic of identification for development (ID4D). Similarly, assessing the country’s preparedness for e-commerce may require an additional study of the topic, and may be linked with Digital Business indicators being prepared by DEC. As part of the diagnostic of digital economy, assessing the totality of digital platforms in a country in Africa may not be feasible.
- To assess digital 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 platforms, if any, are deemed foundational for the country. For such digital platform, the team may examine the enabling conditions for the digital 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’s digital economy.
- Digital platforms share some common elements:*** Though organizations (a government, a nonprofit, or a firm) may pursue different approaches to develop digital platforms, some elements may be common across platforms:

<sup>18</sup> Note that the digital platforms given under government platforms or private sector platforms are illustrative.

- *Service delivery:* 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. For a person's life, digital services may span from cradle to death, including birth registration, digital identification, education, healthcare, driver's license, taxation, vehicle registration, property registration, pension, social security, social protection, and death registration. For a firm's life, digital services may span from starting to closing a business, including business registration, taxation, capital raising, initial public offering, financial reporting, and bankruptcy filing.
- *Shared systems:* To be efficient as a corporate enterprise, each organization may need to set up shared systems for use across the enterprise. Shared systems help remove duplication of resources, and redundancy of cost and effort, across disparate parts of the organization. The work may streamline processes and improve economies of scale. Shared systems may include clouds or data centers, connectivity networks, payment networks, online portals, content management systems, certification authorities, and public key infrastructure.
- *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, upon availability, can provide inputs to decisionmakers to design new programs and cater to individual needs of people.
- *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. These become more important for connecting fragmented systems or legacy systems across enterprise, particularly for government platforms, in a cost-effective manner.
- *Change management and reforms:* Digital transformation require 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.
- *Back-office systems:* Organizations use digital facilities to manage and operate back-office functions for day-to-day operations. These systems cover all aspects of an organization's functioning, in its role as a corporate enterprise, including financial accounting, payroll, human resource management, general administration, and procurement.
- ***Government plays an active role in developing government platforms, and an enabling role in supporting firms to operate private sector platforms:*** In building government platforms, a government takes a direct role in funding and managing such work. Given the low-tech nature of many governments in Africa, governments at times partner with firms to alleviate cost, capacity, and sustainability challenges, though require key capabilities even to procure and manage these partnerships. In supporting growth of private sector platforms, a government plays a facilitating role, by promoting a conducive environment for businesses to competitively operate with good investment climate.

- **The diagnostic should start by gauging the current state of digital platforms, particularly those foundational for digital economy:** The task team carrying out the diagnostic should start by reviewing the current state of digital platforms in a country. **Table 3 Error! Reference source not found.** provides possible indicators to determine the level and use of digital 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. Further analysis may be needed to identify problems in specific digital platforms important for the country. The task team may further complement the analysis by gauging the government’s priority or interest for specific digital 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 Current State of Digital Platforms**

Core Indicators: Digital Platforms	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
E-Government – ranking (and score) in global survey (United Nations, 2016)					
Number of online transactions for government services (per year)					
Value of online transactions for government services (US\$, per year)					
Number of digitally-enabled unique identity proofs issued (per 100 people)					
Country Rank And Value In The UNCTAD B2C E-Commerce Index, Index (0-100) (UNCTAD)					
ICT Use For Business-To-Business Transactions, 1-7 (Best) (INDEX (1-7)) (WEF)					

- **The diagnostic should next determine key hurdles inhibiting growth of digital platforms:** **Table 4Error! Reference source not found.** shows broad areas of assessment for identifying hurdles that may deter the development of digital 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 of digital platforms, such as service delivery, shared services, data management, or back-office systems. Since digital platforms span a broad array of products or services, further refinement may be necessary to identify a few top priorities of the government that may be taken up early on for digitization.

**Table 4: Assessing Hurdles to Digital Platforms**

*Institutions*

- Are there specific national priorities that require digital platforms or interventions?<sup>19</sup>
- Does a government agency have a lead role in digitalization of government? If so, is the agency's role given by law or published policy? What specific role does the government agency play in enabling other government agencies to run digital government platforms? How is the government agency funded?
- How many full-time staff are employed for development or management of digital government platforms, either centrally or across government agencies? Of these, how many staff are permanent or contracted?
- Are fiscal funds used for developing or managing digital government platforms? 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 government services.
- Are donor funds (i.e. grants, loans, etc.) used for developing or managing digital government platforms? 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 government platforms. 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?

*Service delivery*

- What specific government services are currently being offered by the government digitally? Which specific digital channels are currently being used? Please state the government services based on 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 managing digital government platforms? If so, please indicate the terms and value of private sector partnership and state the names of the private partners involved.

*Shared systems*

- Has the government setup and is using shared systems or services to offer digital government platforms 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?
- 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.

*Data infrastructure and policy frameworks*

- 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?

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<sup>19</sup> For example, the government of Ghana upon election prioritized offering a digital identity to every person in the country, and digitizing land records.

- What rights of access to information exist?
  - What is the legal and policy framework for data security, data archiving and digital preservation? 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 have a published policy on open data, based on international best practices<sup>20</sup>? Does the government have adopted international data standards (including metadata standards)? Does the government promote mainstreaming of APIs?
  - 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 formats, instituted across government agencies?
  - Does the government use digital analytics to regularly analyze data and use for policymaking, governance, and private sector development purposes?

#### *Interoperability*

- How does government ensure interoperability of digital government platforms offered across different government agencies?
- How does government ensure interconnectivity across government agencies, at federal, regional and local levels?

#### *Back office systems*

- What back-office government systems are fully digitized? For each back-office system, please specify the government agency that developed the system, is operating the system, the sources of capital expenses for development, and the 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.

## **C. Digital Financial Services**

- ***Digital financial services are a critical enabler of a digital economy.*** 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

<sup>20</sup> <https://opendatacharter.net/>

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.

- ***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.<sup>21</sup>
- ***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.*** First, the government 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). Second, the government may 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. Third, the government can help stimulate demand, including by using government-as-a-customer, such as with government-to-person payments.
- ***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 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 (e.g. leveraging digital data for lending).

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<sup>21</sup> 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>

**Table 5: Determining 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 firms with a transaction account					
% of adults making or receiving a digital payment in past 12 months					
% of adults who used the internet to pay bills or to buy something online in the past year					
% of firms accepting digital payments					
# of retail electronic/digital transactions per capita					

- **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**

<p><i>Market Development</i></p> <ul style="list-style-type: none"> <li>• 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?</li> <li>• 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?</li> <li>• Is there a fintech industry providing services to traditional or nontraditional financial service providers (e.g. to improve credit scoring, AML/CFT, fraud detection)?</li> </ul> <p><i>Policy and Regulation: Overall</i></p> <ul style="list-style-type: none"> <li>• 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?                     <ul style="list-style-type: none"> <li>○ What is the relevance / status of implementation of key actions to promote digital financial services?</li> <li>○ Are the relevant stakeholders included in the development and implementation of the strategy, e.g. telecom regular, fintech industry representatives?</li> </ul> </li> </ul>
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- Is there a clear delineation of responsibilities among regulators for the legal and regulatory framework relevant to digital financial services?
- 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?
- Have the authorities applied a risk-based approach to AML/CFT regulations, including allowing the use of simplified Customer Due Diligence 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 to 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 Entrepreneurship

- ***Helping create the ecosystem for entrepreneurship may further grow digital economy:*** Harnessing the potential of disruptive technologies to drive Africa's transformation require addressing the main barriers to digital entrepreneurship. While countries in Africa have made great strides in fostering entrepreneurship ecosystems, progress is mostly clustered in a few countries and urban centers.
- ***Digital entrepreneurship can be defined as 'new ventures and the transformation of existing business by creating and using novel digital technologies.'*** Digital Enterprises are characterized by a high intensity of utilization of new digital technologies (particularly social, mobile, analytics and cloud solutions) to improve business operations, invent new (digital) business models, sharpen business intelligence, and engage with customers and stakeholders through new (digital) channels'.<sup>22</sup>
- ***The framework and approach is based on a more comprehensive Digital Entrepreneurship Ecosystem Diagnostic methodology developed within FCI GP.*** The framework is structured on the Babson Entrepreneurship Ecosystem model,<sup>23</sup> 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 (see **Figure 9** *Error! Reference source not found.*), to capture the most important dimensions of an ecosystem that are interdependent on each other. The six complementary domains within an ecosystem as a whole determine entrepreneurial opportunities and thereby drive digital entrepreneurship 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 entrepreneurship.
  - Financial Capital – Sources of capital available for digital entrepreneurs, including debt, equity, grants and blended financing.

<sup>22</sup> Adjusted from [http://www.digitaleurope.org/Document-Download/Command/Core\\_Download/EntryId/770](http://www.digitaleurope.org/Document-Download/Command/Core_Download/EntryId/770)

<sup>23</sup> The Babson researchers offer the following rationale for their framework: "The Babson Entrepreneurship Ecosystem Project stems from the observation that in all societies in which entrepreneurship occurs with any regularity or is self-sustaining, there is a unique and complex environment or ecosystem. The Babson Entrepreneurship Ecosystem finds that there are approximately a dozen elements that interact in complex ways. Thus in order to promote entrepreneurship, a holistic approach must be taken." (<http://entrepreneurial-revolution.com>)

- 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.

**Figure 9: Six Pillars of Babson’s Ecosystem Framework, Applied to Digital Entrepreneurship**



- **An ecosystem for digital entrepreneurship consists of many players:** An entrepreneurship ecosystem is essentially a collection of stakeholders, which include government agencies, financiers 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 entrepreneurship ecosystem 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 entrepreneurship, 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 entrepreneurship:** There is currently scarcity of data for entrepreneurship (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 **Table 7**) to determine the level of development of digital entrepreneurship, covering the ecosystem pillars.<sup>24</sup> 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 is further improving the list of entrepreneurship metrics and the tools to automate the data collection<sup>25</sup>. 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<sup>26</sup>. See **Annex 4**) for a full list of indicators.<sup>27</sup>

**Table 7: Determining Current State of Digital Entrepreneurship**

Core Indicators: Digital Entrepreneurship	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
Performance: Number of registered firms in ICT sector per 100,000 people in the working age population - (based on firm-level census or registered firms)					
Performance: Number of green field FDI (ICT & internet infrastructure, R&D, Business Services) per 100,000 people in the working population					
Policy: Doing Business distance to frontier (DTF)					
Infrastructure & Supports: Number of tech hubs & accelerators in the country per 100,000 people in the working age population.					
Infrastructure & Supports: % of firms with access to email or website					
Financial Capital: Venture Capital deal flow by country (Number of deals, Capital Invested (USD))					
Markets: ICT service exports (% of service exports, BoP)					
Culture: Risk taking index (Global Preferences Survey)					

<sup>24</sup> Digital entrepreneurship intensity is often measured at city level, which become hubs clustering entrepreneurship activities within geographical boundaries.

<sup>25</sup> Entrepreneurship – new metrics & pilots (P167399)

<sup>26</sup> Measuring Technology Adoption in Developing Countries (P164974)

<sup>27</sup> Even more comprehensive list of indicators is compiled for the Digital Entrepreneurship Ecosystem Diagnostic toolkit, which can be added based on specific needs of the country. Over sixty of these indicators are available at tc360data: <http://tcdatadev.worldbank.org/Reduced%20App/Testapp/>

- **Assessing hurdles to greater digital entrepreneurship:** Depending on the state of play of digital entrepreneurship, the task team may use the following areas of assessment (see **Table 8**) to determine key hurdles to further development of internet services in 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/>)
  - GEN 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

**Table 8: Assessing Hurdles to Developing Digital Entrepreneurship**

<p><b><i>Policy</i></b></p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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?</li> <li>• 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)?</li> </ul> <p><b><i>Infrastructure and Supports</i></b></p> <ul style="list-style-type: none"> <li>• 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?</li> <li>• 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?</li> </ul>
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- 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?
- 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?

### ***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?

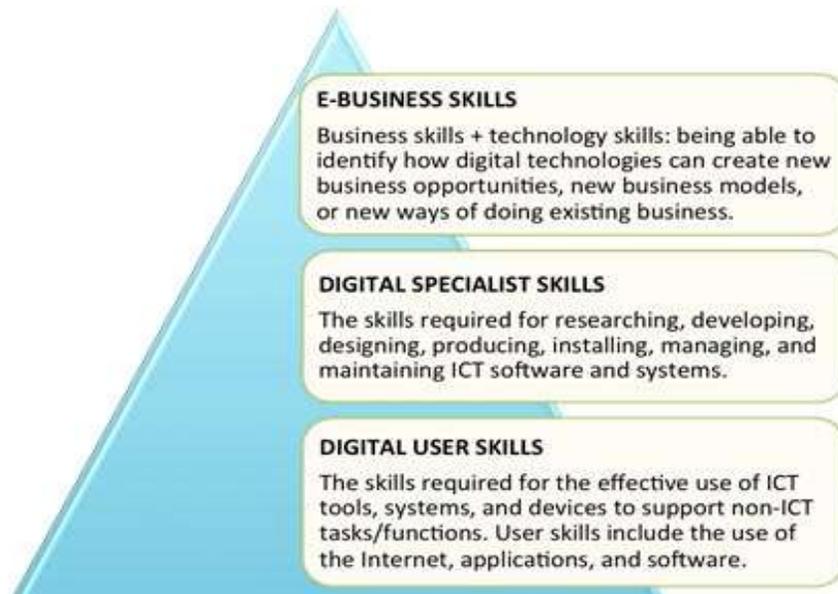
### ***Human Capital***

- 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?

## E. Digital Skills

- **Digital skills are a pre-requisite for benefiting from any technology, across all sectors of the economy, and at all levels of the skills spectrum.** If technologies and all other complementary factors were in place, but people did not have the skills to use such technologies, there would be no impact. Ultimately, the impact of technology depends on the use of technology. Digital and 21<sup>st</sup> Century skills are key to digital entrepreneurship, digital adoption and transformation, and even successful conceptualization and implementation of digitization projects in both the private and public sectors. From the ability to identify requisite talent to recruiting that talent, including across borders, digital skills are crucial.

Figure 10: Digital Skills Pyramid



Based on European Commission (2004), van Welsum and Lanvin (2012).

- **Digital skills span a broad spectrum and are needed across all sectors of the economy:** At all levels of ‘specialization,’ both on the ‘user’ (users of digital technologies) and the ‘producer’ side (producers of digital technologies), digital skills are necessary. Digital skills can be thought of in three main ‘layers,’ with each layer spanning a spectrum of skills from basic to more advanced and including or combining different types of complementary skills. The bottom layer corresponds to “users of digital/ICT tools.” The next layer up corresponds to “producers of digital/ICT tools.” The top layer corresponds to those who apply, create and invent innovative business models, products and services afforded by digital technologies. The digital skills pyramid can be a useful framework for considering skills for the digital economy in three categories: user skills, specialist skills and e-business skills.
- **Basic digital skills are not only foundational requirements for developing vibrant digital economies, but also for obtaining jobs in growing sectors:** Yet, traditional education programs (schools and universities) are not coping with rapid technological changes at the speed needed by the entrepreneurial ecosystem and SMEs. There is a mismatch between what African students are learning, and what skills are sought by employers. The private sector alone cannot correct this structural skills deficit and mismatch; government policies aimed at ensuring its citizens have the appropriate digital skills are important to developing a digital economy.

- ***Digital skills need to be complemented by 21<sup>st</sup> century skills.*** Digital skills by themselves do not provide all the tools needed to take advantage of the digital economy. 21<sup>st</sup> century skills (i.e., problem solving, critical thinking, team work, learning how to learn, etc.) are also critical to leverage the opportunities that the digital world provides, including digital entrepreneurship and access to platforms, job opportunities and services.
- ***A government can facilitate the supply of appropriate skills by creating an enabling climate for incubation and success.*** Supporting an adequate supply of digital and entrepreneurial skills in the economy would necessitate a comprehensive strategy to include:
  - Building interdisciplinary partnerships that bring together relevant stakeholders – including the private sector and educational and vocational training institutions and organizations - to ensure the skills supply/talent pool better matches the business needs in practice.
  - Expanding bootcamp experiential models and ready-to-market/rapid-skill trainings to bridge identified gaps between the official education system and private sector needs.
  - Establishing mechanisms to aggregate demand and boost skills accelerators underpinned by curricula based on and continuously adapted to private sector demand.
  - Developing and operationalizing monitoring and evaluation systems, action plans for longer-term institutionalization of continuous skills diagnostics, agile learning techniques and digital skills platforms.
- Other areas of intervention can include providing information and a one-stop-shop to start a business online, simplifying and speeding-up procedures for the cross-border recruitment of talent, and reducing the associated costs (e.g. related to immigration rules and formalities).
- ***Gauging the state of play of digital skills:*** A task team carrying out the diagnostic for digital economy may examine the following areas (see **Table 9**) to determine the level of development of digital skills.

**Table 9: Determining Current State of Digital Skills**

Indicators: Digital Skills (Life-cycle)	Current Status		Previous Status		Trend & Benchmark
	Year	Value	Year	Value	
<b>School Years (Roughly Ages 5-18, Primary School, Secondary School)</b>					
Internet access in schools – as score from 1 to 7 in Global Competitiveness Index (WEF, 2018 <sup>28</sup> PETS surveys, <a href="#">EdStats</a> , country EMIS data, e.g. <a href="#">South Africa</a> , <a href="#">Ghana</a> )					
Number (or %) of government/public schools with computers for students use (PETS surveys, <a href="#">EdStats</a> , country EMIS <sup>29</sup> data, e.g. <a href="#">South Africa</a> , <a href="#">Ghana</a> )					
<b>Tertiary Education   Roughly Ages 16+, Tertiary School, Universities, TVET Institutions</b>					
Share of population with tertiary degree (census data, household survey, Barro & Lee, <a href="#">STEP Skills Measurement Survey</a> )					
Number of formal higher education programs in the country specifically focused on ICT/digital skills/computer programming, etc (Higher Education govt. data, <a href="#">Africa Development Indicators</a> )					
Number of informal/short programs for digital/computer skills acquisition, such as hackathons, coding bootcamps, competitions (Higher Education govt. data, <a href="#">Africa Development Indicators</a> )					
<b>Outside School, Work (All Ages, but mostly 15+, Post-school years, Workplace learning &amp; Independent learning at all ages)</b>					
Number of digital skills/ICT government programs for out-of-school youth and adults (Higher Education govt. data)					
Number (or %) of adults (working ages of 15-64) using computers as part of their daily work/studies ( <a href="#">STEP Skills Measurement Survey</a> , census information, household surveys)					
Number of employers stating digital literacy as a hindrance to job performance ( <a href="#">STEP Skills Measurement Survey</a> , PIAAC, Employer Surveys)					
Share of engineers, STEM professionals, and scientist in the population (census data, <a href="#">STEP Skills Measurement Survey</a> )					

- Assessing hurdles to digital skills:** As digital skills are often acquired and practiced in non-formal settings, and through private investment, many of these questions below (see **Table 10**) will be essential to understanding the level of digital literacy of the country, as well as understanding the speed with which digital skills acquisition is taking place in the country, and what it is motivated by. The suggestion is not only to draw on the several sources of information already mentioned (through household surveys, Africa Data Indicators, etc.), but rather through focus groups with leaders both in the ICT industry as well as government officials.

<sup>28</sup> The Global Competitiveness Report 2017-2018. See: <http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017-2018.pdf>

<sup>29</sup> EMIS: Education Management Information Systems – most countries will collect EMIS data for their schools.

**Table 10: Assessing the Hurdles to Digital Skills Development**

- Are there any current policies or 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?
- How much funding, both public and private, is directed towards programs that seek to improve digital skills acquisition (for all ages, including non-formal programs)?
- Are there resources widely available for acquisition of digital skills – and if so, what do these mass resources look like, and where are they used most likely? (For example, online learning programs)
- What are the most common software programs (including social media and chat tools such as Google, Facebook, WhatsApp) that are reportedly used? (Will have to gather information from companies themselves, and these could serve as a proxy for how many people have the skills to use these platforms).
- At the schooling level, are there formal/official documents that provide guidance on integration/teaching of digital literacy at different levels of education, or student learning objectives geared towards the acquisition of these skills?
- Are there 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?
- Are there university-industry learning platforms providing real-work digital skills learning experiences for university students? How many private sector initiatives provide apprentices programs for digital skills jobs?
- What are the leading micro-work and free-lancing platforms for online job opportunities in the country? Are there any domestic platform operating in the country? Are there any online marketplace for tasks/jobs operating in the country? What is there annual domestic users base?

### Annex 1: Indicators for Digital Infrastructure

Assessment dimensions and measures/indicators	Data Source
<b>1 Digital Infrastructure</b>	
Number of active mobile broadband subscribers (per 100 people)	WDI / ITU
Number of active fixed broadband subscribers (per 100 households)	WDI / ITU
Residential fixed broadband connection penetration (number of households/number of homes passed) – Includes fixed wireless access and any link providing greater than 2 Mbit/s of download speed.	Operators/telecom regulator
Consumer mobile broadband connection penetration using 3G or newer technology (number of SIM/number/population + unique users/population)	Operators/telecom regulator
Business fixed broadband connection penetration (number of premises/number of premises passed) – Includes fixed wireless access and any link providing greater than 2 Mbit/s of download speed.	Operators/telecom regulator
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	Operators/telecom regulator
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)	Operators/telecom regulator
Percentage of population covered by at least 3G mobile network signal (%)	WDI / ITU
Average monthly wholesale price of international E1 capacity link from capital city to Europe (2 megabits per second, in US\$)	National authorities
Average monthly retail price of high-speed internet service (30 megabits per second per month, in US\$)	National authorities
Individuals using the Internet (from any location), by gender (%)	ITU
Total data traffic in country (in gigabit per month; from end user until local termination or international gateway; avoid double counting traffic)	Operators/telecom regulator
Total international traffic (in gigabit per month)	Operators/telecom regulator
ARPU for mobile broadband, consumer broadband, small business broadband, midmarket, corporate.	Operators/telecom regulator
Average cost per Mbyte for internet termination at carrier to carrier level.	Operators/telecom regulator
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	Operators/telecom regulator
Percentage of average disposable household income is used for broadband connectivity?	Operators/telecom regulator

## Annex 2: Indicators for Digital Platforms

Assessment dimensions and measures/indicators	Data Source
<b>1 Government Platforms</b>	
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
<b>2 Private Sector Platforms</b>	
Country Rank And Value In The Index (0-100)	UNCTAD B2C E-Commerce Index
ICT Use For Business-To-Business Transactions, 1-7 (Best) (INDEX (1-7))	WEF
Business-To-Consumer Internet Use, 1-7 (Best) (INDEX (1-7))	WEF

### Annex 3: Indicators for Digital Financial Services

Assessment dimensions and measures/indicators	Data Source
<b>4 Digital Financial Services</b>	
<b>4.1 Uptake &amp; Usage of Digital Financial Services</b>	
4.1.1. % of adults with a store-of-value transaction account	Global Findex
4.1.2 % of firms with a store-of-value transaction account	Enterprise Surveys
4.1.3 % of adults using internet or mobile phone to access transaction account	Global Findex
4.1.4 % of adults making or receiving a digital payment in past 12 months	Global Findex
4.1.5 % of adults who used the internet to pay bills or to buy something online in the past year	Global Findex
4.1.6 % of agricultural payments made via digital channels	Global Findex
4.1.7 % of domestic remittance senders/receivers using digital channels	Global Findex
4.1.8 % of wage earners receiving wage payments via digital channels	Global Findex
4.1.9 % of Firms accepting digital payments	Enterprise Surveys (proposed) or national authorities
4.1.10 # of retail electronic/digital transactions per capita	Global Payments Systems Survey (GPSS)
4.1.11 Volume of electronic/digital transactions per capita	GPSS
<b>4.2 Policy &amp; Regulation</b>	
<b>4.2.1 Market Entry</b>	
4.2.1.1 % of retail electronic/digital transactions per capita facilitated by nonbanks	National authorities
<b>4.2.2 Delivery Channel &amp; Product Innovation</b>	
4.2.2.1 % of G2P social transfers disbursed via digital channels	National authorities / Global Findex (proxy)
4.2.2.2 # of non-branch access points per 100,000 adults (e.g. agent, PoS, ATM)	IMF Financial Access Survey / GPSS
4.2.2.3 % of accounts opened via remote channels	
<b>4.2.3 Managing Risks of Digital Finance</b>	
4.2.3.1 % of consumer complaints linked to digital financial services	National authorities
<b>4.3 Financial Infrastructure</b>	
<b>4.3.1 Retail Payment Systems</b>	
4.3.1.1 Volume of transactions processed by retail payment systems	GPSS
4.3.1.2 Value of transactions processed by retail payment systems	GPSS
<b>4.3.2 Credit Reporting Systems / Secured Transactions</b>	
4.3.2.1 Strength of legal rights index (selected components, tbd)	Doing Business
4.3.2.2 Depth of credit information index ( <i>selected components, tbd</i> )	Doing Business
4.3.2.3 Credit registry coverage (% of adults)	Doing Business
4.3.2.4 Credit bureau coverage (% of adults)	Doing Business

## Annex 4: Indicators for Digital Entrepreneurship

Assessment dimensions and measures/indicators	Data Source
<b>5 Digital Entrepreneurship</b>	
<b>5.1 Performance</b>	
5.1.1 Entry rate of new firms	National firm-level census or registered firms
5.1.2 Number of registered firms in ICT sector per 100,000 people in the working age population	National firm-level census or registered firms
5.1.3 Number of green field FDI (ICT & internet infrastructure, R&D, Business Services) per 100,000 people in the working population	fDi Intelligence Database
<b>5.1 Policy</b>	
<b>5.1.1 R&amp;D Institutions</b>	
5.1.1.1 Research and development expenditure (% GDP)	<a href="#">WORLD BANK</a>
5.1.1.2 Innovation Capacity – ranking (and score)	Cornell University, INSEAD, WIPO: <a href="#">Global Innovation Index</a>
<b>5.1.2 Venture-friendly legislation and processes</b>	
5.1.2.1 Regulatory Framework for Digital Markets	WORLD BANK Digital Business Indicators
5.1.2.2 IP protection (index 1-7)	<a href="#">WEF Global Information Technology Report (GITR)</a>
5.1.2.3 Barriers to entrepreneurship (aggregate indicator representing the complexity of regulatory procedures, administrative burdens on start-ups and regulatory protection of incumbents)	<a href="#">OECD - Product Market Regulation Database</a>
5.1.2.4 Ease of doing business – ranking in the Doing Business Survey	<a href="#">WORLD BANK DB</a>
<b>5.1.3 Taxation</b>	
5.1.3.1 Total tax and contribution rate (as % of profit)	<a href="#">WORLD BANK DB</a>
<b>5.2 Infrastructure &amp; Supports</b>	
5.2.1 Number of Tech hubs & accelerators in the country	Desk Research (F6S, Afrilabs, Seed-DB, GAN, etc..)
5.2.2 % of firms with access to email or website	WORLD BANK Enterprise Survey
<b>5.3 Financial Capital</b>	
5.3.1 Venture Capital availability [1 = extremely difficult; 7 = extremely easy]	<a href="#">WEF Global Competitiveness Report</a> , Executive Opinion Survey, 2016–17 weighted average
5.3.2 Venture Capital: Deal flow by country (Number of deals, Capital Invested (USD))	EMPEA
5.3.3 Debt: % of firms identifying access to finance as major constraint	<a href="#">WORLD BANK Enterprise Survey</a>
5.3.4 Access to credit (as score from 1 to 100)	<a href="#">WORLD BANK DB</a>
<b>5.4 Markets</b>	
<b>5.4.1 Innovation and Technology adoption at the industry/firm level</b>	
5.4.1.1 New Product early-stage Entrepreneurial Activity (% of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business)	<a href="#">GEM</a>
5.4.1.2 Share of firms that invest in R&D	<a href="#">Enterprise surveys</a>
5.4.1.3 Firm-level technology absorption, (1 = not at all; 7 = to a great extent]	<a href="#">WEF - GITR</a> , Executive Opinion Survey, 2016–17 weighted average

<b>5.4.2 Access to markets and business activity</b>	
5.4.2.1 Trade openness (share of exports and imports in respect to GDP)	WORLD BANK Development Indicators
5.4.2.2 ICT service exports (% of service exports, BoP)	WITS data (sectors ISIC rev 4, division 61, 62, 63)
5.4.2.3 Logistics for e-Commerce	WORLD BANK Digital Business Indicators
<b>5.5 Culture</b>	
5.5.1 Risk taking index	Global Preferences Survey <sup>30</sup>
5.5.2 Gender / Percent of firms with female participation in ownership	<a href="#">WORLD BANK Enterprise survey</a>
5.5.3 Whether discrimination based on gender or marital status prohibited in access to credit	<a href="#">World Bank Women, Business and Law Indicators</a>

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<sup>30</sup> Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D., & Sunde, U. (2018). Global evidence on economic preferences. *Quarterly Journal of Economics* (forthcoming). Falk, A., Becker, A., Dohmen, T. J., Huffman, D., & Sunde, U. (2016). The preference survey module: A validated instrument for measuring risk, time, and social preferences. IZA Discussion Paper No. 9674

### Annex 5: Indicators for Digital Skills

Assessment dimensions and measures/indicators	Data Source
<b>1 Digital Skills and literacy</b>	
<b>1.1 Educational System</b>	
<b>1.1.1 Policy Objectives for Digital Education</b>	
1.1.1.1 Is The Education System Associated With A Longterm Vision Of Skills Requirements In The Country? (0-4 Index)	Institutional Profiles Database
1.1.1.2 Existence Of Institutions Or Arrangements To Encourage Technology Transfers And Skills Transfers From Foreign Players To Domestic Players (0-4 Index)	Institutional Profiles Database
<b>1.1.2 Digital Skills Measurement at School Level</b>	
1.1.2.1 Number (or %) of government/public schools with computers for students use	PETS surveys, <a href="#">EdStats</a> , country EMIS data, e.g. <a href="#">South Africa</a> , <a href="#">Ghana</a>
1.1.2.2 Number (or %) of government/public schools with internet access	PETS surveys, <a href="#">EdStats</a> , country EMIS data, e.g. <a href="#">South Africa</a> , <a href="#">Ghana</a>
1.1.2.3 Number of NGO or privately run programs for this age group working to develop digital skills, ICT, computer literacy (focus groups)	Focus Groups & other government data
<b>1.1.3 Digital Skills Measurement at Higher Education Level</b>	
1.1.3.1 Number of institutions reporting using digital/online methods for classes, submissions of assignments, general learning	
1.1.3.2 Number of formal higher education programs in the country specifically focused on ICT/digital skills/computer programming, etc	Higher Education govt. data, <a href="#">Africa Development Indicators</a>
1.1.3.3 Number of informal/short programs for digital/computer skills acquisition, such as hackathons, coding bootcamps, competitions	Higher Education govt. data, <a href="#">Africa Development Indicators</a>
1.1.3.4 Number of apprenticeships available in organizations for students in computer/ICT themes	Higher Education govt data, <a href="#">STEP Skills Measurement Survey</a> , <a href="#">Google</a>
<b>1.2 Digital Skills Supply and Demand in the Workforce</b>	
1.2.1 Number of government programs for out-of-school youth and adults	Higher Education govt. data
1.2.2 Number of students enrolled in international online learning courses	household survey, information from EdX, Coursera, etc.
1.2.3 Number (or %) of adults (working ages of 15-64) using computers as part of their daily work/studies	STEP Skills Measurement Survey, census information, household surveys
1.2.4 Number of adults who send emails as part of their daily work	<a href="#">STEP Skills Measurement Survey</a> , PIAAC, Household Surveys
1.2.5 Number of adults who use internet searches as part of their daily work	<a href="#">STEP Skills Measurement Survey</a> , PIAAC, Household Surveys
1.2.6 Number of adults who use simple software programs (such as word processing, digital calculations, spreadsheets, databases) as part of their daily work	<a href="#">STEP Skills Measurement Survey</a> , PIAAC, Household Surveys
1.2.7 Number of adults using higher order computer programming for their work on a daily basis	<a href="#">STEP Skills Measurement Survey</a> , PIAAC, Household Surveys
1.2.8 Number of jobs available in the ICT/computer skills industry	<a href="#">Glassdoor</a> , <a href="#">Indeed</a> , local recruitment portals
1.2.9 Number of organizations working in the tech/digital/computer industry	<a href="#">STEP Skills Measurement Survey</a> , PIAAC, Employer Surveys

1.2.10 Number of employers stating digital literacy as a hindrance to job performance	<a href="#">STEP Skills Measurement Survey</a> , PIAAC, Employer Surveys
1.2.11 Share of population with tertiary degree	census data, household survey, Barro & Lee, <a href="#">STEP Skills Measurement Survey</a>
1.2.12 Share of engineers, STEM professionals, and scientist in the population	census data, <a href="#">STEP Skills Measurement Survey</a>