

# Rwanda

# Digital Economy Assessment

## Summary Report



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Digital Economy for Africa

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## About DE4A

**Rapid digital transformation is re-shaping the global economy**, permeating virtually every sector and aspect of daily life, changing the way we learn, work, trade, socialize, and access public and private services and information. In 2016, the global digital economy was worth some USD 11.5 trillion, equivalent to 15.5 percent of the world's overall GDP. It is expected to reach 25 percent in less than a decade, quickly outpacing the growth of the overall economy. However, countries like Rwanda are currently capturing only a fraction of this growth potential and need to strategically invest in the foundational elements of their digital economy to keep pace.

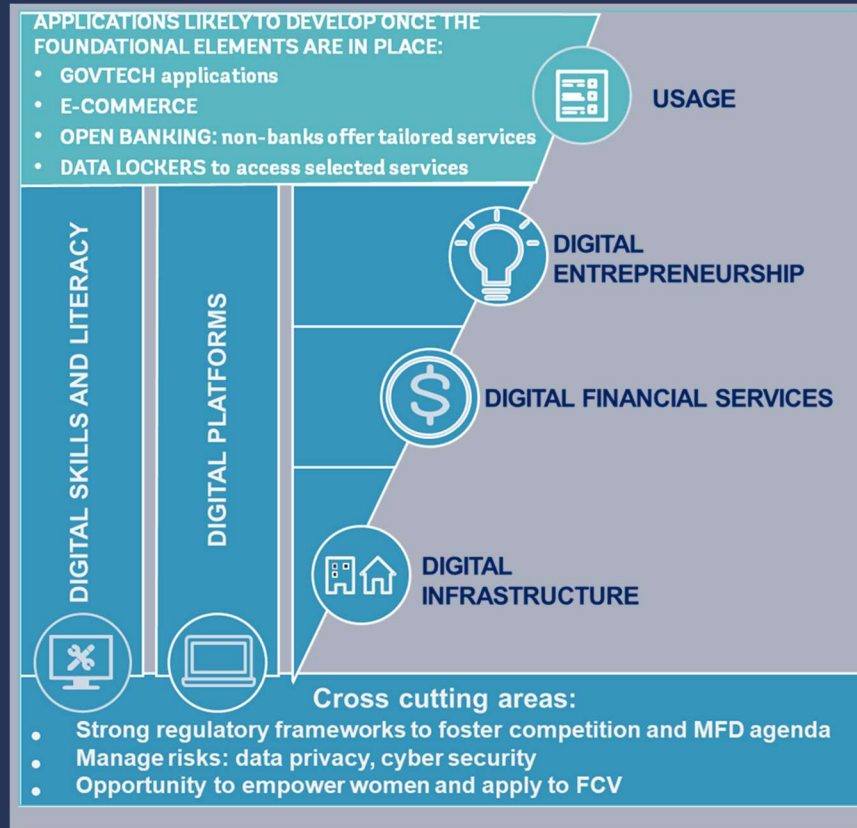
**The Digital Economy for Africa (DE4A) Initiative forms part of the World Bank Group's support for the African Union's Digital Moonshot for Africa**, which aspires to see every African individual, business and government be digitally enabled by 2030. The DE4A Initiative is underpinned by five principles:

1. **Comprehensive:** Taking an ecosystem approach to digital economy development that looks at both supply and demand and defies a narrow, siloed approach in defining the elements and foundations that make up the digital economy.
2. **Transformative:** Aiming at a very different scale of ambition beyond incremental 'islands' of success.
3. **Inclusive:** Recognizing that the digital economy is for 'everyone, in every place, and at all times' as well as creating equal access to opportunities and dealing with risks of exclusion.
4. **Homegrown:** Supporting solutions anchored in the local context and unleashing the African spirit of enterprise to support more homegrown digital content and solutions.
5. **Collaborative:** Dealing with the digital economy requires a more flexible mindset, including collaboration among countries, across sectors as well as between public and private players.

**For a successful and inclusive digital economy, African countries need to support the development of the key foundational building-blocks** (see Figure 0-1). Five foundational elements, which are closely interlinked and synergistic, have been identified:

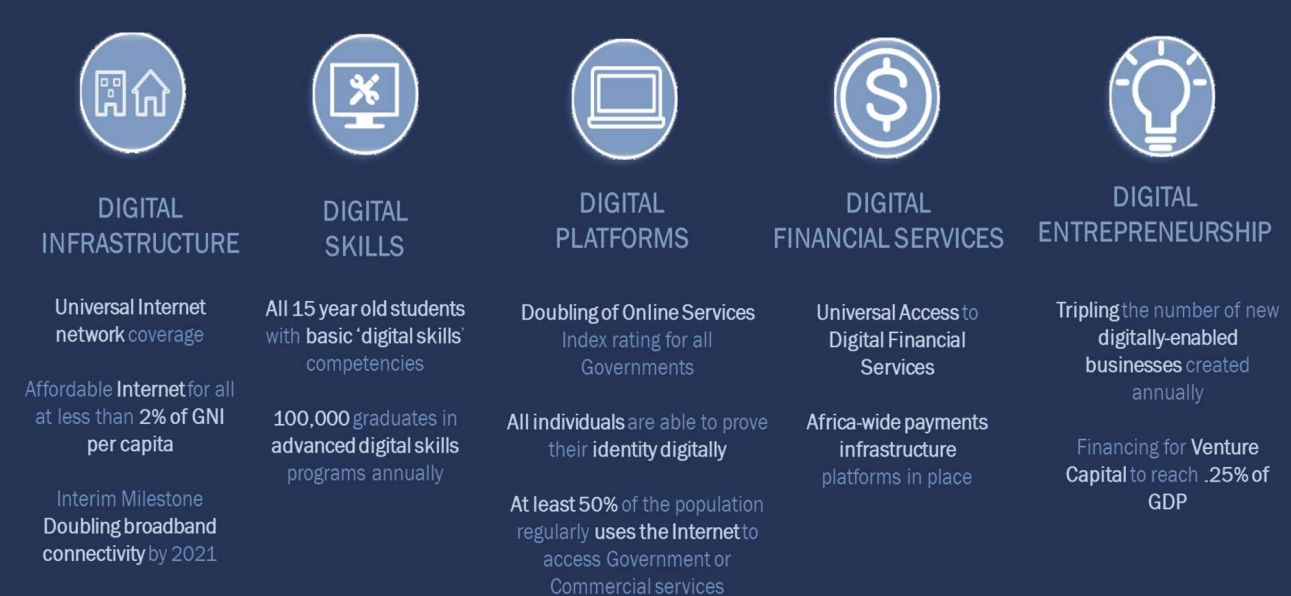
1. **Digital Infrastructure:** Digital infrastructure provides the means for people, businesses, and governments to get online, and link with local and global digital services, thus connecting them to the global digital economy. High-quality and affordable Internet connectivity is a critical foundational component of the digital economy.
2. **Digital Platforms:** Digital platforms offer products and services, accessible through digital channels, such as mobile devices, computers, and the internet. They facilitate digital exchange and transactions, enabling producers and users to create value by interacting with each other. Governments, for example, operate digital platforms to offer citizen-facing government services and share information. Commercial firms and non-profit foundations also operate digital platforms to offer a growing array of products, services and information.
3. **Digital Financial Services:** Digital financial services enable individuals and businesses to conduct transactions electronically and open a pathway to a range of digital financial services in addition to digital payments, including credit, savings, and insurance. Access to affordable and appropriate digital financial services is critical for the participation of individuals and businesses in the digital economy.
4. **Digital Entrepreneurship:** Digital entrepreneurship and innovation create an ecosystem that helps bring the digital economy to life, by spurring new, growth-oriented ventures, products, and services that leverage technology. By enabling the transformation of existing businesses, digital entrepreneurship contributes to net employment growth and helps to enhance competitiveness and productivity.
5. **Digital Skills:** Economies require a digitally savvy workforce to build robust digital economies, competitive markets and to enable individuals to access digital services and information. Digital skills constitute technology skills, together with business skills for building or running a start-up or enterprise. Greater digital literacy enhances the adoption and use of digital products and services among the larger population.

Figure 0-1: Key component of the digital economy ecosystem



As part of the DE4A Initiative, ambitious, high-level targets have been established for all five foundational pillars of the digital economy, articulated under DE4A framework, as a way to define and measure success against the goal of ensuring that every individual, business and government is digitally enabled by 2030 (see Figure 0-2).

Figure 0-2 Digital Moonshot targets across pillars



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# Diagnostic Methodology

An [in-country kick-off and fact-finding mission](#) was undertaken in January 2019, in preparation of this diagnostic. Preliminary findings were presented and validated at a closing meeting held on 1 February 2019.

In addition to [desk research](#) conducted, these engagements allowed for broad stakeholder consultation with both the public and private sector, as well as civil society.

The following [stakeholders were consulted](#) as part of this country assessment:

- **Public sector:** Ministry of ICT and Innovation, Rwanda Information Society Authority, Rwanda Development Board, Rwanda Utilities Regulatory Authority, Ministry of Finance and Economic Planning, National Identification Agency, Ministry of Local Government, Local Entities Development Agency, and Rwanda Public Procurement Authority.
- **Private sector:** YegoMoto, Dalberg, 250 Startups, SOBEK Capital, African Entrepreneur Collective, Cardno, Resonate, Yubeyi, Volkswargen Group, JobsinRwanda.
- **Incubators and accelerators:** Kigali Innovation City, KLab, FabLab, Impact Hub, Westerwelle Startup Haus and Iris Hub.
- **Telecommunications and energy sector:** Korea Telecom Rwanda Network, MTN Rwanda, Airtel/TIGO Rwanda, EUCL Rwanda, Axiom Networks, POPCONN, IHS Rwanda, Africa Olleh Services, and Rwanda Internet Community and Technology Alliance.
- **Financial sector:** National Bank of Rwanda, Bank of Kigali, Mobisol, RSwitch, AccessBank Rwanda, Kenya Commercial Bank Rwanda, and Banque Populaire Rwanda.
- **Education sector:** University of Rwanda – College of Science and Technology, African Leadership University, Carnegie Mellon University in Africa, African Institute for Mathematical Sciences, Digital Opportunity Trust, Rwanda Polytechnic, Integrated Polytechnic Regional College in Kigali, Andela, Moringa School, Akilah Institute, and sample primary and secondary schools in Kigali.
- **Donors and international organizations:** German Society for International Cooperation, Japanese International Cooperation Agency, Sustainable Development Goals Center for Africa, and SMART Africa Secretariat.

Analysis presented also draws on [regional and global benchmarking](#), based on standardized indicators that form part of the DE4A diagnostic methodology, as well as government statistics and data shared by the private sector.



# Acronym List

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ADSL	Asymmetric Digital Subscriber Line
AFR	Access to Finance Rwanda
AI	Artificial Intelligence
AIMS	African Institute for Mathematical Sciences
B2C	Business to Consumer
BNR	National Bank of Rwanda
CBA	Commercial Bank of Africa
CBC	Competency-Based Curriculum
CERT	Computer Emergency Response Team
CIRST	Computer Security Incident Response Centre
CMU	Carnegie Mellon University
CR	Civil Registration
CRVS	Civil Registration and Vital Statistics
DAP	Digital Ambassador Program
DE4A	Digital Economy for Africa Initiative
DFS	Digital Financial Services
DOT	Digital Opportunity Trust
DRP	Data Revolution Policy
DSC	Digital Signature Certificate
DTP	Digital Talent Policy
EAC	East African Community
EAPS	East Africa Payments System
EDGI	United Nations' Global e-Government Development Index
EDPRS	Economic Development and Poverty Reduction Strategy
e-GP	Electronic Government Procurement
ESB	Enterprise Service Bus
EPI	E-Participation Index
FI	Financial institution
G-Cloud	Government Cloud
GDP	Gross Domestic Product
GoR	Government of Rwanda
GSMA	Global System for Mobile Communications
ICT	Information and Communications Technology
IFMIS	Integrated Financial Management Information System
IoT	Internet of Things
IPRC	Integrated Polytechnic Regional Centers
ISP	Internet Service Provider
IT	Information technology
ITU	International Telecommunication Union
KIC	Kigali Innovation City
KT	Korea Telecom
KTRN	Korea Telecom Rwanda Networks
KYC	Know Your Customer
LDC	Least developed country
LMIS	Labor Market Information System
MDAs	Ministries, Departments and Agents
MINECOFIN	Ministry of Finance and Economic Planning
MINEDUC	Ministry of Education

MISTT	Mobile Internet Skills Training Toolkit
MNO	Mobile Network Operator
MOOC	Massively Open Online Course
MSME	Micro, Small and Medium Enterprise
NDC	National Data Center
NICI	National Information and Communications Infrastructure Plan
NID	National ID Documents
NIDA	National Identification Agency
NIN	National ID Number
NISR	National Institute of Statistics of Rwanda
NRI	Networked Readiness Index
NRP	National Population Register
NSDB	National Skills Database
OLPC	One Laptop per Child
PKI	Public Key Infrastructure
PPP	Public-Private Partnership
RDB	Rwanda Development Board
REB	Rwanda Education Board
RIPPS	Rwanda Integrated Payment Processing System
RISA	Rwanda Information Society Authority
R-NDPS	Business Plan for Rwanda National Digital Payment System
ROPL	Rwanda Online Platform Limited
RTGS	Real Time Gross Settlement systems
RURA	Rwanda Utilities and Regulation Authority
RWEDNET	Rwanda Research and Educational Network
Rw-CSIRT	Rwanda National Computer Security and Incident Response Team
SDG	Sustainable Development Goals
SRMP	Smart Rwanda Master Plan
STEM	Science, Technology, Engineering and Mathematics
TCIS	Trade Community Information Systems
TSS	Technical Secondary Schools
TVET	Technical and Vocational Education and Training
UAF	Universal Access Fund
UNCTAD	United Nations Conference on Trade and Development.
VTC	Vocational Training Center
WEF	World Economic Forum
WBG	World Bank Group

# Executive Summary

Rwanda has made great strides toward developing its digital economy over the past decade, led by a government strongly committed to Information and Communications Technology (ICT) as an enabler of economic growth, innovation and service delivery. This commitment is reflected in a number of strategic visions and policy plans, as well as concrete investments and initiatives aiming to position the country as a premier digital hub in the region. One of the government's main investments includes the rolling out of a nationwide fiber optic backbone which was completed in 2010 and subsequently development of a nationwide wholesale 4G network, through a unique public-private partnership. This far-reaching network has brought a larger percentage of the population within reach of high-speed mobile broadband services than any country in the region. The government has also endeavored to boost digitization in a number of ways, for instance by developing digital public platforms and services, including the online one-stop shop Irembo, which provides access to a growing array of public e-services. Efforts are likewise being made to boost digital literacy through the Digital Ambassadors Program and the supply of higher-end skills through partnerships with leading academic and for-profit institutions. Government is also actively supporting the innovation and entrepreneurship ecosystem, aiming to help grow new digital startups and increase technology adoption in 'traditional' industries.

While the government has been a strong champion and investor in the digital agenda, uptake of digital technologies and services by the private sector and private individuals has been slower by comparison. This is in part due to the lack of affordability of broadband services and mobile broadband-enabled devices relative to low average incomes, despite having some of the lowest absolute prices in the region. With some notable exceptions, the development and uptake of digital commercial platforms, services and locally relevant content has also been muted. This is both a consequence of low connectivity penetration and small online customer base within the country, while also a cause of the low demand for broadband among consumers and businesses. Uptake of digital financial services (DFS) by consumers and businesses has been growing quickly, but also lags neighboring markets despite the presence of innovative DFS products and services on offer. Boosting digital entrepreneurship is highlighted as one of the government's strategic goals, but there remains much to be done in terms of building out a culture of innovation, increasing business acumen, and easing access to regional and global markets to create the scale that can help translate early stage support into development of sustainable businesses.

One of the main cross-cutting challenges to the further development of Rwanda's digital economy, and a root cause of many of the gaps described above, is limited digital skills and literacy. Limited digital literacy leads to low demand of related products and services, as consumers are not aware of or able to make use of the benefits of available technology. This in turn leads to a limited uptake of high-speed internet and advanced devices such as smartphones and computers, also limiting the market size for these digital products. In addition, this slows the uptake of digital platforms as well as DFS, as consumers, employees and business owners often lack the knowledge needed in order to make use of them. Limited digital skills also impact the creation of new products and services, since the pool of digitally adept talent remains small in size. Increased efforts in education and training are needed in order to build a tech- and business-savvy workforce that can boost the supply-side of the digital market.

Efforts to increase supply of digital infrastructure, skills, platforms, services, and entrepreneurs need to be paired with more efforts to drive demand. Lowering the costs and other barriers to access are critical, but individuals and businesses, particularly those with very low incomes or profits still need a compelling reason to invest their limited incomes into broadband services and smartphones and their time and energy into developing the digital skills to make use of it. Likewise, Rwanda's digital innovators and entrepreneurs need a large enough market of digital consumers to create viable businesses and reward their risk taking and ingenuity. To drive demand and create this virtuous circle, more attention is needed on the development, quality and user convenience of digital services and

local language content, raising awareness of the benefits and instilling trust in the safety and security of online transactions. Efforts to deepen integration of digital markets across borders will also be critical to access larger markets/external demand for Rwandan startups and to attract investment from foreign digital firms seeking a friendly, enabling environment to set up their business and simultaneously access the regional, continental and global digital market.

**Rwanda exhibits both great potential and ambition in leveraging the many benefits of ICT to increase economic and social growth.** The country enjoys a stable political environment, high level of safety, a high-growth economy, increasing internet and mobile penetration, a strategic geographical positioning close to the center of Africa, a young and increasingly urban population, and an enabling policy environment. By harnessing the power of digital technology and the digital economy, the country can build from this strong base – further propelling growth and job creation and ensuring that every Rwandan, whether an urban techie in Kigali, a trader in Gisenyi, or a child in a rural village has a world of information and opportunities at their fingertips. Taking advantage of this opportunity will require further efforts to build digital skills across the entire population and increase utilization of digital infrastructure and financial services. It will require interventions to jumpstart a virtuous cycle of locally driven innovation and content creation led by government, private entrepreneurs and investors that increases the value proposition for individuals and businesses to get online, growing the online customer base and driving further cycles of digital innovation and investment. Now is the time to ‘Think Big.’

**This assessment analyzes the strengths and weaknesses in Rwanda’s Digital Economy Ecosystem – providing recommendations to address the gaps and to take advantage of the huge opportunities at hand.** It highlights key findings based on a series of technical background papers that provide a more detailed analysis and recommendations across the five digital economy foundations – Digital Infrastructure, Digital Skills, Digital Platforms, Digital Financial Services, and Digital Entrepreneurship.

# 1 Introduction

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## 1.1 Rwanda at a Glance

Rwanda is a relatively small, landlocked country, strategically located in East Africa. Densely populated, with approximately 12 million people in a total area of 26,338 km<sup>2</sup>. The population is young (60 percent under the age of 25) and increasingly urban (urban growth at 5.5 percent per year), though still predominantly rural. Rwanda has spent the past decades emerging from a complex historical past of German and later Belgian colonial rule, faltering economy and social and ethnic divide following the 1962 independence and civil war which ultimately culminated in the Genocide of 1994. Following the Genocide, Rwanda had not only lost hundreds of thousands of lives but had had the social and economic fabric of society torn apart.<sup>1</sup>

The past two decades has, however, been characterized by a remarkable growth and poverty reduction, with poverty rates falling from 77.2 percent in 2001 to 55.5 percent in 2017. There has also been a strong dedication to rebuilding the Rwandan nation and identity. In the words of H.E. President Paul Kagame at the 20<sup>th</sup> anniversary of the Genocide:

*“After 1994 everything was a priority and our people were completely broken. But we made three fundamental choices that guide us to this day. One – we chose to stay together. Two – we chose to be accountable to ourselves. Three – we chose to think big.”<sup>2</sup>*

The country’s vision continues to be ambitious and includes becoming a middle-income, knowledge-based economy by 2020. It aims to become an upper middle-income country and to eradicate extreme poverty by 2035. ICT and digital economy development play a central role in achieving this vision, enabling the country to bypass many ‘traditional’ paths to prosperity. Services are increasingly driving the economy – contributing 47 percent of GDP in 2018, followed by agriculture at 31 percent, and industry at 16 percent. Rwanda ranks as the fifth African nation in the World Bank’s 2018 "Ease of Doing Business" rankings and has seen continued growth in foreign direct investment (FDI), increasing 15-fold between 2005 and 2009, from USD \$8 million to \$118.7 million.<sup>3</sup>

## 1.2 Rwanda’s Digital Economy Vision and Strategy

As a landlocked, least developed country (LDC), the development of the digital economy presents a particularly important opportunity for Rwanda’s economic growth and expansion. Rwanda’s ICT sector has been growing rapidly – 2018 witnessed a value added increase of 18 percent, twice the rate of overall GDP.<sup>4</sup> The World Economic Forum’s Networked Readiness Index (NRI) rated Rwanda first among East African nations in terms of readiness to exploit the opportunities offered by ICT to boost growth and competitiveness.<sup>5</sup> A large part of this is due to a highly ICT-committed government, which sees the development of the digital economy as an integral and essential part of reaching its goal of becoming a knowledge-based economy and an upper middle-income country by 2035.

Rwanda has produced a number of ambitious strategic plans regarding the development of the country’s digital economy. Rwanda’s Vision 2020 views ICT as a cross-cutting enabler of its economic development.<sup>6</sup> This is reflected in the specific digital economy strategies adopted by the government. These started in 2000 with the National Information Communications Infrastructure (NICI) policy, aiming at full digitization by 2020 through four five-year plans. NICI I (adopted in 2000) laid the groundwork for creating an ICT-enabling environment through regulatory and legal reforms. NICI II

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<sup>1</sup> World bank, 2019a.

<sup>2</sup> H.E. President Paul Kagame, April 2014, in a speech at Amaharo Stadium on the 20th anniversary of the genocide.

<sup>3</sup> NISR, Gross Domestic Product 2017-18.

<sup>4</sup> United Nations, 2008.

<sup>5</sup> WEF, Networked Readiness Index 2016.

<sup>6</sup> Rwanda Vision 2020.

(2005) focused on developing ICT Infrastructure including rollout of the National Fiber Optic Backbone, and NICI III (2010) focused on promoting skills development, cyber security, and platforms.<sup>7</sup>

**The SMART Rwanda 2020 Master Plan (SRMP), launched in 2015, continues this progression by consolidating the thematic areas of the NICI plans and moving the process forward toward the realization of the Vision 2020.**<sup>8</sup> It also ran in tandem with the 2013-2018 Economic Development and Poverty Reduction Strategy II (EDRPS II).<sup>9</sup> The SRMP identifies three enablers for digital development: ICT Capability & Capacity, Governance & Management and Secured & Shared Infrastructure. It also identifies seven priority pillars: SMART Agriculture, Finance, Trade & Industry, Health, Education, Government, Women and Youth Empowerment in ICT.

**The ICT Hub Strategy (2019-2024) is a strategic five-year plan that aims to make Rwanda a leading ICT Hub in Africa by 2024.**<sup>10</sup> The strategy identifies three gaps in Rwanda's digital economy development and builds three strategic themes on these – building a skilled and educated, IT literate workforce, fostering a national culture of innovation, and developing advanced technological capability in selected niche areas. The strategy also identifies three strengths already present in Rwanda, namely a proactive and stable government, competitive business environment, and enviable lifestyle. Implementation of the ICT Hub Strategy is overseen by the Rwanda Information Society Authority (RISA), which was established in 2017 with the mission to digitize the Rwandan society.<sup>11</sup>

**The National Strategy for Transformation (2017-2024)<sup>12</sup> aims at building a society that, among other factors, includes high inter-personal trust, high quality of life, and life-long learning.** These goals also tie in with digital economy as an enabler of social connection, higher quality of services and products and access to information and education. The ICT sector strategic plan envisions the use of frontier technologies such as the Internet of Things (IoT), blockchain and artificial intelligence to drive economic growth and transformation to a digital economy.

**Despite the rapid growth of ICT, the significant investments into infrastructure and an overall strong ICT commitment, Rwanda lags behind its peers in a number of areas.** Whereas a few aspects of the ICT development are highly advanced – such as the groundwork of the digital infrastructure through the rolling out of a nationwide fiber optic backbone and 4G network – others lag. Digital skills and digital literacy are widely lacking and cause disruptions or delays in each of the other four pillars explored in this report. Usage of high-speed internet, smartphones and digital financial services remains limited, and there remains a gap in the ability of digital innovators and entrepreneurs to translate good ideas into sustainable businesses.

### 1.3 Structure of this Report

**The chapters that follow present a summary of key diagnostic findings on the current state of the five foundational pillars of the digital economy, as set out by the DE4A integrated and foundations-based diagnostic framework** described above. The first chapter discusses the current access, quality and usage of digital infrastructure, as well as the availability and affordability of connectivity. The second chapter looks at the current state of digital skills attainment and coverage, in relation to the basic, specialist and e-business skills needed to support further uptake of digital services, and application of digitally-enabled solutions. The third chapter analyzes current application and scope to expand the use of digital platforms – both in the public and commercial sector. The fourth chapter examines the state and uptake of digital financial services among the public sector, businesses and individuals. The fifth chapter turns to assessing the state of the digital entrepreneurship ecosystem and culture of innovation. The report concludes with a summary of key issues and next steps.

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<sup>7</sup> NICI Plan Phase I (2000-2005); NICI Plan Phase II (2006-2010); NICI Plan Phase III (2011-2015).

<sup>8</sup> SMART Rwanda Master Plan, 2015.

<sup>9</sup> Economic Development and Poverty Reduction Strategy II 2013-2018, adopted 2013.

<sup>10</sup> Rwanda ICT Hub Strategy 2024.

<sup>11</sup> RISA is found online at: [www.risa.rw](http://www.risa.rw)

<sup>12</sup> Rwanda National Strategy for Transformation, 2017-2024.

## 2 Digital Infrastructure

### Key Messages:

- Rwanda has undertaken ambitious investments to build out broadband network infrastructure through innovative public-private partnerships, achieving nearly universal 4G population coverage
- Several challenges are holding back greater utilization of these assets: Affordability of broadband services and digital devices relative to low household incomes; market dynamics resulting in preference for promotion of 3G services over 4G by leading mobile operators; low rates of digital literacy; and limited development and uptake of locally relevant digital content and applications
- To achieve the bold vision of becoming the ICT hub of Africa, Rwanda will need tackle these constraints to ensure that every individual and business has access to high speed, secure and affordable broadband; It will also need to lay the groundwork for infrastructure of the future such as 5G and the Internet of Things (IoT) through a proactive regulatory approach and increased attention to growing cybersecurity threats

### 2.1 Importance of Digital Infrastructure

#### 2.1.1 Socioeconomic Rationale for Digital Infrastructure Development

**The benefits of a robust digital infrastructure on economic growth and job creation are well documented.** Digital infrastructure, particularly broadband connectivity, can lower the cost of transactions, expand markets and services to remote communities and make supply chains more efficient, resulting in greater inclusion, efficiency and innovation. Digital infrastructure forms the bedrock of the digital economy – individuals, business and government must first be able to get online in order to engage in the digital world.

#### 2.1.2 Alignment with Country Development Strategy & Goals

**Digital infrastructure is identified as a fundamental enabler across the Government's socio-economic development strategies.** ICT is considered one of the three crosscutting areas for achieving the country's Vision 2020, with digital infrastructure at its core. The SMART Rwanda Master Plan (2015-2020), focuses on ICT as a transformational enabler to generate growth and create jobs, while building on the infrastructural accomplishments of NICI II (2006-2010). The ICT Sector Strategic Plan (2018-2024) also emphasizes infrastructural developments and envisions the use of frontier technologies including the Internet of Things, blockchain and Artificial Intelligence to transform economic and social progress and to make Rwanda the leading ICT hub in Africa. Finally, the National Broadband Policy envisions broadband as a driver of economic growth, social cohesion, productivity and innovation across all sectors of the economy.

### 2.2 Diagnostic Findings: Current State of High-Speed Internet Development

**Backed by a government highly committed to ICT, Rwanda has taken significant steps to develop the country's digital infrastructure.** A government-funded, nationwide fiber optic backbone network was completed in 2010, followed by a nationwide 4G wholesale network through a PPP with Korea Telecom, reaching 97 percent of the population – an unprecedented level of coverage for a country at Rwanda's stage of socio-economic development. Rwanda has thus largely achieved the Sustainable Development Goal (SDG) ICT infrastructure goal for LDCs of widespread availability.<sup>13</sup> While infrastructure coverage goals have largely been met, the main challenges are to address quality and low uptake of high-speed internet services.

<sup>13</sup> Sustainable Development Goal 9.

## 2.2.1 Availability and access to broadband

Rwandans have relatively few subscriptions of wired broadband, with 0.18 subscriptions per 100 people in 2018. The two main reasons for this are limited availability of wired broadband outside of urban areas, and much higher prices than the mobile alternatives. Fixed broadband is important for enterprises and institutions which rely on higher capacity and has been shown to provide a much larger boost to productivity compared with a mobile connection (though this discrepancy is falling as mobile speeds continue to improve).

Instead, the vast majority of Rwandan consumers access the internet through mobile technologies. This is similar to the pattern across sub-Saharan Africa given the lack of legacy fixed infrastructure. There are three mobile broadband technologies operating in Rwanda: 3G, 3.5G and 4G. While most of the Rwandan population live within signal range of 4G, most consumers are still opting for lower capacity services.

Table 1 Rwanda ICT Infrastructure Benchmarking, 2017

	Rwanda	East Africa	Mauritius (top ranked African country on NRI)	Korea (Rep.) (13th on NRI)	Singapore (1st on NRI)
<b>Usage</b>					
Internet Usage (%)	9*	21	54 (2016)	90	84
Own mobile phone (%)	48	66	83	97	94
Fixed BB Subscriptions (per 100 people)	0.2	1.1	19	42	26
<b>Affordability</b>					
Fixed-BB basket (% of GNIPC)	140	54	1.7	1.5	0.8
Mobile-cellular basket (% of GNIPC)	7.7	9	0.6	1.2	0.2
Mobile broadband 1 GB (% of GNIPC)	36	16	0.6	0.4	0.3
<b>Coverage</b>					
2G Population Coverage (%)	99.9	97	99	99.9	100
3G Population Coverage (%)	93	76	99	99.9	100
4G Population Coverage (%)	89	40	99	99.9	100

Note: NRI = Network Readiness Index. East Africa average is the mean of Kenya, Rwanda, Tanzania and Uganda.

Source: ITU, national surveys for Internet use and World Bank Global Findex database for mobile phone ownership.

\*penetration has grown significantly since this data was collected

## 2.2.2 Analysis of Sector Structure, Market Structure & Regulatory Environment

Despite a small market size, the telecommunications sector in Rwanda is relatively competitive, with two main mobile operators – MTN and Airtel. Airtel bought the operations of a third main operator – Tigo – in 2018, and the market is today fairly equally divided between the two remaining operators. In the fixed line market, MTN and Airtel are joined by Liquid Telecom. Wired broadband is also provided by approximately 20 internet service providers (ISPs), over asymmetric digital subscriber line (ADSL) or fiber, with the top four ISPs accounting for 92 percent of all subscriptions.

Rwanda's 4G wholesale network was launched through a PPP joint venture between Korea Telecom (KT) and the Government, resulting in the KT Rwanda Networks (KTRN). Establishing KTRN was a way for the government to accelerate the rollout of 4G technology in an environment where the existing operators were reluctant to invest given uncertainty and desire to first capitalize on their investments in 3G networks. Government contributed the fiber backbone assets and awarded an exclusive license for 4G and higher services to the joint venture, while KT invested a reported \$140 million in network buildout. KTRN acts as a 4G wholesaler, selling capacity to existing mobile operators and internet service providers (ISPs). The nationwide fiber optic backbone is jointly owned through KTRN and managed by KT. Access is open to all operators at cost-based prices. Other operators have also

deployed thousands of kilometers of fiber along the transmission lines of the state-owned Rwanda Energy Group and other routes.

### 2.2.3 Constraints to High-Speed Internet Development

Constraints to high-speed internet development are analyzed below, using a framework developed in the World Bank's World Development Report 2016 Digital Dividends, based on the four "miles":

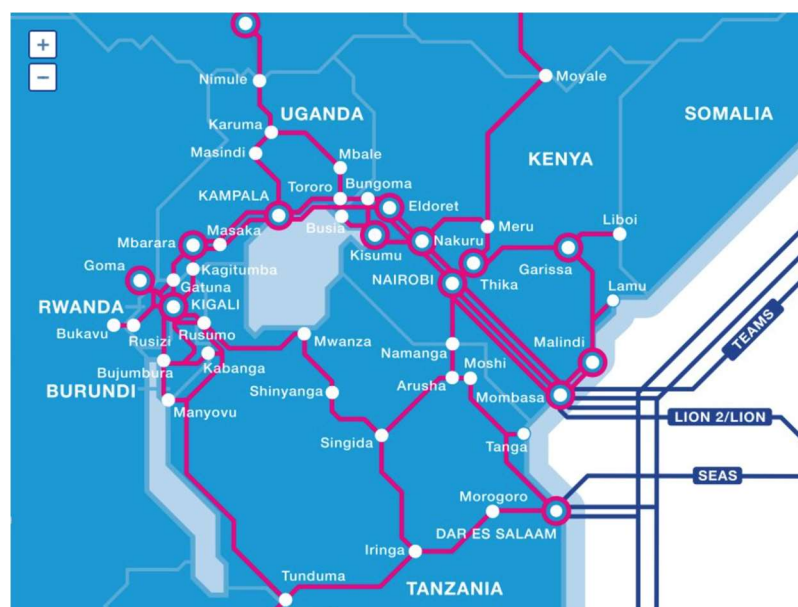
- **First Mile:** how internet enters the country. Understanding how Rwanda is connected to international and regional networks.
- **Middle Mile:** how internet passes through the country. Looking at the national backbone, related regulation and business practices, as well as Internet Exchange Points (IXPs), datacenters/hosting, etc.
- **Last Mile:** how internet reaches end users. Examining local access and mobile networks (2G, 3G, 4G), as well as related market dynamics and structures, regulation and business practices.
- **Invisible mile:** state of hidden elements of the value chain. Exploring policy, legal, and regulatory aspects governing the market including those related to competition, cybersecurity, spectrum allocation, data protection etc.

In Rwanda's case the constraints observed are mostly related to commercial and demand factors, found primarily in the last mile, whereas the first and middle mile are generally well developed.

#### 2.2.3.1 First Mile: International Connectivity

**As a landlocked country, Rwanda's international connectivity depends on establishing connections to neighboring countries in order to access undersea fiber optic cables.** Rwanda connects to submarine cables in Kenya (Mombasa) and Tanzania (Dar es Salaam). It also has international connectivity with Uganda and Burundi (Figure 2-1). After the completion of a World Bank-financed fiber link in eastern DRC to the border of Rwanda, Rwanda will have international connectivity with each of its neighboring countries.

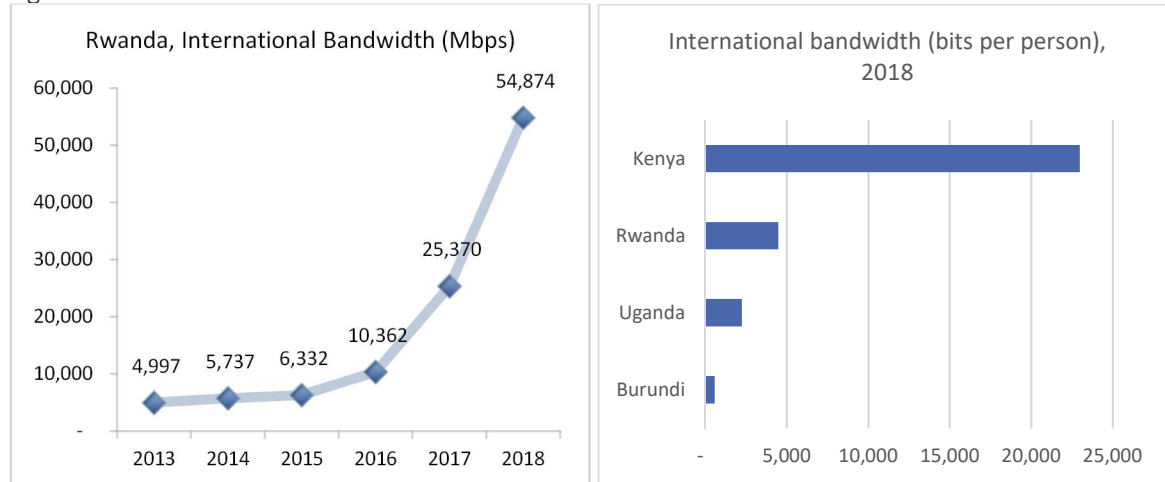
Figure 2-1: Rwanda international fiber optic transmission routes



Rwanda's international internet bandwidth has more than doubled between 2017 and 2018 and now compares favorably to other East African nations (Figure 2-2). One challenge that remains is the large distances that data traffic needs to traverse in order to reach the submarine cables, which may impact latency. This could be addressed by bringing so-called points of presence (PoP) closer, with data caches housed domestically or within the East Africa region. Liquid Telecom is also upgrading fiber networks to support more advanced high-speed technology that should further improve quality.<sup>14</sup>

<sup>14</sup> Nokia. 2019.

Figure 2-2: International Internet bandwidth

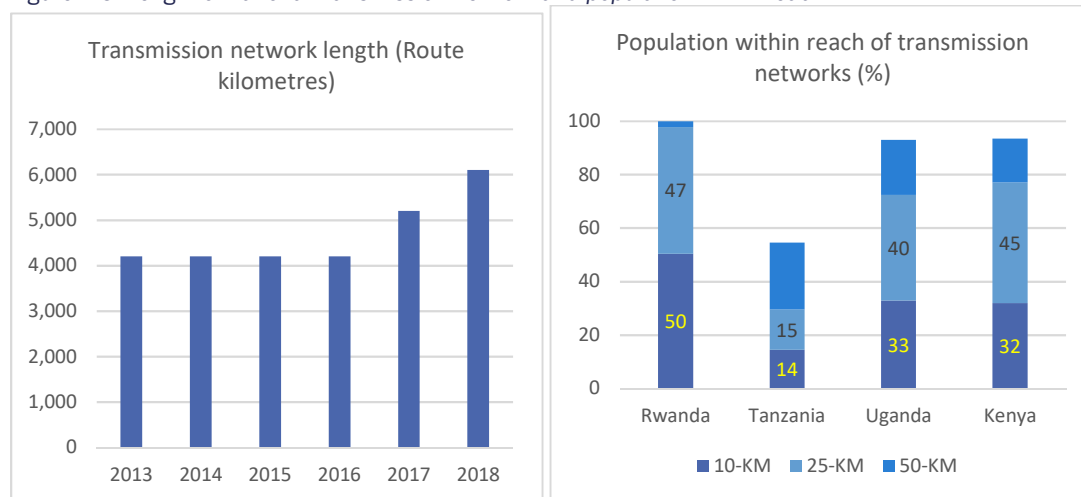


Source: RURA and regional regulators.

### 2.2.3.2 Middle Mile: Backbone Networks

**A nationwide fiber optic backbone network supports the transfer of high-speed data across the country.** The backbone network includes 3,000 kilometers of fiber distributed to all 30 districts and 11 border points, with four rings providing resilience in the case of failure. It also includes 9 interconnection spurs linking to four neighboring countries. This network is now jointly owned by the KTRN joint venture and managed by Korea Telecom (KT). Access is open to all operators at cost-based prices. The government has also invested in the Kigali Metropolitan Network, which provides broadband access to more than 700 institutions, including schools, health centers and local government agencies. In addition, there are several thousand kilometers of fiber deployed by other operators (i.e., MTN, Liquid Telecom, Airtel/TIGO) as well as fiber optic deployed in the transmission lines of the state-owned electricity company Rwanda Energy Group, some of which is leased to telecommunication operators. Given Rwanda’s high population density, compact size, and the far-reaching backbone network, a higher percentage of the population lives within 25 kilometers of the high-speed internet than in any other East African nation (Figure 2-3), a key enabler to offering affordable last mile retail services. Competition in this segment has helped drive investment and lower costs of services.

Figure 2-3: Length of national transmission network and population within reach



Source : ITU Interactive Transmission Maps (<https://www.itu.int/en/ITU-D/Technology/Pages/InteractiveTransmissionMaps-old.aspx>).

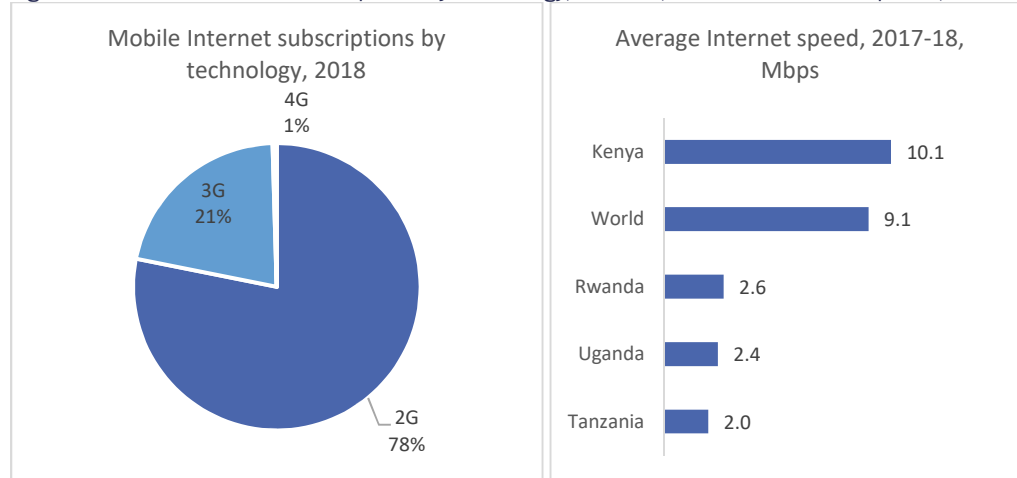
The Rwanda Internet Exchange Point (RINEX)<sup>15</sup> reduces reliance on costly international links and improves service quality, but most traffic is still international. It currently links 14 members including all of the main operators. Traffic averaged around 2.5 Gb/s in June 2018, almost double the previous year and roughly equivalent to about 4 percent of Rwanda’s Internet traffic. However, the low proportion illustrates the degree to which most of the country’s Internet traffic is still to overseas sites.

There are several data centers in the country providing data storage and cloud computing services. The National Data Center is managed by a joint venture between the government and Korea Telecom<sup>16</sup> providing hosting facilities for public institutions and the private sector. In addition, both Liquid Telecom and MTN have data centers offering commercial services. Consultations revealed the perception by current and potential customers that data storage/cloud services in Rwanda remained high cost, in part due to the small scale of the datacenters, high costs of electricity and lack of presence from the larger regional and global players in the Rwandan market. This can have a significantly negative impact on the development of downstream data driven services offerings.

### 2.2.3.3 Last Mile: Internet Services

The last mile of digital infrastructure is where Rwanda faces the most significant challenges. Although network investments have resulted in impressive signal coverage, internet usage and demand for high-speed internet remain low, which prevents the infrastructure from meeting the end user. As seen above, wired broadband subscriptions are uncommon. Broadband in Rwanda is instead overwhelmingly mobile, with 3G being by far the most common technology deployed. However, 78 percent of mobile subscribers still rely on 2G services, which has very limited practical application or use beyond voice and SMS based services. Low uptake of higher speed technology is primarily due to affordability constraints – both for the services as well as the mobile broadband enabled devices that are needed to connect. These constraints are compounded by lack of awareness of the benefits of broadband connectivity and the skills to use it as well as limited energy access in rural communities (the battery on a basic 2G mobile phone lasts longer than a smartphone).

Figure 2-4: Mobile Internet subscriptions by technology, Rwanda, 2018 and Internet speeds, 2017-18



Note: Speed data for Rwanda based on 995 tests.

Source: RURA and Cable (<https://www.cable.co.uk/broadband/speed/worldwide-speed-league/>).

Few subscriptions of wired broadband, as well as a high reliance on low speed internet technologies, mean that consumers’ experience of internet services is slower than need be. Rwanda has significantly lower average internet speed (2.6 mbps) than the global average (9.1 mbps) and the regional leader Kenya (10.1 mbps). This, in turn, can result in an even lower demand as consumers do not realize the full potential of the services available. Low speeds also limit the economic impact of digital

<sup>15</sup> <http://rinex.org.rw>

<sup>16</sup> <http://www.aos.rw>

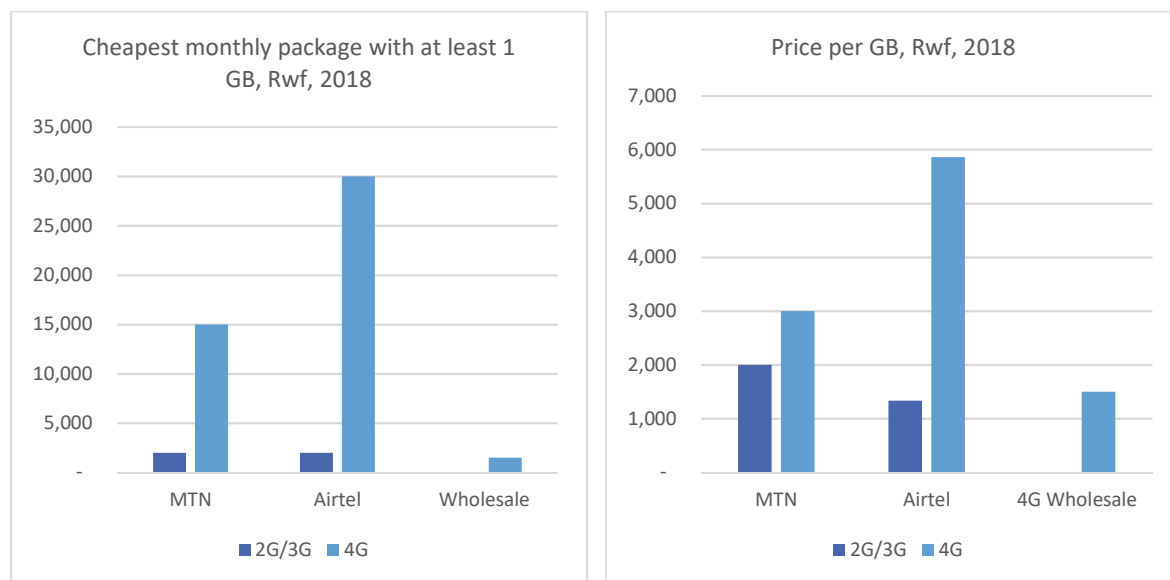
infrastructure where studies have found that higher speeds have a notable impact, in addition to adoption.<sup>17</sup>

**Rwanda has among the lowest absolute prices for mobile broadband in the world, however prices are still high relative to the median monthly income.** The average monthly price of 1GB of data was US\$0.56 in 2018,<sup>18</sup> equivalent to 5.1 percent of the median monthly income. Daily and monthly plans currently offered by operators allow users flexibility in matching consumption to income. Besides exploring the potential for further reduction of prices, the perceived value of internet access also needs to be addressed in order for more users to prioritize this in their household expenditures.

**Accessibility and affordability of smartphones and other advanced computer devices is a significant challenge.** Access to basic communication devices has some way to go to achieve ubiquity. Only 63 percent of households reported having a mobile phone in 2017, with a significant gap of over 30 percentage points between urban and rural areas. To address the affordability constraint MTN launched an “entry-level smartphone” in early 2019. At a retail price of \$23 it is inexpensive by global standards, but still represents around half of the median Rwandan monthly income.<sup>19</sup> It also lacks the full functionality of a smartphone. 4G devices are particularly costly, with the cheapest smartphone offered by KTRN priced at RwF 68,000 compared to a median monthly income of RwF 39,000. This dampens consumer demand for higher speed services and drives more mobile broadband customers toward slower 3G services. Mobile phone taxes in Rwanda are also among the highest in the world, which may contribute to high prices and low uptake.

**Commercial considerations are also holding back adoption of higher speed (4G/LTE) services.** The main mobile operators actively promote 3G and 3.5G services utilizing their proprietary networks rather than re-sale of 4G services offered through the KTRN wholesale network and corresponding devices. The cheapest 30-day package including at least 1 GB of data is significantly cheaper on 2G/3G networks compared to 4G networks and the price per GB is also cheaper. This is despite the fact that the wholesale price for 4G has been falling and appears to be in line with or lower than the retail price for 3G.

Figure 2-5: Price of 1 GB mobile data on different networks



Source: MTN Rwanda, Airtel Rwanda and KTRN.

As a result, only 1 percent of mobile subscriptions use 4G technology. While it is difficult to assess the relative weight of the factors at play, market consultations also revealed perceptions that the

<sup>17</sup> Rohman & Bohlin, 2012; Koutroumpis, 2018.

<sup>18</sup> Cable, 2018.

<sup>19</sup> KTRN, Wholesale Plans and Prices.

“bundles” of services on offer were not viewed as attractive to the mobile operators, due to pricing and limited opportunity to distinguish their subsequent retail offerings (they prefer “unbundled” bandwidth). Concerns were also expressed about the capacity of the 4G network due to relatively low tower density and the lack of control over service quality by the re-sellers though the services are being offered under their retail brands.

**Lack of digital skills and awareness are also impacting uptake.** Focus group discussions carried out among non-Internet users across Rwanda cited three main factors for lack of uptake that largely confirm the analysis above. Firstly, illiteracy and lack of understanding of English or French makes operation of devices a challenge and much digital/internet content inaccessible, particularly to those who had not finished primary and/or secondary school. Secondly, they listed affordability constraints to buying smartphones and data. Thirdly, there is a limited awareness of the benefit of using internet, particularly in rural areas.<sup>20</sup>

#### 2.2.3.4 Invisible Mile: Regulation, Policy and Institutions

**Rwanda has established strong and accountable policy and regulatory regimes and institutions governing the telecommunications sector.** This has resulted in proactive efforts to bring down the costs of digital infrastructure deployment, attract investment, promote network security and increase access in rural areas. While the current landscape is highly supportive, there will be a need to continually update the regulatory framework and policies in line with technology evolution and market maturity. Given the limited number of players in the mobile retail space, a robust regulatory oversight will need to be maintained to avoid abuse of market power and promotion of competition.

**The 2016 Communications Act (N°24/2016 of 18/06/2016) provides comprehensive coverage of a wide range of activities (GoR 2016).** The law covers telecommunications, broadcasting and postal services and other related areas. Key sub-topics covered include universal service, licensing, type approval, rights of way, electronic transactions and computer crime.

**Rwanda has a de facto converged licensing regime.** While a formal regime does not exist currently, the National Broadband Plan calls for technological neutrality in the licensing regime. The three types of concessions recommended under this plan include: Individual Licenses (covering operation of networks and use of radio frequencies), Standard Licenses (covering service provision) and General Authorizations (covering equipment supply, installation and maintenance) The simplified licensing regime has been key to the rapid deployment of 4G in the country.

**Infrastructure sharing has lowered the costs of network deployment and operations.** The regulatory framework encourages passive infrastructure sharing (sites, masts etc.) and discourages sharing of the active parts of networks (base stations, microwave radio equipment, switches etc.) A key result of the passive infrastructure sharing has been the sale of masts owned by operators to tower companies.<sup>24</sup> These transactions lower Opex and Capex costs for operators by an estimated 30-50 percent, provide alternative sources of revenues, and reduce the environmental impact of each operator having their own tower.

**Rwanda has also put in place initiatives to enhance information security with the aim to increase confidence and trust among consumers and businesses.** The 2018 *Law on Prevention and Punishment of Cyber Crimes*<sup>22</sup> provides the Legal basis for prosecuting offenses. The Computer

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<sup>20</sup> RIA, 2017.

<sup>21</sup> For example in 2014, MTN Rwanda sold 550 towers for US\$48 million to IHS, a pan-African mobile infrastructure company. See "Note 5" in MTN's 2014 Financial Statements at: [http://www.mtn-investor.com/mtn\\_ar2014/financials/note5.html](http://www.mtn-investor.com/mtn_ar2014/financials/note5.html)

<sup>22</sup> Government of Rwanda. 2018. *Law N° 60/2018 of 22/8/2018 on Prevention and Punishment of Cyber Crimes*.

[https://minict.gov.rw/fileadmin/Documents/Mitec2018/Policies\\_\\_\\_Publication/ICT\\_Laws/Law\\_on\\_prevention\\_and\\_punishment\\_of\\_cyber\\_crimes.pdf](https://minict.gov.rw/fileadmin/Documents/Mitec2018/Policies___Publication/ICT_Laws/Law_on_prevention_and_punishment_of_cyber_crimes.pdf)

Security Incident Response Centre (CIRST) monitors attacks and implements security solutions. The National Cybersecurity Agency was established by a 2017 law.<sup>23</sup>

**A series of institutions have been created to establish and implement the government's vision for the telecommunications sector and wider digital economy transformation.** These include: (i) The Ministry of Information and Communications Technology and Innovation, responsible for ICT (and postal service) policy and strategy; (ii) The Rwanda Utilities Regulatory Authority (RURA), a multi-sector regulator responsible for telecommunications, media, water, energy, sanitation and transport; (iii) The Rwanda Information Communication and Technology Association (RICTA) a non-profit organization representing the Internet community and administering RINEX and the .RW internet country domain name; (iv) the Rwanda Development Board (RDB) which facilitates private sector investment and marketing ICT products internationally; and (v) the Rwanda Information Society Authority (RISA), established in 2017 as a dedicated ICT implementation agency charged with executing the government's digitization strategy and fostering collaboration with the local ICT ecosystem.

## 2.3 Recommendations & Next Steps

**To achieve the goals of universal access and full utilization of existing digital infrastructure investments, further steps are needed to stimulate demand and to address the structural constraints in the 4G market.**

**R1. Rolling out broadband in public centers.** Government can purchase capacity for public institutions (schools, health centers, agricultural extension centers, public Wi-Fi hotspots, etc.) and make it available for public use as part of a demand stimulation and public service delivery effort. This can provide exposure and increase the understanding of the benefits being connected to the internet.

**R2. Deploy strategies to lower digital device costs.** Reducing or eliminating import duties and sales taxes on ICT devices would make them more affordable. Availability of low-cost loans to spread payments out can help and could be offered in conjunction with other services. For those that cannot afford a device via loan repayment, support mechanisms such as third-party payment or partial voucher schemes could be explored. Government could also consider bulk negotiation/purchase schemes to bring down the unit costs of 4G devices. Regionally coordinated schemes would help increase bargaining power and reduce leakage of subsidized or tax-exempt units across borders.

**R3: Increasing offerings and uptake of 4G services.** Government is encouraged to engage with the main mobile operators and KTRN to find a viable pathway to improve the attractiveness of the 4G wholesale offerings to the MNOs in exchange for commitment by the MNOs to actively market and price 4G services and devices with the aim to massively increase uptake. If such dialogue fails, more aggressive options, including restructuring of the KTRN joint venture could be explored.

**R4. Increasing internet usage among companies.** Increasing the presence of MSMEs online would boost digitization of the economy and create opportunities for startups to offer business applications and sell goods and services through online platforms. Evidence suggests that the majority of MSMEs do not currently have websites or use internet services for business purposes. Training opportunities, financial incentives and initiatives such as mandating online filing of tax forms or providing low cost wired broadband and computer packages for small businesses could help boost uptake.

**R5. Continue raising digital literacy.** As explored further in the digital skills section of this report, the GoR is encouraged to continue to scale up the Digital Ambassadors Program to provide opportunities for individuals in every community to gain basic digital literacy and create a wider pool of potential digital consumers.

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<sup>23</sup> Government of Rwanda. 2017. Law No 26/2017 of 31/05/2017 Establishing the National Cyber Security Authority and Determining its Mission, Organisation and Functioning.

[https://minict.gov.rw/fileadmin/Documents/Mitec2018/Policies\\_\\_\\_Publication/ICT\\_Laws/Law\\_establishing\\_the\\_\\_NCSA-2-20.pdf](https://minict.gov.rw/fileadmin/Documents/Mitec2018/Policies___Publication/ICT_Laws/Law_establishing_the__NCSA-2-20.pdf)

**R6. Improving data collection to inform policymaking and investments.** Finally, there is a need for more detailed and routine data collection on why people and firms are using or not using the Internet and other digital technologies, and what they use them for. Dedicated ICT surveys for individuals and businesses, could help shed light on personal and enterprise usage patterns and bottlenecks. Disaggregated national accounts and employment data would also be necessary to better understand the ICT sector and the breakdown between telecommunications on one hand and computer and information services on the other. This can be carried out through a dedicated ICT Sector Satellite Account or collecting disaggregated data in business surveys.

## 3 Digital Skills

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### Key Messages:

- Digital skills are a cross-cutting constraint to developing Rwanda's digital economy
  - It is critical to achieve universal digital literacy to ensure that no Rwandans are excluded from the digital economy and to create the user base to incentivize development of digital services, content and e-commerce applications and businesses
  - Addressing the digital skills gap through the traditional education system and approaches alone will not be sufficient; Alternative training delivery models, close links between industry, government and academia and a commitment to lifelong learning are critical to prepare for the jobs of the future and to support a rapid digitization of 'traditional' industries
  - Rwanda has the opportunity to become a hub for advanced digital talent, but stronger links with the sub-region, continent, and global networks are critical
- 

### 3.1 Importance of Digital Skills

#### 3.1.1 Socioeconomic Rationale for Investing in Digital Skills Development

**Digital skills form an essential building block of the digital economy and are critical to maximizing the uptake, impact and benefits of digital development.** Widespread digital skills also help ensure greater inclusion and equal access to online services, information, and the digital market. As such, digital skills have a cross-cutting effect on all other foundational pillars of the digital economy. In Rwanda, gaps in digital literacy have been identified as a major barrier to the uptake of ICT services and platforms (government and commercial), to digital entrepreneurship and market growth, and to accessing digital financial services.

**In a rapidly digitizing world, building a tech-savvy workforce is crucial to harnessing emerging opportunities and increasing productivity across sectors.** Increased digital skills can support job growth, protect existing jobs, and facilitate new ones, by preparing the workforce for a continued technological and digital development. Finally, increasing digital skills is critical to enabling innovation, which is high on the GoR's agenda and important for continued economic growth.

#### 3.1.2 Alignment with Country Development Strategy & Goals

**Rwanda has adopted a number of policies to specifically support the integration of ICT in education.** These include the National Digital Talent Policy (DTP),<sup>24</sup> which envisions transforming Rwanda into the most digitally talented nation in the region, by addressing education, skills mismatch, and ICT sector economic growth. In addition, the 2016 ICT in Education policy complements the Smart Rwanda Plan (SRMP) and focuses on using ICT as an enabling tool to strengthen education and training for all Rwandans.

**The GoR evaluates its progress on digital skills development by regularly conducting a SWOT analysis and shifting the policy direction accordingly.** The most recent assessment resulted in a new policy draft labeled "A strategy to match ICT skills with ICT sector industry needs in Rwanda, 2019-2023". This aims at further addressing the gaps within ICT skills development, such as misalignment between ICT education and practical skills needed by industry, and low enrollment and completion of trainings.

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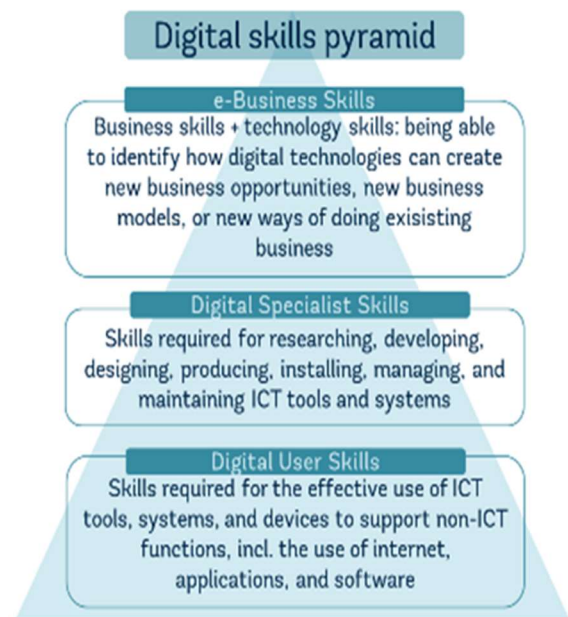
<sup>24</sup>Ministry of Youth and ICT, 2016.

## 3.2 Diagnostic Findings: Current State of Digital Skills

### 3.2.1 Market Analysis of Digital Skills Demand & Availability

This report applies a tiered definition of digital skills analyzing (1) basic and core digital user skills, (2) more advanced digital specialist skills and (3) e-business skills (See figure 3-1). Each layer of the digital skills pyramid spans a spectrum from basic skills to more advanced. Basic digital user skills are mostly taught at primary and secondary school level. They include basic digital literacy and tools such as typing, word-processing, and online browsing and communication. Digital specialist skills entail advanced understanding of developing, designing and producing ICT tools and systems. This spans from web design, programming and software development to more advanced development of artificial intelligence (AI). Digital specialist skills are primarily taught at universities, and to a lesser extent at Technical and Vocational Education Training (TVET) institutions or by private education providers. E-business skills correspond to skills needed in digital entrepreneurship and include the business acumen and advanced digital specialist skills needed to produce and market new commercial products or services.

Figure 3-1: Digital Skills Pyramid



#### 3.2.1.1 Basic Digital User Skills

**Basic digital skills are included in the national Competency-Based Curriculum (CBC) at both primary and secondary school level.** Primary and lower secondary school is mandatory, while upper secondary school is not. Enrollment in primary level is near universal, but drops markedly at secondary level, which clearly affects the impact and inclusiveness of any digital education after primary level. The CBC plan for digital skills education spans from “befriending” the computer and learning basic usage in lower primary school, all the way to teaching optional and specialized classes in programming and database management in upper secondary level. Students often learn about these topics in theory rather than in practice, because of lack of digital devices, limited internet connectivity in schools, and gaps in teacher training. Teaching this curriculum offline significantly affects its impact.

**The Ministry of Education (MINEDUC) has sought to improve access to devices through the One Laptop per Child (OLPC) initiative launched in 2008.** This mainly targets primary schools and aims at covering at least five schools per district. OLPC’s XO laptops that come pre-installed with educational content and applications, have been provided in targeted schools, however a well-trained teacher is still required in order to explain its functions. Implementation of OLPC has faced challenges in terms of funding constraints and limited teacher capacity, inter alia.<sup>25</sup>

**MINEDUC is now refocusing from OLPC to the concept of a “Smart Classroom” at primary level.** This involves switching to standard laptops rather than the pre-programmed XO computers, which could lower costs. Efforts are also made to better integrate digitization in teaching and learning, rather than as a separate module.<sup>26</sup> Current implementation seems to fall short of the initial targets however, and limited internet connectivity and access to electricity remain a significant obstacle. Teachers also seem to lack sufficient training in how to integrate ICT and digital skills into existing learning modules. The Rwanda Education Board (REB) carries out trainings, partly through the OLPC program, where 9,350 teachers have been reached so far, but there is wide scope to do more.

**Insufficient digital content also represents a challenge in effectively supporting integration of digital material and tools in education.** There is currently limited digital content available that is aligned with

<sup>25</sup> Ministry of Education, 2016.

<sup>26</sup> Ministry of Education, 2016.

the CBC, however the REB is reportedly working on digitizing materials. MINEDUC, the African Institute for Mathematical Sciences (AIMS) and the College of Education are also collaborating on digital content development. The process has been hampered in part by weak access to enabling infrastructure and internet connectivity, as well as copyright issues for digitizing textbooks. Partnering with the private sector in order to continue developing digital content could prove beneficial.

**Although basic digital skills should ideally be embedded in the national education system, market-led, government-run or voluntary complementary schemes may also be relevant when facing large gaps.** In line with this, the GoR launched the Digital Ambassadors Program (DAP) in 2017, as part of a PPP with the World Economic Forum (WEF) and the Digital Opportunities Trust (DOT).<sup>27</sup> The program aims to train 5,000 young Rwandans to serve as digital skills trainers, with the objective for these ‘ambassadors’ to collectively reach 5 million people by offering training programs in their communities. If successful, this can have an enormous impact on the country’s digital literacy. As of mid-June 2019, 115 Digital Ambassadors have been trained, which in turn have provided trainings to 41,307 beneficiaries according to the DOT.

**There are other relevant PPPs and private sector programs** including a teacher-training collaboration between MINEDUC and Microsoft’s Imagine Academy, as well as the Tigo- and GSMA-led Mobile Internet Skills Training Toolkit (MISTT) which targets entry-level smartphone users across Rwanda.<sup>28</sup> It would be beneficial to expand on private sector trainings, as these have often resulted in a win-win. When digital literacy is raised in the public, usage of digital services and revenue for private sector providers increase. MISTT, for instance, resulted in 77 percent of trained users increasing their data usage.

### 3.2.1.2 Digital Specialist Skills

**Training in basic digital specialist skills is available at upper secondary schools, whereas more advanced skills are taught at universities.** At upper secondary level, TVET is offered by Technical Secondary Schools (TSSs), Vocational Training Centers (VTCs) and Integrated Polytechnic Regional Centers (IPRCs). These offer primarily pre-employment training to youth and unemployed, but also up-skilling and continuous education for those already in the workforce.

**ICT courses are offered by all three types of TVET institutions, but not all can be considered to be at digital specialist level.** The most advanced skills are taught at IPRCs through a diploma in information technology or in multimedia, whereas TSSs offer certificates in computer science and VTCs offer only basic IT skills training. All courses, particularly those in basic IT skills, would benefit from moving away from a conceptual level of teaching to more professional application of ICT skills. In 2017 only 11 percent of TVET students were studying ICT. Efforts are being made to draw more students and increase the quality of education, such as the establishment of ICT innovation centers at some IPRCs. The government has also launched a coding academy which covered 108 TVET institutions and trained 15,000 students.

**In terms of specialist skills in higher education, Rwanda is also home to 28 accredited universities, as well as other higher learning institutions that offer courses in digital skills.** Out of these, the research team has reviewed ICT-related programs offered at six university institutions.<sup>29</sup> The analysis revealed that while all universities offered courses in basic digital skills, and many offered basic specialist skills – such as those needed to educate computer support technicians – the more advanced subjects were covered by fewer institutions. There are few universities that offer the digital specialist skills needed for the fourth industrial revolution such as artificial intelligence (AI), internet of things (IoT), big data analytics and blockchain, partly due to lacking teaching capacity in these areas.

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<sup>27</sup> WEF, 2017.

<sup>28</sup> Millicom and the GSMA, 2018.

<sup>29</sup> The Adventist University of Central Africa (AUCA), the African Institute of Mathematics and Science (AIMS), the Carnegie Mellon University (CMU), Rwanda, the Kigali Independent University (ULK), the African Leadership University (ALU) and the University of Rwanda (UR).

Total enrollment for higher education in 2016-2017 was 91,193 students,<sup>30</sup> with an estimated 2,544 students graduating with ICT-related degrees in 2016. The quality of education could be improved according to stakeholder consultations, mostly by increasing focus on hands-on, practical teaching. Graduates tend to have a theoretical understanding but lack the ability to apply that effectively. While the number of graduates could meet a significant proportion of the current market demand if the quality is improved, they would be insufficient to meet the higher aspirations of serving as a regional digital talent hub.

**Education is also dependent on ICT access and human resources.** All universities have internet access, but only 58 percent of TVET institutions have access. The Rwanda Research and Educational Network (RWEDNET) has been established, but related infrastructure is not yet fully functional due to funding constraints. Rwanda would also benefit from connecting to the regional education network UbuntuNet. Accessing ICT-qualified faculty is a challenge, with many courses relying on international faculty or Massively Open Online Courses (MOOCs). MOOCs have proven successful, allowing students to learn from world-leading professors at a distance, and could be scaled up.

**Private providers have been successful in establishing a number of advanced digital skills trainings, mostly through PPPs, that could be further expanded.** Programs include Andela, which uses a hands-on approach to computer programming trainings and recruits primarily computer science university students and WeCode, which trains girls and women in programming through 11-week bootcamps. Both programs connect students to prospective employers and WeCode offers contracts to the most successful graduates at their own outsourcing center. Short courses for advanced IT skills are also taught through the pan-African Coding for Employment Program, as well as K-Lab and FabLab. The two latter also offer space and resources to test prototypes and build business models for aspiring entrepreneurs (see the Digital Entrepreneurship section). Stakeholder consultations however show that users often do not finish projects due to other school or work commitments, suggesting that formalized partnerships between the labs and universities could help improve trainings.

**The GoR also launched a coding academy in early 2019,** focusing on areas with weak supply of digital talent, namely cyber security, embedded programming and software programming. The initiative is currently running its first training, with 60 students undertaking a three-year software engineering course. The aim is to enroll 300 students annually, with one academy in each province.

### 3.2.1.3 *E-Business Skills*

**Courses in e-business skills taught through formal education are limited.** At TVET-level, this is only taught through a handful of modules for advanced IT students. Universities also have a limited offering, with most courses focusing on pure IT skills, not including business acumen. There are some exceptions, such as the University of Rwanda (UR), the Adventist University of Central Africa (AUCA) and the African Leadership University (ALU) where relevant courses are taught, but overall the cross-pollination between ICT courses and business administration can be expanded significantly. Partnerships between academia and industry have resulted in some successful programs, such as the industry-based practicum and internship program run by Carnegie Mellon University (CMU) where students are linked with alumni and businesses to gain practical experience. Similar programs could be encouraged at more educational institutions.

**Private providers have launched a number of initiatives to address the gap of e-business skills in Rwanda.** The Digital Opportunity Trust (DOT) has launched the ReachUp initiatives that target out-of-school, unemployed youth with trainings in soft skills and financial digital literacy, encouraging small-scale entrepreneurship. K-Lab offers short entrepreneurship courses and hosts events, such as pitching competitions and hackathons, aimed at inspiring and identifying digital entrepreneurship talent. In addition, the German Development Agency-funded Make-IT-Africa has supported approximately 145 startups through specific skills training. Private initiatives and programs seem to have been successful and could be greatly expanded.

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<sup>30</sup> Ministry of Education, Rwanda Education Statistics, 2017.

**Government-run programs include the *Girls in ICT* initiative**, which was launched by MINICT and the International Telecommunication Union (ITU) together with local female entrepreneurs and professionals and aims at increasing the percentage of women in the STEM field. It includes coding bootcamps, a mentorship network and most notably the Ms. Geek Rwanda competition. Although the initiative was successful to train and mentor girls, further consultations suggested that there is scope to improve follow-up.

#### 3.2.1.4 *Demand for digital skills*

**In order to generate a greater digital economic development, Rwanda will need to adopt a two-pronged approach, boosting not only the supply of skills but also the demand for them.** This will ensure that the labor market makes the most possible use of the available talent and that it is attractive for individuals to acquire these skills. Current market demand for digital specialists stems primarily from financial service providers, IT and telecommunications companies and governmental agencies, along with the health sector as a seemingly growing employer. Although analysis shows that more digitally skilled labor is needed for the digital transformation that the government envisions, it also seems that the current job market is not appropriately absorbing the existing skills base through offers of employment. Stakeholders did not, for instance, list agriculture or trade as potential employers, suggesting that further efforts are needed to digitize these sectors in line with the government vision.

**Outsourcing centers appear to be a promising way to support employment of digitally-skilled graduates.** Several international freelancing applications are currently being used in Rwanda and there is scope to expand this. The emerging Kigali Innovation City (KIC) aims to promote Rwanda as a destination of outsourcing.

**Another important aspect is to improve matching of supply and demand.** The GoR is in the process of developing an Integrated National Skills Database (NSDB) system that can help collect data on available talent and increase connections with employers. An annual labor force survey seeks to gather data on labor market trends, however more data is needed in terms of skills on the demand side. The website of the Ministry of Public Service and Labor posts governmental vacancies and is among the most accessed sites in Rwanda. Other existing job sites include New Times (a media website), Job Web Rwanda, Jobs in Rwanda, Tohoza, Mindsky JobsKazi, and Ejobu.

**The Rwanda Development Board predicts that digital skills will be critical in Rwanda beyond the ICT sector**, enabling roughly 3 million jobs in 2030, compared to one million in 2016.<sup>31</sup> This suggests that with appropriate support according to the factors listed above, there is great potential for the employment of digitally-skilled talent.

### 3.2.2 *Constraints to Attracting & Developing Digitally Skilled Labor*

**Limited access to electricity, internet connectivity, digital devices and digital content present constraints to further developing digital skills training at the primary, secondary and TVET level.** The quality of digital education suffers when skills are taught in theory rather than in practice. In addition, gaps in teacher training and capacity persist from primary school to TVET and university level, limiting the impact of programs in basic education as well as the depth and breadth of advanced education. Limited attractiveness and low enrollment in STEM-related subjects also presents a constraint to boosting skills among graduating students. Other constraints include limited funding available for scale-up of successful models, such as the Smart Classrooms, Digital Ambassadors program, and the Rwanda Education and Research Network.

**Trainings and educational programs are generally characterized by weak linkages to industry, which prevents skills-training from being tailored to the needs of the labor market.** Companies are reluctant to offer on-job training, preferring instead to train existing employees or poach talent from competitors, which perpetuates a skills gap among recent graduates. In order make use of existing digital and e-business skills, education also needs to be complemented by soft and 21<sup>st</sup> century skills. These

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<sup>31</sup> Rwanda Development Board. 2019.

include problem solving, communication and public speaking, critical thinking, leadership and team work, and are typically not taught in the Rwandan educational system. Finally, there is a gap in labor market data pertaining to digital skills, which could otherwise facilitate better alignment between the educational side and the labor market. Existing data collection, including the government's labor force survey and Labor Market Information System (LMIS), does not allow for granular analysis in terms of skills on the demand side.

### 3.3 Recommendations & Next Steps

#### Objective 1: Improve access to necessary resources in education and trainings

**R1. Equip students and educators with appropriate devices, infrastructure and content.** More investments are needed to expand access to digital devices, as well as secure electricity coverage and internet connectivity at schools and TVET institutions. Scale up of Smart Classrooms and other initiatives may also need to be evaluated, while taking funding restrictions into consideration. This should be complemented by digital content that is engaging, available in local languages and aligned with the CBC. The REB could consider leveraging open resources that are already available, as well as partnering with the private sector.

**R2. Review and expand teacher training.** Teachers need further and upgraded training in relation to digital skills and their integration with the CBC.

**R3. Crowd-in more private sector providers to expand non-formal basic user training as well as funding for existing schemes such as the DAP.** The Government can make efforts to identify companies that might benefit from organizing trainings and establish win-win partnerships.

#### Objective 2: Support quality improvement in the education of work-ready digital specialists

**R4. Consider scale-up of MOOCs and sourcing lecturers from the private sector to bridge existing faculty gaps.** Creating a roster of regional trainers could also reduce the costs associated with sourcing international faculty.

**R5. Expand scholarships to boost access and completion rates for higher education.** This will help ensure that financing is not preventing talented students from accessing training opportunities.

**R6. Boost the attractiveness of STEM-related education.** This can be done by supporting in-school activities such as ICT weeks or 1-day coding boot camps, as well as other efforts to increase enrollment.

#### Objective 3: Encourage greater development of soft skills, business acumen and other qualifications tailored to the needs of the labor-market.

**R8. Boost the development of soft and 21st century skills in the existing curriculum.** Problem solving, critical thinking and other 21<sup>st</sup> century skills need to be better included in the CBC, in order to prepare students for the workforce.

**R9. Expand and improve the quality of TVET-level digital specialist skills education, through PPPs and skills development funds.** Competitive financing and formalized partnerships between facilities could help improve quality and expand access to hands-on training. Basic digital user skills trainings can also be complemented with professional application of ICT skills in technical and vocational fields, facilitating application of digital tools across a wide range of sectors.

**R10. Increase industry-academia exchange.** This will help decrease the gap between skills development and labor market needs, as well as expand access to practical training.

**R11. Support cross-pollination between academic programs available in ICT and business administration.** This will better prepare graduates for applying their ICT skills in a business setting, and also encourage more viable tech start-ups.

**Objective 4: Align supply and demand to break the low skills equilibrium**

**R12. Improve labor market data collection and analysis.** A more accurate understanding of the current state of digital skills, market trends and future needs could help address skills mismatch.

**R13. Expand initiatives to incentivize and accelerate digital transformation of key sectors.** Government needs to further encourage digital transformation of the private sector, in order to increase the local demand of digital skills and employment opportunities for existing talent.

## 4 Digital Platforms

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### Key Messages:

- Rwanda has put in place many of the key building blocks to deliver digital public services and to digitize internal government operations including cloud infrastructure, enabling platforms such as ID and payment systems, strong institutions, and clear strategies and implementation plans
  - While gaps in the building blocks remain, the greater challenge is to boost uptake and impact of digital public services by increasing awareness and digital literacy, ensuring universal internet access, and increasing the convenience, security and privacy of online services and transactions
  - Without the benefits of a large domestic market and online customer base, deliberate efforts by government are also needed to stimulate development of the digital commercial platforms and services ecosystem and to maximize the opportunities and benefits to MSMEs and individuals that use commercial platforms to communicate and connect to new information, services, customers and jobs
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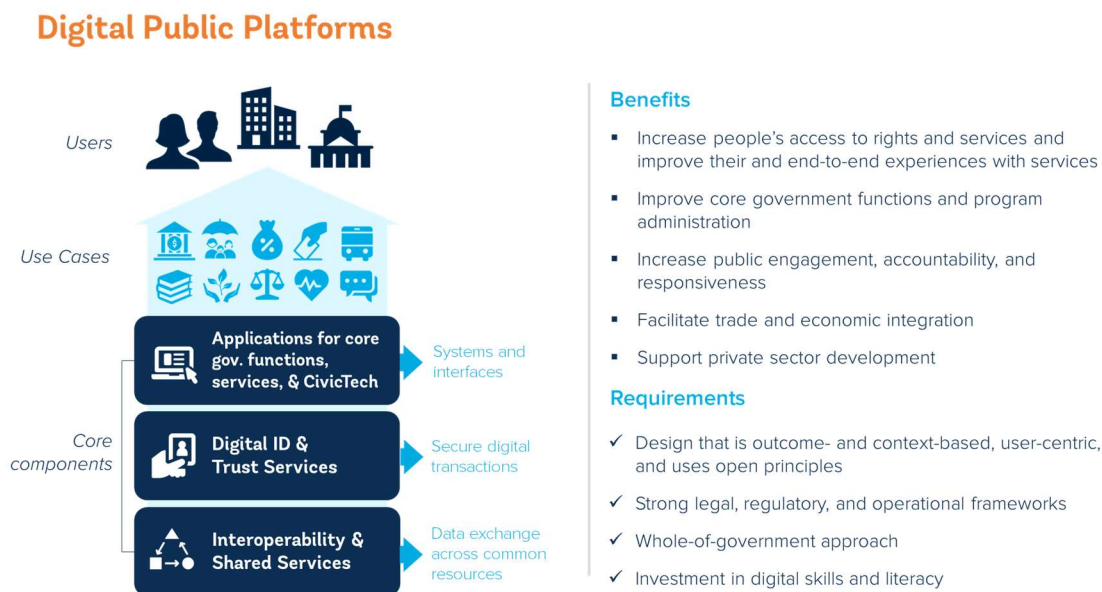
### 4.1 Importance of Digital Platforms

#### 4.1.1 Socioeconomic Rationale for Digital Platform Development

**Digital platforms have the potential to transform the way people, governments, businesses, and civil society interact with each other.** They have the benefit of virtually connecting people, institutions and things, and facilitating digital transactions, including the exchange of information, goods and services. This can beneficially impact users' lives in a multitude of areas, as well as increase operational and economic efficiency, improve service quality, and facilitate innovation and economic development. Two main categories of platforms relevant to Rwanda's digital development are explored in this report: (i) digital public platforms and (ii) digital commercial platforms.

**Digital public platforms have the potential to provide new and more efficient channels for public service delivery, improve civic engagement and enhance transparency and accountability.** For example, a robust digital ID platform can help facilitate access to digitized services and transactions for citizens and cut down on resource leakage by eliminating payments to "ghost" beneficiaries. Digital public platforms also benefit private companies that can leverage them as a base upon which to build new digital services and applications or to enhance the efficiency of their operations. Examples include banks using digital ID systems to verify their customers and build alternative credit scoring systems, transport and logistics companies leveraging public geographic information platforms/digital maps to improve their analytics and route planning, or businesses filing taxes and licensing requirements through online portals.

Figure 4-1 Digital Public Platforms - Benefits and Requirements



**Digital commercial platforms generate efficiency gains, foster competition, and improve market intermediation.** Such platforms can remove costly intermediaries, take advantage of economies-of-scale and network effects, as well as utilize economic resources more effectively. Commercial platforms can build two-sided trust by removing informational asymmetries and can reduce moral hazard problems in the provision of services.<sup>32</sup> In addition, they can create new and more inclusive markets by aggregating supply and demand, as well as match job seekers with employers. E-commerce platforms add to the convenience and effectiveness of both consumers and businesses and have the potential to connect MSMEs and disadvantaged groups to new markets and suppliers, including subsistence farmers, rural households, and women.

#### 4.1.2 Alignment with Country Development Strategy & Goals

The development of digital platforms and services in Rwanda has been prioritized within many of the key strategies, policy instruments mentioned throughout this report and realized through corresponding investments and reforms. NICI III (2011-2015)<sup>33</sup> focused on delivery of services through ICT and sought to utilize digital public platforms to improve government operational efficiency, service delivery, and citizen participation. This laid the groundwork for a comprehensive e-Government program as outlined in the SMART Rwanda Master Plan (2016-2020) and a vision of “a 24-hour self-service, cashless and paperless government”. To achieve this vision, the plan calls for increased usage of cloud-based and data-driven services and innovation, along with shared e-Government infrastructure, service integration and a focus on cyber security.

## 4.2 Diagnostic Findings: Current State of Digital Platforms

The use of digital public platforms in Rwanda has grown significantly over the last ten years, albeit from a very low base. This is evidenced by Rwanda’s rank as one of the highest performers in Africa in the United Nations’ Global e-Government Development Index (EDGI).<sup>34</sup> The ecosystem of commercial platforms is far less developed. There is scope to expand commercial platforms considerably, which could lead to greater efficiency, innovation and boost employment outside the agricultural sector while also stimulating unrealized demand for broadband connectivity.

<sup>32</sup> Brynjolfsson, 2018.

<sup>33</sup> See: [https://minict.gov.rw/fileadmin/Documents/Rwanda\\_NICI\\_2015.pdf](https://minict.gov.rw/fileadmin/Documents/Rwanda_NICI_2015.pdf)

<sup>34</sup> United Nations (2018).

#### 4.2.1 The state of digital public platforms

The development of Rwanda's digital public platforms ecosystem benefits from a robust and centralized institutional framework, which has helped situate e-government initiatives within a broader digital development agenda. Overall leadership is provided by the Ministry of Information Communication Technology and Innovation (MINICT), which also leads policy development. Implementation, coordination and services delivery is facilitated by the Rwanda Information Society Authority (RISA). The National Identification Agency (NIDA), which resides under the Ministry of Local Government (MINALOC), provides leadership on ID-related issues, but works in close coordination with both the MINICT and RISA. Furthermore, the NISR and National Commission of Science and Technology (NCST) plays a role in supporting data management, innovation and research. On the private sector side, the Private Sector Foundation (PSF)-ICT Chamber convenes ICT-related associations, businesses, groups and individuals, who are frequently consulted on matters related to sectoral policy and development.

##### 4.2.1.1 Digital identification and E-signatures

**Trust in a person or entity's identity is a cornerstone of economic and social transactions, including those undertaken online.** Rwanda has developed one of the strongest national ID systems in Africa, administered by NIDA. The ID system generates a unique 16-digit national ID-number (NIN) and provides corresponding physical national ID documents (NID), with coverage now reaching an impressive 99 percent of adults.

**NIDA is currently offering identity verification services to an impressive 47 public and private organizations through APIs, with further rollout to more agencies underway.** In addition, NIDA is the process of integrating civil registration with ID that would allow for seamless data updates and would result in an even more robust ID system in the country, needed to allow for seamless identification and authentication on-line, including across borders.

**Beyond these "traditional" forms of identification, the emergence of the digital economy has created a need for fully digital identity credentials.** These include digital ID and other 'trust services' such as e-signatures which are required to ensure secure and accurate identification and authentication for transactions over the internet. The GoR has expressed interest to capitalize on its robust "traditional" ID ecosystem to develop next generation digital ID and on-line authentication services that are necessary for the expansion and access of digitized services and transactions.

**Rwanda has rolled out a nascent e-signature system, based on Public Key Infrastructure (PKI).** In 2016, Rwanda established a Certification Authority tasked with issuing Digital Signature Certificates (DSCs). However, only a limited number of DSCs have been issued to public and private entities. The process is cumbersome and is yet to be extended to citizens, which in turn prevents wider scale-up of e-services/transactions that require an additional level of security. The GoR is now looking for ways to make the process of obtaining the e-signature cheaper and easier for individuals, including via mobile phones. This will require addressing gaps in the Public Key Infrastructure (PKI) architecture through hardware and software upgrades, as well as re-thinking some of the underlying business processes.

##### 4.2.1.2 Interoperability layers and shared services

**Interoperability, shared ICT infrastructure, and moving towards a "One government" system have been identified as priorities by NICI III as well as the SMART Rwanda Master Plan.** In order to reach this goal, further consolidation and integration of the government's IT infrastructure, databases, systems, services and ability to share data through compatible systems will be essential. Rwanda is in the process of rolling out an interoperability platform that will enable data exchange and connect disparate online systems and services. It is due to be rolled out from June 2019, through a PPP between the GoR and Rwanda Online, Ltd and will begin by interconnecting seven line ministries. An Interoperability Framework Blueprint is also being developed, supported by technical assistance from the Korean National IT Promotion Agency.

**A tier-3 national datacenter (NDC) was introduced in 2010, providing a central data hosting solution.** The NDC has allowed for the expansion of cloud-based services, including the roll-out of a Government cloud (G-Cloud), enabling more data and hosting service sharing among MDAs. There is scope for further consolidation of smaller datacenters, server rooms located at various government agencies, and management of facilities, as well as streamlining and expanding the use of cloud-based infrastructure. While a technical evaluation was not completed as part of this exercise, stakeholders noted the need for further upgrades to the datacenter as well as strengthening of back-up and recovery solutions.

**Cybersecurity capacity has been growing, with the Rwanda National Computer Security and Incident Response Team (Rw-CSIRT) established in 2014,** as prioritized through NICI III, and later the adoption of the 2015 National Cyber Security Policy. However, the threat level is growing exponentially and there is a need to continue to expand the level of technical and human resources capacity geared toward mitigating cybersecurity risks, possibly through regional collaboration given the shared threats faced across the region and opportunities for cost savings through sharing of threat intelligence and human expertise.

#### **4.2.1.3 Applications for core government functions, digital service delivery and CivicTech**

**The GoR has also deployed a wide range of digital services aimed at citizens, mostly offered through the centralized platform Irembo.**<sup>35</sup> The e-services offered have increased from five in 2015 to 89 in 2018,<sup>36</sup> and include visa/residency permits, land management and ownership, and civil registration among many others. Uptake of e-services has remained limited, and of the 1,500 daily Irembo users, 54 percent still prefer to access the platform through an agent. The most popular services have been civil status certificates, as well as online NID, provisional driving license applications, and online health insurance contributions.

**In order for Irembo to reach more citizens, Rwanda will need to address underlying issues discussed in previous sections;** i.e. limited usage and affordability of high-speed internet and smartphones as well as low digital literacy. It is also necessary to make the platform more user-friendly and accessible via its agent network. There is currently a payment gateway that supports credit card, mobile money as well as other fintech payment solutions. Besides addressing increased access, there is a need to further expand the number of services available and to adopt user-centric design to improve the experience. In particular there is a need to ensure full end-to-end digitization, eliminating the need for the user to be physically present at any stage of the process. Evidence suggests that a requirement for physical presence at any stage in service delivery will dramatically reduce adoption and perceived value of digital services. Similarly there is a need to adopt ‘ask once’ data collection practices to eliminate duplicate requests for information from citizens and businesses across different services.

**The GoR has also launched several back-office digital platforms, including the Integrated Financial Management Information System (IFMIS) as well as an Electronic Government Procurement (e-GP) system.**<sup>37</sup> IFMIS has comprehensively aligned the country’s public financial management cycle and automated several related financial processes. The e-GP system has been heralded as an example of best practice in the region and has been used for over 4,500 public tenders. While the introduction of these platforms has been successful, stakeholder consultations suggest that improved change management and training prior to and after the launch of new platforms could be beneficial and could address limited uptake. Efforts are also being made to mainstream adoption of management information systems and adopt shared back office platforms across key sectors including governance,<sup>38</sup> justice and legal systems,<sup>39</sup> education, land management<sup>40</sup> and health.<sup>41</sup>

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<sup>35</sup> Online at <https://irembo.gov.rw/rolportal/en/aboutus>

<sup>36</sup> The New Times, 2018.

<sup>37</sup> online at: <http://www.umucyo.gov.rw>

<sup>38</sup> World bank group, 2011, E-Rwanda Project (P098926).

<sup>39</sup> Government of Rwanda, IECMS.

<sup>40</sup> World Bank Group, 2017.

<sup>41</sup> See OpenMRS portal, online at: <https://rwanda.pih-emr.org/openmrs/index.htm>.

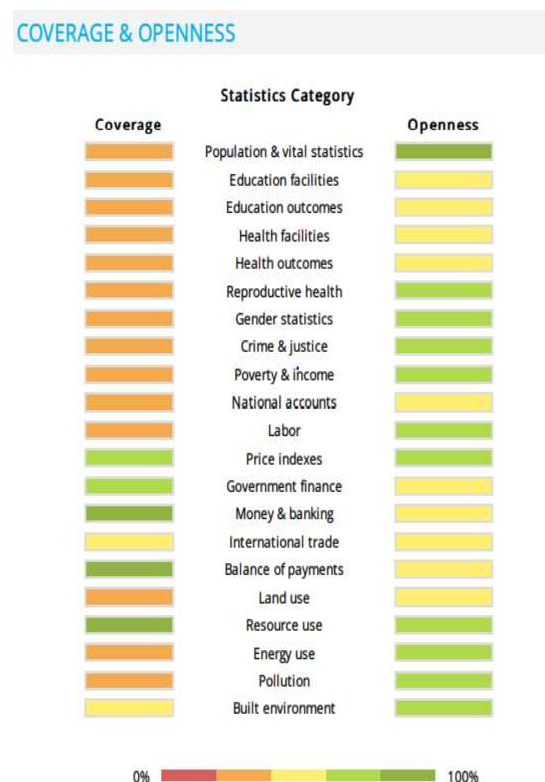
Rwanda ranks as a top performer in Africa in the E-Participation Index (EPI) (Table 2). Ministries, Departments and Agencies (MDAs) engage in e-information sharing through websites and social media. The usage of e-consultation and e-decision making is more limited however, despite e-government having been identified by GoR as a means to increasing citizen participation.<sup>42</sup> The Parliament has a website and twitter account, and some ministries have begun posting draft policies online and encouraging feedback. There is however scope for expansion in terms of a dedicated platform where citizens can participate and better communicate their views.

Table 2: Rwanda ranking in the E-Participation Index

E-participation Index (EPI) Scores		
South Africa	39	0.84
Tunisia	53	0.79
Rwanda	59	0.75
Uganda	87	0.62
Tanzania	92	0.61
Togo	107	0.54
Kenya	110	0.53
Senegal	114	0.50
Nigeria	117	0.48
Mozambique	122	0.44
Sierra Leone	129	0.41

The opportunity to use open data to improve analytics and decision making and to drive public and private sector innovation is recognized, though currently underutilized. The National Institute of Statistics of Rwanda (NISR) administers an online open data portal.<sup>43</sup> The policy framework for open data governance, however, remains unclear and would benefit from clarification addressing overlaps between the 2017 Data Revolution Policy (DRP) and the SRMP. As for the existing data, while many public records and datasets have already been digitized,<sup>44</sup> more can be done in terms of user accessibility, publishing the data routinely in machine-readable format and expanding the coverage of public registries (See figure 4-2).

Figure 4-2: Open data performance: Coverage & Openness



#### 4.2.2 State of Digital Commercial Platforms

The development and deployment of digital commercial platforms is relatively nascent, though growing. Existing commercial platforms do cover a wide range of sectors, including social networks, construction, transportation, health, and e-commerce.

Some domestic commercial platforms have been developed, focusing primarily on e-commerce and transportation, but the country lags behind many of its peers in this respect. African economies that have been more successful in developing commercial platforms also tend to have a more vibrant tech startup and incubation ecosystem, indicating that a boost in digital entrepreneurship (further discussed in Chapter 6) would also improve the state of domestic platforms. Foreign platforms have mostly targeted the tourism and hospitality industry, which has generated growth in this sector. Job search and matching applications are also relatively prevalent. Further development of commercial platforms has the potential of boosting employment outside of the agriculture sector, in line with Vision 2020, connecting individuals with jobs in the domestic market as well as virtual jobs in the global market. Current platforms employ approximately 24,000 people in Rwanda, compared to 286,000 in Kenya.

<sup>42</sup> References made to this in for example NICI III and Smart Rwanda Master Plan.

<sup>43</sup> Rwanda Open Data Portal, online at: <http://rwanda.opendataforafrica.org/data/#menu=topic>.

<sup>44</sup> Key examples include: financial management data via IFMIS; public tending data via e-GP; public case data via IECMS; land data via LMIS; citizens' poverty levels and profiles via the Ubudehe database; citizens' biometric data via the NCR; the active profiles of all registered companies via the Business Registration Database; tax payment via the RRA's database; public health insurance data; pension data via the RSSB; Census and survey data via the NISR etc.

#### 4.2.2.1 Domestic and foreign e-commerce

**MSMEs as well as consumers have been slow to adopt e-commerce practices.** There are many reasons for this, including failure to see the business benefits offered by platforms in terms of market and service expansion, structural and economic barriers pertaining to access to affordable connectivity and logistics services, limited electricity access, as well as knowledge gaps in online marketing.<sup>45</sup> Consumers are wary of e-commerce transactions and digital payments, especially in connection with small, unknown vendors, due in part to limited consumer protection. Rwandan consumers tend to insist on paying post-delivery, adding to the logistical and financial challenges of MSMEs. There are however signs of a growing uptake among consumers in Kigali, where 27 percent of the urban population reported buying goods online.<sup>46</sup>

**The e-commerce transactions that do take place are mainly via m-commerce applications and mostly relating to trading vehicles, clothes and food.** Cross-border e-commerce relies mostly on larger, foreign platforms such as Alibaba and Ali Express.<sup>47</sup> Investing in the expansion of cross-border e-commerce could help limit the current trade deficit and boost exports.<sup>48</sup> Rwanda ranks 19<sup>th</sup> in Africa in the 2018 UNCTAD B2C E-commerce Index, which looks at key enablers for e-commerce. The low ranking is primarily due to limited internet usage, server access, and postage reliability. Weak and costly supply chains may also be hampering the use of domestic platforms.

**There is scope to expand the usage of e-commerce platforms, which could increase businesses' access to new markets and customers, as well as better align supply and demand.** Recent initiatives have included the Ministry of Agriculture's eSoko platform, which facilitates easy access to information on market prices among farmers allowing them to make more informed market-pricing decisions.<sup>49</sup> Other examples are the Alibaba-led Electronic World Trade Platform,<sup>50</sup> which connects Rwandan and Chinese buyers and sellers, as well as the E-commerce Service Centre which aims at connecting MSMEs to international markets. While partnerships such as that with Alibaba have increased the presence in Rwanda to positive effect in the short term, caution is warranted to avoid exclusivity of such arrangements which could be a longer-term constraint to competition and platform economy development.

### 4.2.3 Constraints to Digital Platform Development

#### 4.2.3.1 Limited internet usage and digital literacy

**Limited usage of internet and access to digital devices is a clear constraint to further development and uptake of digital platforms.** As seen in Chapter 2, low internet usage, coupled with affordability of devices and data and knowledge gaps concerning the benefit and value of internet access may hamper further uptake of e-services and in some cases make e-commerce a more expensive or less convenient alternative to in-person transactions. Furthermore, the rural-urban gap in connectivity and digital literacy is reflected in corresponding access and uptake of digital platforms and services.

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<sup>45</sup> The New Times (2018) ; All Africa, 2018.

<sup>46</sup> The New Times, 2018.

<sup>47</sup> Export.gov, 2019.

<sup>48</sup> WITS, 2016.

<sup>49</sup> online at: <http://www.esoko.gov.rw/>

<sup>50</sup> eWTP, *Rwanda First in Africa to Join eWTP*.

#### 4.2.3.2 Limited uptake of DFS

**Digital payments are another key enabler for the development of vibrant platforms ecosystems – both in the public and private sector.** The usage of digital financial services (DFS) in Rwanda is growing, led primarily by MNO wallets, but uptake remains limited. Lack of interoperability between DFS and platforms such as ID or e-commerce services, may also hamper usage. The affordability and ease of cross-border digital payments also needs to be addressed as the high transaction fees and cross-platform and cross-border interoperability constraints limit possibilities for commercial platform providers to offer services beyond Rwanda’s borders. DFS issues are discussed further in Chapter 5.

#### 4.2.3.3 Distribution, transport and logistics constraints

**There are a number of constraints to digital commercial platform development that relate to distribution, transport and logistics.** Expensive and unreliable transport infrastructure hampers last-mile delivery, particularly damaging the expansion of e-commerce. These challenges can be particularly detrimental to a landlocked market like Rwanda when it needs to reach a wider international consumer base, yet they are not currently addressed in the Market Infrastructure Master Plan.<sup>51</sup>

**Poor transport and logistics infrastructure affect the reliability and costs of goods-based e-commerce, while also pushing up prices for consumers and deterring MSMEs from engaging in digital-based business models.** E-commerce relies on the affordability and quality of transport infrastructure in order to deliver and receive goods in a satisfactory and cost-effective way. Although Rwanda outperforms many of its regional peers in terms of transportation infrastructure – scoring 4.7 out of 7 in the transportation section of World Economic Forum 2018 Global Competitiveness Index<sup>52</sup> – there is still limited access, particularly in rural areas. In addition, Rwanda’s postal system suffers from weak reliability, traceability, and high courier costs, which further prohibit the spreading of e-commerce. The national addressing system is lacking, making it difficult to reliably establish the location of customers.

**The impact of these constraints is skewed toward MSMEs, since major international players can afford to absorb high logistics and transport costs in order to reach new markets, by leveraging economies of scale.** It is instead the domestic MSMEs, including startups, that find themselves unable to fully engage and compete. However, even larger players are affected by low order and delivery volumes, as well as high shipping costs, rendering the commerce unattractive to both consumer and provider.<sup>53</sup>

**Rwanda and its neighbors have taken significant steps towards promoting the free movement of goods within the region, but more remains to be done to improve cross-border logistics.** The 2010 Common Market Protocol (CMP) seeks to eliminate tariff and non-tariff barriers (NTBs) to trade between member of the EAC.<sup>54</sup> However, a number of NTBs remain including a time-consuming and administratively burdensome processes for clearing customs, unharmonized procedures and lack of interconnected information systems within Rwanda and with neighboring countries. Initiatives such as the Rwanda Electronic Single Window and the Trade Community Information Systems (TCIS) have demonstrated the potential to significantly reduce the time for clearance.

#### 4.2.3.4 Data sharing, protection and privacy

**Services offered via digital platforms all rely on the ability to safely and easily store, process, and transfer data, within Rwanda and internationally.** Constraints to this include overly restrictive data localization policies that require data on local citizens to be processed and stored physically within Rwanda’s borders, impeding cross-border data exchange, processing and storage which are critical to cloud-based services. Such constraints limit the attractiveness of Rwanda as a datacenter investment destination and raise the costs of cloud services/storage to local startups and businesses increasingly reliant on such services to go digital.

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<sup>51</sup> Rwanda’s Market Infrastructure Master Plan, 2014.

<sup>52</sup> Based on World Economic Forum’s 2018 Global Competitiveness Index. See: [http://www3.weforum.org/docs/GCR2017-2018/03CountryProfiles/Standalone2-pagerprofiles/WEF\\_GCI\\_2017\\_2018\\_Profile\\_Rwanda.pdf](http://www3.weforum.org/docs/GCR2017-2018/03CountryProfiles/Standalone2-pagerprofiles/WEF_GCI_2017_2018_Profile_Rwanda.pdf)

<sup>53</sup> McKinsey Global Institute, 2014.

<sup>54</sup> East African Community, *Common Market*.

**A dedicated data protection and privacy law and corresponding regulations and enforcement body are needed.** Rwanda currently lacks a rigorous data protection and privacy regime, which jeopardizes the integrity of the government's data collection, as well as by other entities. A draft bill is under preparation, led by MINICT. The government is encouraged to adopt an open, consultative process and to consider the Organization for Economic Co-operation and Development (OECD) Privacy Principles, and African Union (AU) Convention on Cybercrime and Personal Data Protection (adopted in 2014) as examples of best practice to align with.

#### 4.2.3.5 Cybersecurity

**In addition, gaps in cyber security detection and response capacity, as well as a lack of cyber awareness continues to jeopardize the integrity of both key public and digital commercial infrastructure, as well as the security of their users.** The introduction of a Computer Emergency Response Team (CERT) and the National Cyber Security Authority seeks to address these gaps, however there is scope to further efforts on raising awareness and security.

### 4.3 Recommendations & Next Steps

#### Objective 1: Build an environment of online trust

**R1. Develop a 'next generation' digital ID system that enables seamless identity verification and on-line authentication services.** This would involve scaling up efforts in the area of integration of civil registration and national ID; expanding identity verification services to more agencies; developing appropriate technical architecture and upgrading hardware and software capability needed for the new generation digital ID, which could also be recognized across borders; introducing seamless e-signature capability; and finding the best modality for introducing Mobile ID, which may be done in collaboration with the private sector. Privacy and security should be embedded by default, providing ways for people to control their own personal data.

**R2. Enact robust data protection and privacy legislation and include rigorous safeguards against misuse.** This includes finalizing and enacting the draft data protection and privacy bill and enacting corresponding regulations that provide clear accountability and guidelines for the collection, processing, use, and sharing of data. Key regional frameworks and guidelines should be followed to ensure compatibility with aspirations for a single digital market in East Africa and across the continent.

#### Objective 2: Increase interoperability, integration as well as shared infrastructure and services

**R3. Support movement towards shared infrastructure and services, consolidating, and upgrading existing assets.** This can be done by upgrading the existing national datacenter capacity and mandating greater use of shared infrastructure among MDAs. In addition, the use of cloud-based ICT infrastructure can be increased to improve service delivery among MDAs, including migration of existing systems once they are in need of a refresh. A shared e-payment module and SMS-notification mechanism can also be developed, improving services offered via Irembo.

#### Objective 3: Expand uptake, effectiveness and perceived value of digital platforms

**R4. Prioritize development of public platforms and services based on feedback from users.** Development of public platforms that can drive usage should be prioritized by the government, and those that involve digital payments could also boost uptake of DFS across the economy. Design workshops and other techniques can be utilized to engage users in the prioritization of future services. End-to-end digitization, 'ask once' data collection practices and user-centric design techniques can also be used to enhance the user-experience and expand usage.

**R5. Unleash the potential of the local private sector to innovate in service delivery.** Steps such as prioritizing open source solutions and open APIs for public platforms can drive the development of commercial platforms. The use of international standards to prevent vendor lock-in should be ensured to open up opportunities for multiple private providers to engage. Organizing global or national level challenges to crowdsource innovative solutions can be explored. In addition, key legal and regulatory frameworks would benefit from review, including competition law, IP and copyright. Agile pro-competition regulations can ensure market contestability and by extension, greater usage of services.

**Objective 4: Expand access to Open Data and usage of big data analytics that can support innovation and improvements in service delivery**

**R6. Develop a clear approach to Open Data, while expanding and encouraging greater usage.** Plans should be developed to publish key datasets in standardized and easily accessible, machine readable formats, along with more frequent updates of the open data portal to stimulate public and private development of new data-driven services and innovation. Further engagement with data users in both civil society and private sector through roundtables, competitions, and hackathons can promote and facilitate increased data re-use. In addition, clarification is needed in the current management structure as well as existing guidelines for open data.

**Objective 5: Improve institutional frameworks to enable greater e-transformation, including expanded e-commerce**

**R7. Consider elevating the authority of RISA to enhance its ability to drive the transformation agenda across government.** Such changes could include elevating the role of the Chief Information Officer to report directly to the President to provide authority to guide digital transformation across all MDAs. Empowering the Chief Digital Officers who have been appointed within individual MDAs with the responsibility and authority to drive business process transformation rather than playing a strictly technical (IT) role, could likewise improve the impact and success of sector level digitization efforts.

**R8. Support greater inter-agency cooperation and coordination on the e-commerce agenda.** A holistic approach and the development of a shared vision for e-commerce development should be employed. In addition, e-commerce would benefit from interagency collaboration to expand uptake of connectivity and digital devices, reform and modernize postal services, introduce package tracking and develop a functioning addressing system with national coverage aligned with international standards, and set up drop-off points for e-commerce deliveries to reduce last mile delivery costs. Investment in national transportation networks, should also be encouraged in order to improve quality and coverage. Barriers to trade and customs need to be reduced, through the gradual harmonization and streamlining of regional trade and customs policies to facilitate cross-border shipments. Legal frameworks pertaining to e-commerce should also be reviewed with these aims in mind.

**Objective 6: Address skills and capabilities gaps within the government**

**R10. Introduce innovative initiatives to encourage digital skills development in ministries and continued hiring of top digital talent.** Further reinforce existing capabilities by recruiting and retaining a team of highly competent and talented individuals to drive the transformation agenda within government, with growth in line with expansion of digital services offerings and initiatives. In addition, consider introducing a Presidential Innovation Fellowship Program,<sup>55</sup> which could aid in pairing talented, diverse technologists and innovators with top civil-servants. Identification of “digital champions” within MDAs and competitions to select innovative digital solutions as a means to identify good ideas and to engage with employees with an ICT knowledge or drive regardless of job title.

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<sup>55</sup> The fellowship could be modeled on the US version, found online at <https://presidentialinnovationfellows.gov/>.

# 5 Digital Financial Services

## Key Messages:

- Rwanda has a fast growing DFS ecosystem, fueled by a progressive regulatory structure
- While financial inclusion has improved significantly as a result of DFS, stubborn challenges remain to expand access to marginalized groups
- Merchant reluctance to accept digital payments represents a significant challenge, but also an opportunity to dramatically increase acceptance and transaction volumes of DFS

## 5.1 Importance of Digital Financial Services (DFS)

**DFS includes financial products and services, such as payments, transfers, savings, credit, insurance, securities, financial planning, and account statements that are delivered through mobile money, banking and online channels.** It represents an important step toward accessibility of financial services as well as financial inclusion. With the GoR's commitment to DFS policy, an increasingly supportive regulatory environment, and strong digital infrastructure, Rwanda has a solid base from which to move to the next stage of DFS development.

### 5.1.1 Socioeconomic Rationale for Digital Financial Services Development

**Access to financial services is a key enabler to poverty reduction and economic growth.** Access to DFS provides individuals, households and businesses with convenient and affordable channels by which to pay, save, borrow, and engage in financial planning. It is considered the most successful means of increasing financial inclusion in emerging markets, as it empowers low-income populations to gain access to formal financial services, without the often costly and time-consuming task of visiting a physical bank branch. Over 2 billion adults globally lack access to formal financial services, excluding them from opportunities to improve their livelihoods.<sup>56</sup> DFS has the potential of empowering individuals, enabling them to invest in education, save money, and launch businesses.<sup>57</sup>

**Greater access to DFS also has several other positive effects on the economy.** Increased financial inclusion leads to greater aggregate expenditure and boosts GDP levels. Increased access to credit for MSMEs leads to employment growth. DFS also enables banks to operate more efficiently and increases competition among them. Customers are able to switch banks and financial service providers more easily, putting greater pressure on banks to provide quality services. In addition, customers and suppliers develop credit histories when they interact through DFS, reducing informational asymmetries and providing useful input into credit decisions. DFS also presents opportunities for fintech providers to partner with banks, which can help them further reduce operational costs and improve the quality of their intermediation activities.

**Finally, DFS also serves an important function for government in terms of increasing efficiency and accountability in their payment streams.** This also increases the volume of formal financial transactions and generates higher tax revenue for governments. In addition, the reduced circulation of physical money and cash transactions may result in less counterfeit money as well as reduced inflation.

### 5.1.2 Alignment with Country Development Strategy & Goals

**The GoR recognizes the importance of DFS and has a broadly supportive regulatory environment.** The SMART Rwanda Master Plan lists “expanding financial infrastructure to increase access to financial services” as one of its core objectives. It plans to execute this by enhancing basic infrastructure for

<sup>56</sup> Global Partnership for Financial Inclusion, 2016.

<sup>57</sup> Ozili, Peterson Kitakogelu, 2018.

transactions, establishing web-based financial transaction core systems, enhancing financial security systems, and expanding financial transaction channels to facilitate utilization.

**Rwanda's Vision 2050,<sup>58</sup> includes multiple goals that align with DFS development,** including: improved quality of life, universal access to financial services, modernizing infrastructure and livelihoods, as well as increased productivity and competitiveness. The Rwanda National Payment System Strategy (2018-2024) encourages the use of electronic payments by all residents of Rwanda,<sup>59</sup> with the aim of inter alia accelerating the rate of economic growth, facilitating a cash-less economy, increasing financial inclusion, enabling a stronger environment for innovation, and developing a safer, more reliable and efficient payment system for all participants in the financial ecosystem.

**Finally, financial inclusion has been a top priority for the GoR for several years.** Governmental intervention increased financial inclusion of adults from 72 percent in 2012 to 89 percent in 2017. At the time 26 percent were served by formal banks and 65 percent by non-bank financial institutions. However, informal means of finance are still widely used by 72 percent of adults and 11 percent remain financially excluded. DFS presents an important step in continuing this commitment to increasing financial inclusion.

## 5.2 Diagnostic Findings: Current State of Digital Financial Services

### 5.2.1 Availability of Digital Financial Services

**The usage of DFS has grown rapidly in recent years, driven mainly by MNO wallets.** According to the National Bank of Rwanda (BNR), the number of mobile wallets rose from 1.44 million in 2012 to 9.7 million by the end of 2016, with the number of wallet transactions growing by 900 percent. The growth of mobile banking through traditional financial institutions has been more modest, however, with approximately one million accounts by late 2016, performing 4 million transactions. Although the number of ATMs and card-reading POS devices has grown, only 5 percent of adults had a debit card in 2016, used mainly for ATM withdrawals. Less than 1 percent of adults had a credit card. The typical profile of a DFS is a male between the ages of 31 and 59, living in urban areas with tertiary education. Usage is also higher among those who receive salaries or wages from government (83 percent) or private businesses (49 percent). To truly achieve financial inclusion through DFS, this bias needs to be addressed.

### 5.2.2 Enabling Environment for Digital Financial Services

**Rwanda has a significant advantage over most regional peers, in the form of a political and regulatory environment that is highly supportive of using technology to increase financial inclusion.** The 2017 Brookings Financial and Digital Inclusion Project ranked Rwanda's regulatory environment and commitment to financial inclusion among the highest in Africa.<sup>60</sup>

**The financial sector, including DFS, is regulated and supervised by the National Bank of Rwanda (BNR), and a few core policy and legal instruments provide a largely enabling regulatory environment.** Both banks and non-banks are allowed to become licensed mobile money providers, while still upholding standard measures to protect customers. It also allows for “tiered KYC”, which means that low income customers can self-register for simple, low-value accounts, thus facilitating usage among underserved groups. The 2017 Agent Banking Regulation further harmonized the requirements for bank and non-bank agents to create “a level playing field” and promote competition. International remittances to and from mobile wallets have been permitted since 2015, with most connections between MNOs in the East African region.

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<sup>58</sup> Rwanda vision 2050, launched 2016,

<sup>59</sup> BNR, 2018

<sup>60</sup> Brookings Institute, 2018.

Steps have also been taken by the BNR to increase interoperability between systems, through the 2014 *Interoperability policy*,<sup>61</sup> which has interconnected several banks and MNO wallets with more planned to follow as new technology replaces outdated banking systems. Further steps are also planned to improve the interoperability of payment channels with BNR delivering a common switch that connects all financial service providers. To this end, BNR is also partnering with Access to Finance Rwanda (AFR) in setting out a Business Plan for the Rwanda National Digital Payment System (R-NDPS). Finally, the Rwanda Integrated Payment Processing System (RIPPS) has been implemented to reduce time lag in e-payments and mitigate systemic risk in the financial system.

## 5.2.3 Constraints to Digital Financial Services Development

### 5.2.3.1 Limited uptake of smartphones and data services by consumers and financial institutions

**Slow uptake of smartphones and data services by consumers hinders innovation, introduction of more innovative DFS products and significantly affects user experience.** As seen in Chapter 2, the usage of high-speed internet and smartphones is still highly limited, despite the existence of a strong digital infrastructure with widespread accessibility of 4G. In addition, there is also limited usage of non-digital financial services, which spills over to DFS.

**As for financial institutions (FIs), banks are just now starting to enter the digital payments sector and have been slow to embrace digital channels.** Several banks<sup>62</sup> have now started offering services in mobile money, online banking and card services, with some also upgrading their core systems to provide APIs that allow for more innovative products. Although growing, usage of these services has yet to gain scale.

**Some initiatives to improve cross-border DFS transactions have been launched but are not fully embraced by banks.** The East African Payment System (EAPS) was launched in 2013, supported by the Real Time Gross Settlement systems (RTGS) and operated by EAC central banks, in order to provide inexpensive, direct cross-border SWIFT payments within East Africa.<sup>63</sup> Although this initiative would be highly beneficial for users and as a method of increasing DFS usage, it has not prospered, seemingly due to the banks' preference of the established system that yields higher margins. EAPS2 is currently in development and seeks to overcome these obstacles.

### 5.2.3.2 Scope to grow MNO wallets and services

**The leading development within DFS in Rwanda is MNO wallets.** There are two main providers, MTN offering MTN Mobile Money, and Airtel (who recently bought the third largest MNO, Tigo) offering Airtel Money. They currently offer basic services, such as cash in/cash out, person-to-person (P2P) transfers, airtime purchase, bill payments, as well as transfers to and from bank accounts. There is scope to widen usage of MNO wallets.

**MTN is leading mobile money innovation** and has partnered with Commercial Bank of Africa (CBA) to offer MoKash, a savings and short-term loan service. Response has been modest so far, with half a million users registered by mid-2017 and few loans granted. There is clearly an opportunity to grow this kind of service by educating customers on how to increase their credit rating. MTN has also partnered with Rwanda Online to simplify payment for government services on the *Irembo* platform.

### 5.2.3.3 Limited merchant acceptance of digital payments

**Perhaps the largest constraint to the growth of DFS and MNO wallets specifically is the low merchant acceptance of digital payments in-store and lack of incentives schemes to promote digital payments.** Merchants are typically charged a transaction fee to accept digital payments, whereas cash is often seen as free. Other common constraints include suppliers not having mobile money instruments and

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<sup>61</sup> BNR, 2014, Interoperability Policy.

<sup>62</sup> Including Bank of Kigali (BK), Equity Bank, Banque Populaire Rwanda (BPR), Ecobank, CogeBanque and KCB.

<sup>63</sup> World Bank, 2010.

requiring payments to be made in cash, or merchants' existing business processes being based entirely on paper and cash, which makes adding digital components into the process seen as very time-consuming.

**To address this, incentives need to be given to merchants in order to overcome these perceived negatives.** Rwanda could benefit from testing successful examples from neighboring countries, such as Kopo Kopo, a fintech in Kenya that recruits merchants and manages the administration of their mobile money payments. There are also examples of DFS providers using the data from in-store digital payments in order to offer short-term merchant loans at competitive rates. This could encourage merchants to engage more with DFS. Merchant acceptance of digital payments represents a core prerequisite for the spread of DFS throughout Rwanda, as it links straight to consumers' and businesses' everyday transactions and is therefore imperative to address.

#### 5.2.3.4 Lack of agent interoperability

**Many digital services currently rely on agents to perform digital transactions on customers' behalf,** as well as engage in services such as customer registration and basic cash in/cash out. Although agent exclusivity is precluded,<sup>64</sup> there is limited interoperability in the agent infrastructure, meaning each new DFS launched has to recruit its own agents independently. Agents need to maintain an e-money float with each organization it represents, which is costly and restricts the number of partnerships they take on. This, in turn, restricts new market entrants from accessing agents and market presence. Increasing interoperability and facilitating for agents to use a single e-money float for multiple DFS providers, could markedly improve the efficiency and accessibility of the DFS market for consumers, providers and agents alike. Agent interoperability initiatives are still relatively new, but successful examples can be observed in Tanzania, among other countries.

#### 5.2.3.5 Lack of MSME focus

**More can be done to extend the benefits of DFS to MSMEs.** These enterprises typically find access to credit to be a significant challenge and DFS can offer potential solutions to this. For instance, MSMEs that utilize digital services can be offered credit initiatives based on the enterprise's big data and credit histories built through previous digital transactions. Other incentives to increase DFS usage could include tax breaks or incentives to businesses trialing digital payments, in order to reduce associated costs and risk.

#### 5.2.3.6 Bank-specific regulatory restrictions

**Despite the high level of equality of DFS regulation across industry sectors, there are still some areas where restrictions specific to banks hinder their ability to participate fully and compete directly with non-bank DFS organizations.** Even though non-banks are able to use 3<sup>rd</sup> party cloud services for hosting financial services, banks are required to host services and customer data themselves. Cloud hosting may significantly reduce infrastructure and HR (IT specialist) costs, offer improved data security, and increase performance and reliability, particularly during disaster recovery. Moreover, banks are mandated to use paper for processes such as customer registration and loan assessments, that could instead be performed electronically in order to increase efficiency, accuracy and digitization of systems. BNR regulations could be more supportive of the banking sector's move toward increased use of DFS.

## 5.3 Recommendations & Next Steps

**Objective 1: Boost capabilities of consumers to use DFS and build the skills base to power continued digital transformation and innovation in Fintech**

**R1. Continue work to advance digital skills.** As with all other pillars discussed, digital literacy represents a major constraint to the uptake of DFS. Increased digital skills in the labor market are urgently needed in order to boost usage within businesses and advanced digital skills are needed for the development

and operation of DFS, lessening the dependence on expertise from abroad. Further recommendations for advancing digital skills can be found in Chapter 3.

**R2. Increase financial literacy and awareness among consumers.** Consumers need to increase their financial literacy and awareness of DFS benefits and practices, in order to change the mindset from cash to digital. Awareness campaigns can increase understanding of available products and services, while also illustrating benefits and risks, in order to empower consumers in recognizing safe and beneficial services and generate trust toward DFS. Such campaigns can be provided by private sector providers or through public-private partnerships.

#### **Objective 2: Facilitate wider usage of DFS**

**R3. Introduce incentives to increase merchants' DFS uptake.** Merchant uptake of digital payment is crucial for the spread of DFS. Incentives can be offered during introductory periods, such as tax discounts on associated fees, rendering DFS lower cost and lower risk for merchants.

**R4. Create a shared float account for agents.** The faster and more efficient deployment of new DFS initiatives would be facilitated by making the current agent network fully interoperable with a single common e-money float. Established as a part of an overall agent interoperability framework, this would entail agents using a single float for multiple e-money providers, and ideally a single POS. It is still a nascent concept but working successfully in a few markets such as Tanzania. A single common e-money float account for agents can significantly increase efficiency, interoperability and reduce costs of agent networks. This can ease liquidity constraints of agents, improve service delivery to customers and reduce barriers to new market entrants.

**R6. Enable stable and reliable usage of cloud services.** Remove the restriction on banks using cloud services in order to allow them to compete in DFS. In addition, stable and reliable data governance needs to be ensured, in order to increase the trust and security in DFS transactions.

#### **Objective 3: Encourage market-wide digital transformation**

**R7. Consider a joint industry sandbox for further development of DFS.** An API exchange marketplace can serve as a joint industry sandbox, used to develop and encourage the exchange of ideas and finding solutions for customer needs in Rwanda. Exchange and cooperation could be facilitated via a cloud-based architecture.

**R8. Build a collaborative network for the financial ecosystem.** A regional and collaborative Financial Innovation Network can help participants develop common approaches to business and address common regulatory and technical challenges. This can build on the existing system approach of R-NDPS and the National Payment Council.

**R9. Offer regional training program for FIs.** To support FIs in their digital development and transformation strategies, a Digital Transformation Bootcamp can provide a hands-on opportunity for FIs to develop their own unique and effective digital strategies. Such trainings can be facilitated by the International Finance Corporation (IFC).

# 6 Digital Entrepreneurship

## Key Messages:

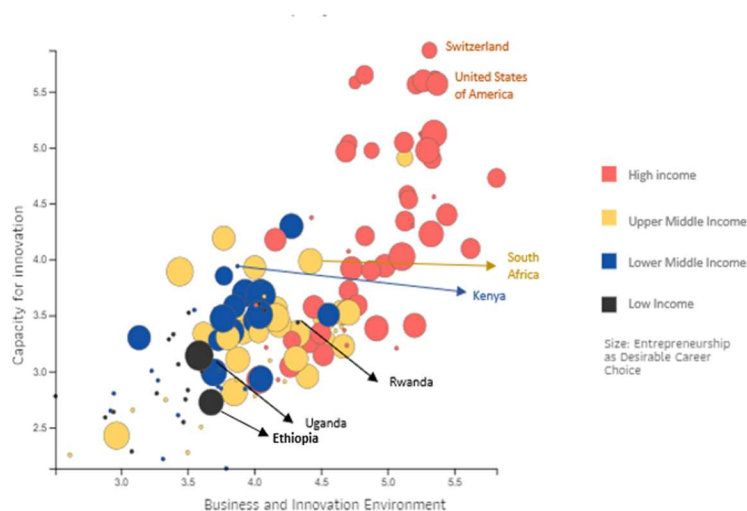
- Despite a strong government commitment and conducive enabling environment to support digital entrepreneurship, there have been few successful “homegrown” digital firms in Rwanda
- The limited domestic market size and even smaller market of digitally connected and skilled individuals makes achieving scale and profitability difficult; Greater access to regional and global markets is critical
- A gap in the entrepreneurship support infrastructure persists for firms looking to scale beyond the pre-incubation phase. Attracting globally recognized startup incubators and accelerators with a track record of success could help create a virtuous cycle of successful startups that will inspire a new round of entrepreneurs and innovators and attract the attention of global capital to Rwanda

## 6.1 Importance of Digital Entrepreneurship

### 6.1.1 Socioeconomic Rationale for Building Digital Entrepreneurship Ecosystems

**There is an undeniable association between entrepreneurship and a country’s income level.** The ten top-ranking countries of the Global Innovation Index (GII) all share the characteristic of having high GDP,<sup>65</sup> and high-income level countries score among the highest on “Capacity to Innovate” and “Business and Innovation Environment” (Figure 6-1). Entrepreneurship has the potential of creating new businesses and jobs and generating wealth and high standards of living. Rwandan entrepreneurs and innovators can build on the growing strength of the country’s foundations of digital infrastructure, digital skills, digital platforms, and digital financial services to develop new digital products and services and to develop more efficient digitally enabled business models, propelling the country’s growth and reaping the dividends of the digital economy.

Figure 6-1: Countries position on ‘Capacity to Innovate’ and ‘Business and Innovation Environment’



Source: TCdata360, World Bank Indicators

**Rwanda exhibits many signs of potential for innovation and a strong entrepreneurship ecosystem.** The country is strategically located, enjoys a conducive business environment with strong ICT infrastructure in place, and has been labeled an innovation achiever in the Global Innovation Index, over the past

<sup>65</sup> Global Innovation Index, 2018.

five years. All these can be capitalized to spur entrepreneurship and innovation. Establishing entrepreneurship ecosystems depends on a range of factors that go beyond investment into traditional inputs such as R&D, infrastructure, and education. These factors would include creating an enabling entrepreneurial ecosystem, through a favorable regulatory environment, availability and accessibility of talent and capital, and nation-wide availability of infrastructure, among others. Developing these factors should be one of the key focus areas going forward for Rwanda.

### 6.1.2 Alignment with Country Development Strategy & Goals

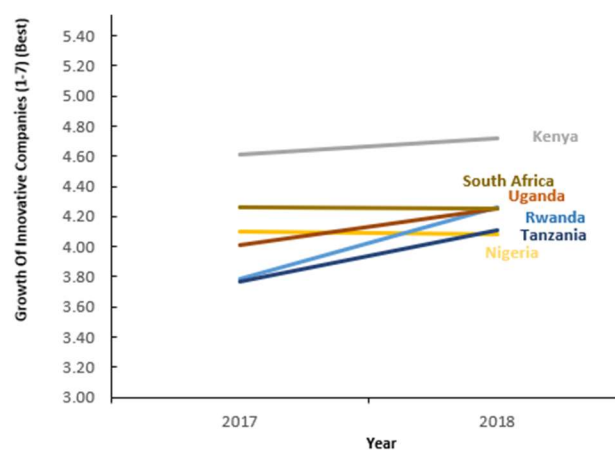
**Innovation and entrepreneurship are viewed as an integral part of achieving Rwanda’s Vision 2020 of building a knowledge-based economy.** The recent ICT Hub Strategy also aligns with this vision, with one of its three strategic goals being “to foster a national innovative culture”. A 2030 Vision has also been developed together with the Private Sector Foundation, which aims at advancing ICT and domestic businesses. In addition, efforts have been made to support business development through the establishment of supportive entities such the Rwanda Development Board (RDB) and Business Development Centers. These policy and strategic goals that prioritize both business development and ICT provide Rwanda with a strong foundation on which to build digital entrepreneurship.

## 6.2 Diagnostic Findings: Current State of Digital Entrepreneurship

### 6.2.1 State of the Digital Entrepreneurship & Innovation Ecosystem

**Rwanda has become a regional leader in terms of the “Ease of Doing Business”,<sup>66</sup> and exhibits a number of factors that are important for the development of digital entrepreneurship.** These include having a stable political environment, high levels of safety, a high-growth economy, increasing internet and mobile penetration, strategic geographical positioning, and governmental policies strongly committed to ICT development. In addition to this, it also has a growing urban and youth population, both of which can help fuel an innovation culture. Rwanda ranks second highest among the “low income” countries on the GII index, surpassed only by Tanzania. Figure 6-2 shows that Rwanda has exhibited meaningful growth in the number of innovative companies and has the potential to catch up to regional leaders.

Figure 6-2 Growth of Innovative Companies



Source: World Economic Forum, Global Competitiveness Index

**The government is helping build out critical support infrastructure.** This includes KLab, a public-private partnership supported by the GoR and the Japanese International Cooperation Agency (JICA). It serves as a pre-incubator, offering aspiring entrepreneurs free work space, internet connection, events, and classes to turn their ideas into businesses. FabLab, a sister-organization of KLab, is a hardware experimentation space that allows for the building of prototypes and testing. Moreover, since construction started in 2016, Kigali Innovation City (KIC) is taking shape with financial backing from Africa50, the infrastructure investment platform of the African Development Bank, that announced in

<sup>66</sup> IMF, 2018.

late 2018 that it would partner with the GoR on KIC with a goal of creating 50,000 jobs and generating annual ICT exports of US\$150 million.<sup>67</sup> An important government-led development, KIC aims to provide a physical space for the ICT ecosystem, including industry and services, academia, operators, incubators, and corporates. While these efforts have been welcome, there is consensus among stakeholders that the private sector has not yet grown enough to make the ICT sector broadly independent of government and donor funding.

**While KIC has the potential to boost the innovation and entrepreneurship profile of Rwanda it does come with its share of risks.** Indeed, it is not guaranteed that “if you build it, they will come.” Therefore, a prudent, multi-stage approach is needed to build out the networks, amenities, density, and regulatory environment required to solidify the value proposition and “stickiness” of KIC. The GoR has already shown their commitment in making KIC a success by following a human capital-centric approach rather than setting up a collocating park, with contracts already negotiated with large educational players, such as the African Leadership University, Carnegie Mellon University, and more.

**Several successful technology ventures have been recently launched.** These include innovative companies such as Zipline, a digital startup focused on drone delivery of blood and medical supplies<sup>68</sup> and AC Group, a pioneer in the use of a Tap&Go cashless payment systems for public transportation that has expanded to Cameroon. Rwanda is also evolving as an innovation “test kitchen” for initiatives such as a wholesale mobile broadband network, mass digital literacy through the Digital Ambassadors Program, and Internet for schools using the newest low earth orbiting satellites.

**Despite these individual successes, a largely conducive environment for digital entrepreneurship and significant government support, challenges remain.** Consultations with stakeholders have revealed that enabling factors such as presence of high-skilled entrepreneurs, digitally fluent consumers, and capital are quite limited. Investor protections also remain a challenge in attracting investors and access to capital.

## 6.2.2 Constraints to Digital Entrepreneurship & Innovation

### 6.2.2.1 Regulations, Policies & Institutions

**The GoR has undertaken significant policy changes and investments to fuel ICT growth.** Further promotion of digital entrepreneurship and innovation culture play a large role in the development of the ICT sector, particularly in recently adopted strategies, such as the ICT Hub strategy. There are however more steps to be taken in order to create an economic environment which favors innovation and entrepreneurship.

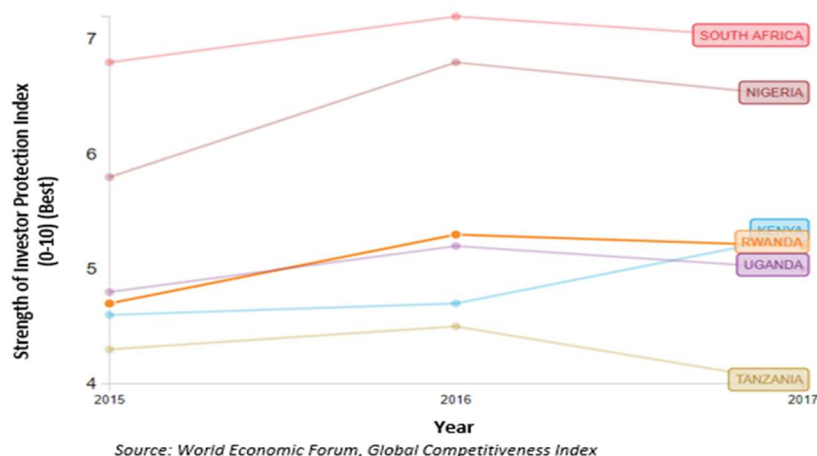
**Limited investor incentives and protections are constraining greater investment.** Although investor protection was improved through reforms in the 2015 Investment Code, Rwanda still scores lower than most peers on the strength of protecting investors (Figure 6-3). It is also worth noting that there is an absence of tax incentives and subsidies for investors, which may further reduce investors’ motivation given the nascency of and inherit risk within the Rwandan ecosystem.

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<sup>67</sup> Africa50, 2018

<sup>68</sup> Fleming, Sean. 2018.

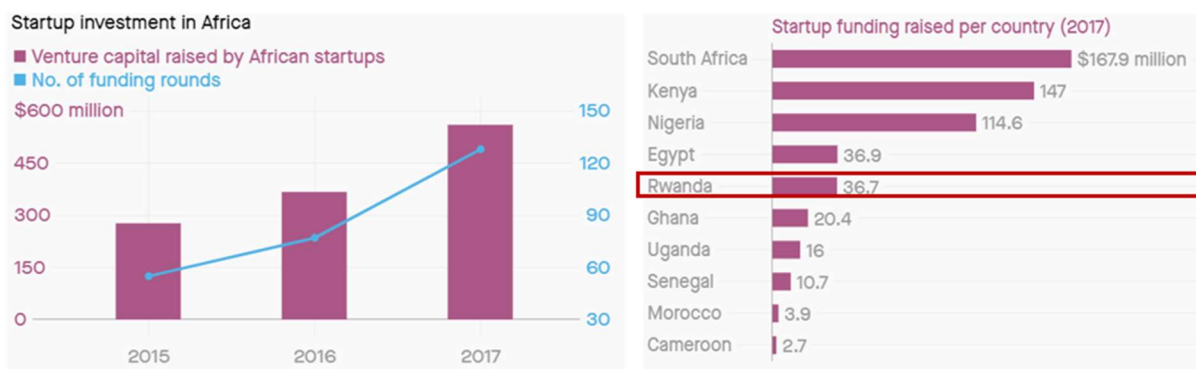
Figure 6-3 Performance of select African countries on 'Strength of Investor Protection'



**Insolvency procedures are limiting business creation in Rwanda.** Rwanda is currently performing lower than all other regional peers in terms of Insolvency Recovery Rate, i.e. cents on the dollar recovered by secured creditors. Inherently, many new ventures fail, therefore it is important to have strong insolvency and bankruptcy laws that can enable companies to restructure appropriately and help maximize the recovery rates for creditors. Efficient liquidation processes act as a stimulus for entrepreneurship because it allows for the quick reallocation of a failed firm’s assets and human capital, for better uses and new opportunities. Similarly, when a firm can restructure quickly, this helps protect the value of the assets and may increase the chances for a turnaround.

**While a steadily increasing flow of venture capital is seen in Africa, South Africa, Kenya and Nigeria continue to account for 76 percent of that total funding** (Figure 6-4). In order for Rwanda to be able to tap into this funding stream, further reforms on investment protection and insolvency laws are needed. Investors in Rwanda are not protected or incentivized enough to invest in the entrepreneurship ecosystem. Although reforms have been put in place with regards to investor protections such as the 2015 investment code, overall, investor protections are weak. In fact, Rwanda scores lower than most peers on the strength of protecting investors. In addition, the absence of tax incentives or subsidies, further reduces investors’ motivations to invest while links with international investors are largely absent.

Figure 6-4 Venture capital raised by African startups and amount of startup funding raised by select African countries



Source: Partech Ventures, 2017

### 6.2.2.2 Ecosystem Support & Infrastructure

The unavailability of appropriately skilled talent is a major constraint in the digital ecosystem, as discussed in Chapter 3. The World Economic Forum (WEF) Global Human Capital Index measures the

extent to which countries have optimized their human capital for the benefit of their economies and individuals. While Rwanda ranked the highest among all African countries in the 2017 index (71 out of 130 countries globally), 28 percent of employers have listed inadequate workforce skills as a major constraint.<sup>69</sup>

**Furthermore, there is limited support for startups beyond certain stages of growth.** As mentioned, the GoR successfully helped establish kLab<sup>70</sup> in 2011, a pre-incubator and open technology hub, and FabLab in 2016, an open digital manufacturing space. Beyond these very early stages however, there is still limited infrastructure of support for startups, such as incubators and accelerators, which serve a crucial function in facilitating access to skills, networks, mentorship, capital, technology and digital tools for startups. Stakeholder consultations revealed that while there are several spaces such as Impact Hub and Westerwelle Startup House, where innovators are co-located, there are very few entrepreneur support organizations for startups to “graduate” to. 250Startups, a GoR- and JICA-backed incubator, and Inkomoko, a business consulting firm, offer business skills training. More is needed, however in terms of solid mentorship, access to networks and markets.

**In addition to this, it is important to have access to growth-oriented financing for early-stage enterprises that generally have limited access to traditional commercial loans.** Besides funding from friends and family, early-stage enterprises depend largely on venture capital, which enables them to engage in user research, liaising with potential customers, building and testing prototypes, and refining their business models, in order to launch successful ventures. Rwanda sees a lack of funding channels and also gaps between investors and investees that are characteristic of a nascent entrepreneurial market. There are limited local channels of venture capital funding, angel investors, and seed stage investments. The WEF Global Competitiveness Report ranks venture capital availability in Rwanda at 3.24 on a scale of 1 to 7. Consultations revealed that entrepreneurs are often dependent on personal networks of friends and families to finance the early stages of their businesses, but do not have many options beyond that once their ventures reach a certain level of growth. As several ecosystem players pointed out, ‘capital follows ideas;’ this can be seen by the success of Zipline, a startup focused on drone delivery of blood and medical supplies, which started in Rwanda and was able to attract funding from prominent global VC investors such as Google Ventures, Sequoia, and Andreessen Horowitz. However, the majority of ideas or business plans within Rwanda are suffering due to entrepreneurs’ unfamiliarity with pitching their ideas effectively, as well as lack of technical soundness, and product-market fit, i.e. entrepreneurs are building products that do not meet the needs of the local market.

### 6.2.2.3 Markets & Culture

**There are a number of structural constraints in the area of digital entrepreneurship.** The Rwandan market is relatively small, with 38 percent of the population living below the poverty line and with high unemployment (approximately 15 percent in 2018), signaling limited purchasing power on the consumer side. In addition to this, demand of digital innovations is low due to limited digital skills and literacy among the majority of end-consumers.<sup>71</sup>

**Entrepreneurial mindset is limited due to lack of awareness around digital innovation and limited collaboration between ecosystem players.** The innovation culture and entrepreneurial mindset suffers from a lack of role-model effect on strengthening ambition and inspiration, since there is a general lack of awareness of successes of digital startups. There is also limited collaboration between existing digital entrepreneurs and startups, partly because of fear of competition, which limits information sharing and peer-to-peer learning. Finally, the high poverty and unemployment levels limits individuals’ ability to engage in innovation and risk-taking ventures.

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<sup>69</sup> WEF, 2018

<sup>70</sup> Online at <http://klab.rw/>.

<sup>71</sup> National Institute of Statistics of Rwanda, 2018.

## 6.3 Recommendations & Next Steps

### Objective 1: Address the financing gap for entrepreneurs

Stakeholder consultations show that access to financing is a major impediment for entrepreneurs, particularly at the seed stage. Initiatives are growing however, with a \$100 million Rwanda Innovation Fund being set up with the support of the African Development Bank to target growth stage enterprises. Private sector players such as Sobek Capital and Norrsken are in the process of entering the Rwandan market, and donor support has launched several relevant initiatives. Rwanda should build on this momentum and explore new channels of funding.

**R1. Establish alternative financing mechanisms for entrepreneurs.** A convening player, such as KIC, could create an angel network through which to spread information on potential investments, so that angel investors could opt in or out based on their interests. This would primarily target local angels but can also signal to foreign and regional investors the maturity and potential of the Rwandan ecosystem. In addition, the network could offer financial/investment education workshops. Moreover, a sovereign wealth fund, capitalized by the government's own revenue streams can be set up and a credit guarantee scheme, or other means of de-risking capital to encourage financial intermediaries, can be established. In addition, further studies and stakeholder consultations can be conducted to explore alternative channels for seed-stage financing.

### Objective 2: Boost entrepreneurs' capacity and create a market-appropriate talent pool

**R2. Increase efforts to raise digital skills and literacy.** Much like other digital economy pillars, limited digital skills are an impediment to entrepreneurship. Government and private sector initiatives have begun to address this, as explored in Chapter 3, and there is scope to continue this engagement. Increasing digital skills means exposing more individuals to digital learning and facilitating greater mobile and internet access.

**R3. Include business acumen and market-relevant skills in educational efforts.** Business acumen can be increased by offering more managerial and tech training programs, as well as introducing more practical educational elements in public and private schooling along with more internships and shadow programs with industry players. At the same time, it would also be beneficial to put some focus on soft skills and technical skills demanded by industry in relevant programs.

**R4. Introduce incentives to close the gender gap.** Efforts to include more women in digital entrepreneurship can include leadership workshops, confidence building initiatives, and trainings geared at shifting mindsets towards entrepreneurial career paths. Stakeholder consultations to further understand the gender gap and how to address it may be beneficial.

### Objective 3: Encourage investment in Rwandan entrepreneurship

Rwanda enjoys a highly positive perception as a stable and business enabling country,<sup>72</sup> and should capitalize on this to encourage venture capital inflow. The key is to encourage investors and the private sector to not only set up in Rwanda, but to also stay and maintain significant operations in the country.

**R5. Introduce tax incentives.** Tax incentives, such as tax breaks for digital startups and international investors, can encourage establishment in the country. An expert commission could also review the tax environment from the perspective of competitiveness taking all trade-offs into account.

**R6. Refine insolvency and bankruptcy laws and strengthen investor protection mechanisms.** More enabling insolvency and bankruptcy laws, along with stronger protections for investors could encourage investments and thus grow the VC ecosystem. Investor protections can include enforceability, share transfers, and director liability.

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<sup>72</sup> World Bank Group, 2018.

**R7. Introduce procurement policies that attract tech startups.** Agile procurement policies allowing startups to compete with larger companies in government procurement could increase opportunity.

**R8. Engage in proactive outreach to encourage investments.** “Invest in Rwanda” events and other proactive outreach can raise awareness about the Rwandan market and opportunities, as well as facilitate links between investors and entrepreneurs.

#### **Objective 4: Grow market size for digital innovation**

Rwanda scores among the highest in Africa in terms of the Ease of Doing Business.<sup>73</sup> Although stakeholder consultations show that it is considered easy and attractive to set up a business in Rwanda, it is not easy to grow a business there. This is due to a small market size, among other constraints.

**R9. Expand and deepen the domestic digital market and increase cross-border market integration.** As noted in previous chapters, increasing digital skills and access to the internet and digital devices can raise demand for digital products and services in Rwanda. However, given the imperative for most digital firms to scale quickly, it will be important to accelerate digital market integration efforts within East Africa and across the continent, providing seamless opportunities for expansion and a regional market size equivalent to the domestic base enjoyed by entrepreneurs in the major continental and global digital hubs.

#### **Objective 5: Build a culture of innovation and entrepreneurship**

**R10. Raise awareness of the digital innovation ecosystem and celebrate success stories.** Raising awareness of innovative Rwandan developed digital services, technological innovations, and entrepreneurial success stories can have a significant spillover effect, inspiring others to follow suit. Entrepreneurship needs to be showcased as nation-building and a celebrated practice. This can be done through public events, workshops and conferences, as well as through documenting and popularizing success stories in the media. An ecosystem mapping can likewise shine a spotlight on the various ecosystem players and help connect entrepreneurs, innovators and investors as well as create a baseline and benchmarking to track ecosystem development and gaps.

#### **Objective 6: Establish global linkages**

The establishment of global linkages has begun through a nascent support system of local and international players. The ecosystem has allowed some of the local players to establish international links, but they are still few and limited in scale. Also, there is limited support in accessing global markets.

**R13. Attract leading entrepreneurship support institutions.** Attracting a world-class, international accelerator would greatly strengthen the ecosystem and allow for global linkages, by signaling that Rwanda is indeed a strong choice for aspiring entrepreneurs in Africa. This is an opportunity for Rwanda to reach its aim of becoming a regional ICT hub. Leading accelerators, such as Y Combinator, 500 Startups and Techstars are currently looking to expand in Africa, and Rwanda would benefit from attracting one of these players, while also putting in place certain building blocks to foster innovation and entrepreneurship. This would subsequently lead to further organic growth and significantly boost digital entrepreneurship in Rwanda.

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<sup>73</sup> World Bank Group, 2019b.

## 7 Conclusion: The way forward

**At first glance, Rwanda may not appear an obvious candidate to champion a digital economy transformation agenda.** As a small, landlocked country facing significant challenges of poverty and access to high quality education and healthcare services, one could be forgiven for asking why these challenges shouldn't be tackled first. But it is precisely because of these challenges that the government has set out an ambitious vision to leverage technologies and digitally enabled business models to tackle them in new and more effective ways and to harness a unique opportunity to transform the development trajectory for government, society and the wider economy. Following the tested, "traditional" approaches to socioeconomic development will continue to bring steady improvements. While this is important, given Rwanda's low starting point, an incremental approach alone will still deny far too many of today's youth from realizing their potential. Instead, the country is making a bold bet on a digital future to accelerate this transformation.

**Rwanda can build upon its strengths to achieve its ambitious digital transformation vision.** These include strong leadership commitment and institutions, advanced network infrastructure investments, business and innovation friendly reputation and a strategic position in East Africa. The progress in building up the country's digital infrastructure, institutions and enabling environment over the past decade has been remarkable but has yet to translate fully into impact for the average citizen or from a wider macro-economic perspective. An acceleration and deepening of efforts is needed to bring the expected dividends: a dynamic, inclusive digital economy that drives economic growth and new job creation and provides access to high quality services, information and opportunity for every Rwandan.

**Harnessing the power of Rwanda's digital economy will require a coordinated, holistic approach that simultaneously builds and integrates the foundations for success.** It will require efforts to ensure that every individual and business has access to affordable and secure high-speed broadband and digital devices to connect to the digital economy – ensuring that all are able to participate while building a larger online user base to drive demand for further infrastructure development and creation of local digital content, applications and services. Efforts to digitize public services, build cross-cutting platforms and improve the user experience will need to be scaled up to create a compelling reason for more individuals and businesses to get online, adopt digital payment services and invest in improving their digital skills. The trust environment will need to be strengthened to create confidence that online communications, transactions and personal data are secure. Costs of digital payments, incentives for wider merchant adoption and consumer awareness will need to be addressed to accelerate the switch to a cashless economy that drives financial inclusion and eases online transactions.

**Finally, it will require programs, support infrastructure and networks that provide the digital capabilities needed to drive digital transformation across industries and government and spur development of new digital startups and innovations that bring the digital economy to life.** Every Rwandan will need to be empowered with a basic level of digital literacy to enable participation in the digital economy and to access vital services. The Workforce will need to be equipped with the technical and soft skills and lifelong learning opportunities needed for the jobs of the future and the platforms to match them with new work opportunities. Graduates of technical programs will need to leave with the practical competencies demanded by industry. Innovators will need to have the business acumen and access to finance or access to support networks that can match these needs in order to translate good ideas into successful business models.

**The challenges that lay ahead are great, but the opportunity is even greater.** Tackling the deficits noted across this report will require significant financial resources, collaboration and coordination across government and industry and a commitment to deeper digital market integration with Rwanda's neighbors to create the economies of scale and scope needed to drive competitiveness, attract private investment and share the costs of development of shared digital public goods.

**The World Bank Group stands ready as a committed partner to support Rwanda’s journey toward digital transformation. This report represents only a first step.**

# Annex 1: Recommendations Summary Table

Digital Infrastructure
Objective: Stimulate demand/uptake of broadband
R1. Roll-out broadband in public centers
R2. Deploy strategies to lower digital device costs
R3. Increase internet usage among companies
R4. Improving data collection to inform policymaking and investments
R4. Increase offerings and uptake of 4G services
Digital Skills
Objective: Improve access to necessary resources in education
R1. Equip students and educators with appropriate digital devices, infrastructure and content
R2. Review and expand teacher training
R3. Crowd-in more private sector providers to expand non-formal basic user-training as well as funding for existing schemes such as the DAP.
Objective: Support quality improvement in the education of work-ready digital specialists
R4. Consider scale-up of MOOCs and sourcing lecturers from the private sector to bridge existing faculty gaps
R5. Expand scholarships to boost access and completion rates for higher education
R6. Boost the attractiveness of STEM-related education
Objective: Encourage greater development of soft skills, business acumen and other qualifications tailored to the needs of the labor-market
R7. Boost the development of soft and 21st century skills in the existing curriculum
R8. Expand and improve the quality of TVET-level digital specialist skills education, through PPPs and skills development funds
R9. Increase industry-academia exchange
R10. Support cross-pollination between academic programs available in ICT and business administration
Objective: Align supply and demand to break the low skills equilibrium
R11. Improve labor market data collection and analysis
R12. Expand initiatives to incentivize and accelerate digital transformation of key sectors
Digital Platforms
Objective: Build an environment of online trust
R1. Develop a 'next generation' digital ID system that enables fully virtual ID and authentication
R2. Enact robust data protection and privacy legislation
Objective: Increase interoperability, integration as well as shared infrastructure and services
R3. Support movement towards shared infrastructure and services, consolidating, and upgrading existing assets
Objective: Expand uptake, effectiveness and perceived value of digital platforms
R4. Prioritize development of certain public platforms based on feedback from users
R5. Unleash the potential of the private sector to innovate in service delivery

**Objective: Expand access to Open Data and usage of big data analytics that can support innovation and improvements in service delivery**

**R6. Develop a clear approach to Open Data, while expanding and encouraging greater usage**

**Objective: Improve institutional frameworks to enable greater e-transformation, including expanded e-commerce**

**R7. Consider elevating the authority of RISA to enhance its ability to drive the transformation agenda across government**

**R8. Support greater interagency cooperation and coordination on the e-commerce agenda.**

**Objective: Address skills and capabilities gaps within the government**

**R9. Introduce initiatives to encourage digital skills development in ministries, and strive to hire top digital talent**

### **Digital Financial services**

**Objective: Boost capabilities of consumers to use DFS and build the skills base to power continued digital transformation and innovation in Fintech**

**R1. Continue work to advance digital skills**

**R2. Increase financial literacy and awareness among consumers**

**Objective: Facilitate wider usage of DFS**

**R3. Introduce incentives to increase merchants' DFS uptake**

**R4. Create a shared float account for agents**

**R6. Enable stable and reliable usage of cloud services**

**Objective: Encourage market-wide digital transformation**

**R7. Consider joint industry sandbox for further development of DFS**

**R8. Build a collaborative network for the financial ecosystem**

**R9. Offer regional training program for FIs**

### **Digital Entrepreneurship**

**Objective: Address the financing gap for entrepreneurs**

**R1. Establish alternative financing mechanisms for entrepreneurs**

**Objective: Boost entrepreneurs' capacity and create a market-appropriate talent pool**

**R2. Increase efforts to raise digital skills and literacy**

**R3. Include business acumen and market-relevant skills in educational efforts**

**R4. Introduce incentives to close the gender gap**

**Objective: Encourage investment in Rwandan entrepreneurship**

**R5. Introduce tax incentives for digital start-ups**

**R6. Refine insolvency and bankruptcy laws and strengthen investor protection mechanisms**

**R7. Introduce government procurement policies that attract tech start-ups**

**R8. Engage in proactive outreach to encourage investments**

**Objective: Grow market size for digital innovation**

**R9. Expand and deepen the domestic digital market and increase cross-border market integration**

**Objective: Build a culture of innovation and entrepreneurship**

**R11. Raise awareness of the digital innovation ecosystem and celebrate success stories**

**Objective: Establish global linkages**

**R13. Attract leading entrepreneurship support institutions**

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