e-Conomy Africa 2020

Africa's $180 billion Internet economy future

Google

IFC International Finance Corporation
WORLD BANK GROUP
Creating Markets, Creating Opportunities

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Foreword

Throughout the global pandemic, Africa's Internet economy is proving resilient, as digital startups across the continent devise innovative solutions to problems in a fast-changing world. These versatile Internet-based companies are leveraging Africa's unique strengths to expand opportunities for significant economic growth that will help create jobs, reduce poverty, and contribute to overcoming the continent's development challenges in the future.

The e-Conomy Africa 2020 report—a unique collaboration between Google and the International Finance Corporation (IFC)—provides a timely analysis of Africa's current Internet landscape. The report calls for tech companies, investors, and governments to join in supporting dynamic African entrepreneurs who are driving economic growth, fueled by a fast-growing population of increasingly urban and educated consumers.

This report is particularly poignant due to three key trends accelerating the growth of the African Internet economy:

1. Increased access to more affordable and higher-speed Internet across the continent
2. The manner in which African startups are transforming the African economic landscape and creating new market opportunities
3. Africa's commitment to developing the world's largest single market under the African Continental Free Trade Area

Over the past decade, Google has been dedicated to ecosystem building in Africa—with developer advocacy, startup acceleration, training programs, and global technical mentorship. IFC, a member of the World Bank Group, focuses its work on the private sector in developing countries and has a track record of supporting early-stage startup investments on the African continent. Google and IFC have collaborated on this report to leverage unique industry expertises, primary research, and analyses.

Google and IFC have created the e-Conomy Africa 2020 report to showcase and support African entrepreneurs and developers and highlight growth opportunities within the continent. This report provides a road map for investment opportunities in a vital sector of the African economy that, despite setbacks from COVID-19, is on track to expand in the coming decade, transforming lives in the process.

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Executive Summary

About the African digital opportunity

The African Internet economy is one of the largest overlooked investment opportunities of the past decade with potential for profound impact on development. The mobile Internet is transforming life across the continent with the support of growing local connectivity and mobility and a dynamic, young urban population. With a potential to add up to $180 billion to Africa's gross domestic product (GDP) by 2025, depending on the usage intensity of digital technologies by businesses, the Internet economy is improving productivity and efficiencies across large swaths of the economy, including agriculture, education, financial services, healthcare, and supply chains.

The Internet economy's potential to play a pivotal part in Africa's GDP growth has led to burgeoning investor interest. Buttressed by increasingly large liquidity events in African technology, even in the wake of the pandemic, venture capital funding in Africa reached an all-time high in 2019. There are signs that African venture capital funding is continuing its forward momentum, despite near-term disruption caused by COVID-19. The total amount of invested venture capital is still a fraction of total global venture capital funding, especially relative to the size of Africa's population, but this gap presents potential first-mover advantages for investors.

The COVID-19 pandemic has demonstrated that digital startups in Africa are able to provide innovative solutions when they are needed most. For example, public sector partnerships with private healthcare startups are increasing the availability of testing and have expanded the capacity for medical recordkeeping. The continued operation of the informal sector - a major portion of Africa's economic activity - is supported by e-Logistics and e-Commerce supply chain startups. New partnerships and business models like these will likely continue to influence startups across all industry sectors, even beyond the COVID-19 pandemic.

Africa has the world's youngest, fastest-growing, and increasingly urbanized workforce. These demographics, coupled with improved longevity and education levels, have led to a rise in the consumption of online services. Additionally, heavily concentrated populations in Africa's cities are supporting developer communities that attract new investors and talent pools. Rural populations also benefit from digital startups, and the Internet economy is critical to reaching and supporting the continent's 1.3 billion people.

The African Internet opportunity is driven by the talent of young digital entrepreneurs. Startups are solving some of Africa's most challenging issues, such as access to healthcare for remote populations, employment opportunities for women, and the ability to securely send and receive money. Advanced technologies—tailored to data-driven, scalable, and pan-African approaches—are providing new ways for Africans to conduct business and earn income. A robust collaboration between the private and public sectors is imperative to ensuring that African entrepreneurs succeed, not only in their home countries and regions, but in the global marketplace. Startups, and the entrepreneurs who create them, are the future of the continent.

Acknowledgements

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The core working group of the initiative was jointly led by Google's Andy Volk, Kevin O'Toole, Olivia Levine, Sheryl Lim, and Catherine Liang and IFC's Yera Park, Georges Vivien Houngbonon, and Kelly Alderson. The working group comprises Folarin Oreoluwa Aiyegbusi, Jake Chajson, Mike Robert den Hartog, and Toby Hei Nok Hung from Google and Alejandro Alvarez de la Campa, Davide Strusani, Gemma Torras Vives, Nicolas Friederici, Thomas Rehermann, and Toni Kristian Eliasz from the World Bank Group.

The working group is grateful to all researchers, advisors, and experts at Google and IFC who assisted in this report's creation and hope that its content will support the ongoing efforts of African entrepreneurs and developers.

A note on primary and secondary data

e-Conomy Africa 2020 employs developer and startup sizing, iGDP projections, and analysis commissioned from Accenture. Given the fast growth of the digital sector across Africa and the lack of consistent data and collection methodologies across all 54 countries on the continent, and in an effort to be academically inclusive of other Africa market analyses, this report also includes data and research from third parties that offer additional insights and perspective. In some instances, the primary data commissioned for this report and third party data may differ. The authors of this report elected to include the discrepancies in an effort to showcase alternative approaches to modeling the future of the African Internet economy. It is worth noting that in these instances, despite modeling differences, third party and commissioned projections consistently align in indicating positive growth over the coming years for the technology ecosystem in Africa, and that entrepreneurial activity will be a primary driver of sector development during that period. All data sources are cited thoroughly within the report's endnotes.

This report has been prepared solely for information purposes to provide a perspective on the African Internet economy. Projected market and financial information, analyses, and conclusions contained herein should not be construed as definitive forecasts or guarantees of future performance or results. Google and IFC do not provide market analysis or financial projections. Google and IFC internal data was not used in the development of this report.

1 The State of the Continent, Macro Trends, and Drivers of Change

Key Takeaways:

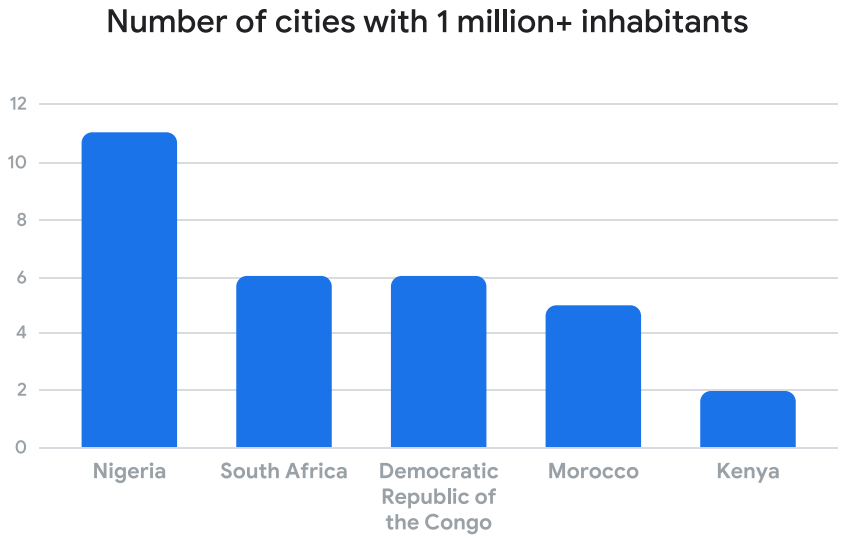
- Nineteen of the top 20 fastest-growing countries in the world are in Africa. Urbanization is on the rise, and an increasingly young and educated population is driving higher consumption of online services.
- The African Union (AU) is building the single largest free trade zone in the world through the African Continental Free Trade Area (AfCFTA), enacted in May 2019.
- Despite a negative macroeconomic outlook as a result of COVID-19, the African Internet economy is expected to be resilient.

An overview of the continent's demography and geography

Africa is home to 1.3 billion people, or 16% of the global population.[1] The continent encompasses 20% of the world's landmass distributed across 54 countries with diverse populations, cultures, states of development, and levels of stability.[2] Africa's 54 countries are clustered into five regions: Central Africa, East Africa, North Africa, Southern Africa, and West Africa.[3]

Of the top 20 fastest-growing countries in the world, 19 are in Africa. Projections indicate 87% population growth in Africa between 2020 and 2050 will result in a total population of 2.5 billion.[4] The African continent is demographically young: 60% of the population will be under 24 by 2025, and Africa will be home to 1 in 3 youths (aged 15 to 35) globally by 2050.[5]

Africa is experiencing rapid urbanization, with 68 cities each home to over one million inhabitants in 2020; the number of such cities is projected to increase to 85 by 2025.[6] By that same year, Africa's urban population is predicted to grow by 190 million people, meaning that just under half—45%— of all Africans will be living in a city.[7] Some countries—Nigeria, Ghana, and Angola among them—will see the proportion of urban residents increase to over 80% of their total population by 2050, when 800 million more Africans will have moved to urban areas.[8] In addition, there has been a general improvement in life expectancy, as Sub-Saharan Africans are expected to live nearly six years longer than a decade ago. These are positive trends that suggest a higher adoption of digital services in Africa in the future.[9]

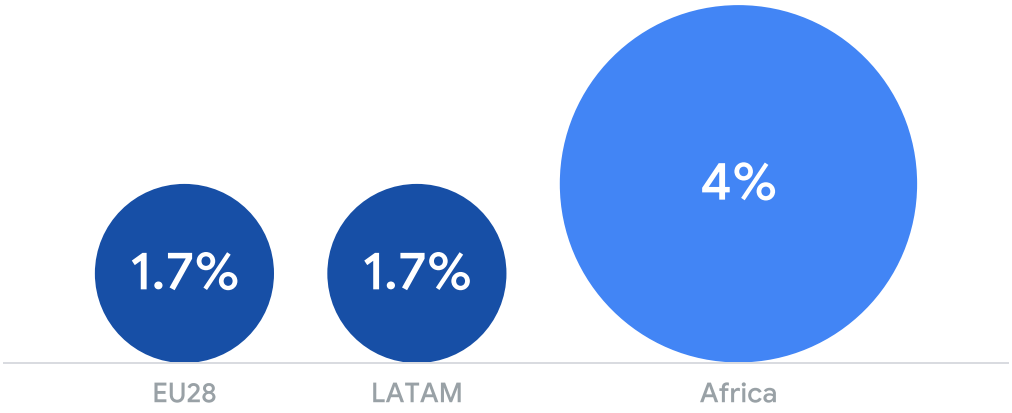


Africa's young, urbanized population is driving economic growth

Urbanization drives growth. In African countries that experienced the highest rural-to-urban migration between 2007 and 2011, urbanization also produced greater gains in consumer spending.[10] City dwellers consume more than those living in rural areas: in Africa's large metropolitan areas, the amount of money spent on consumer goods and services is typically 79% higher than the national average.[11] Africans who relocate to cities are also in closer proximity to innovative technologies and growth, given the higher level of connectivity in urban areas. This broadens employment opportunities and creates larger markets for commerce, which in turn drives greater consumer spending both on a personal scale and in the business sector.

Africa's demographic boom fuels consumption. Young African consumers are becoming more affluent and globalized as they also grow to become household decision-makers. The proportion of the population that is of working age will continue to rise; by 2050, Africa will have the only decreasing dependency ratio globally. This boosts the continent's competitiveness in both skilled and unskilled labor, and will lead to increased spending power for consumers.[12] By 2030, Africa is expected to be home to over 1.7 billion consumers with total consumer expenditure of $2.5 trillion.[13] [14]

Africa's economy has significantly expanded over the past decade and on average faster than most other regions



> Gross domestic product (GDP) grew by 4% per year between 2010 and 2019, more than twice that of the EU28 (1.7%) and Latin America (1.7%) over the same period.

Across the continent, private sector investment has contributed two to three times more to GDP growth than public investment.[15] There are 400 companies operating in Africa that earn annual revenues of over $1 billion; an additional 700 businesses earn at least half that. These companies grew faster than similar companies worldwide relative to both local currency and global profitability.[16]

According to the African Development Bank, there are over 350 million middle-class people in Africa.[17] Excluding South Africa, a growing middle class[18] in Sub-Saharan Africa is spending over $400 million per day.[19] Household spending rose to $1.6 trillion in 2017 after crossing the $1 trillion mark in 2010, indicating an expanding consumer class. Between 2011 and 2016, the income or consumption of the median individuals grew in most countries.[20]

Economic and trade reforms boosting digital transformation

Africa's private sector performance is broadly derived from economic reforms and improving governance. Compared with 2019, Sub-Saharan African economies increased their average score for ease of doing business by 0.9 points.[21] Some countries have increasingly adopted reforms to improve the ease of doing business, especially for companies in the Internet economy. These reforms fall into three categories:

1. **Starting a business:** involving reducing registration fees, improving online services, removing unnecessary requirements, and offering a one-stop-shop approach to administrative processes;
2. **Trading across borders:** Involving automation of maritime and terrestrial border controls and simplification of verification procedures; and
3. **Taxation:** Involving electronic filing and payment or merging all permits for simplicity.

According to the Ibrahim Index of Governance, the Safety & Rule of Law score for 30 African countries—more than half—has increased since 2014. The categories of Rule of Law and Transparency & Accountability have shown the most improvement. [22]

The African Union (AU) is building the largest free trade zone in the world. When it was enacted in May 2019, the African Continental Free Trade Area (AfCFTA) created the single biggest free trade zone on the planet, containing almost every African country. The AfCFTA aims to reduce tariffs on 90% of all goods and facilitate free movement of goods, services, capital, and people. Because of the COVID-19 crisis, the original start date of July 1, 2020 for trading under the AfCFTA is being rescheduled.[23]

> The AfCFTA will enable Africa's regional economic communities to become more integrated and easier to access.

The effects of the COVID-19 pandemic on the Internet economy – so far

Despite a negative macroeconomic outlook as a result of COVID-19, the African Internet economy is expected to be resilient. Africa's total GDP is expected to decrease by an order of magnitude that will depend on both the duration of the health crisis and the effectiveness of government responses to save lives and livelihoods, and to mitigate potential business failures and unemployment.

However, so far the African Internet economy has proven broadly resilient during the outbreak as digital connectivity and services have been widely used to support business continuity and consumer needs. This trend is expected to continue for various sub sectors of the African Internet economy, especially e-Commerce, e-Logistics, edtech, entertainment, fintech, and healthtech. Subsectors such as urban mobility, hospitality, travel, and events, on the other hand, may struggle to recover from the economic downturn caused by COVID-19. The African Internet economy will no doubt be transformed in the aftermath of COVID-19; exactly what this transformation will look like exactly remains to be seen.

COVID-19's impact on Africa's macroeconomic outlook (as of June 2020)

Overall impact on gross domestic product

The growth prospects of Sub-Saharan African countries following the COVID-19 pandemic are not encouraging (although the African Internet economy may be more resilient). The International Monetary Fund (IMF) projects that the region's economy will contract by -3.2% in 2020 from 3.1% growth in 2019, as COVID-19 disrupts production and demand and reduces global economic growth, compounded with a decline in commodity prices.[24] The economic uncertainty is exacerbated by difficulties in testing for and containing the virus.

The situation is fluid with the COVID-19 crisis, and some estimates show a bigger range of decline of between 3 and 8 percentage points in 2020 depending on the magnitude of government interventions.[25] The economic shocks from COVID-19 are being felt even in the continent's largest economies – Egypt, South Africa, and Kenya.[26] Nigeria, whose economy is the region's largest and is mainly dependent on oil exports, could see its GDP contract by -5.4%, from a 2.2% growth rate in 2019.[27] South Africa faces a significant downturn and possible decline in growth from 0.2% in 2019 to −8.0% in 2020, as existing structural constraints in the country are expected to be compounded by lower external demand, along with disruptions caused by containment and mitigation measures.[28] Kenya's GDP is expected to drop from 5.4% in 2019 to -0.3% in 2020 as global financial conditions worsen as a result of COVID-19. In Egypt, GDP growth is expected to decline from 5.6% to 2.0%.[29]

While South Africa and Nigeria will certainly see a sizable contraction in GDP, many smaller countries expect a large amount of external financial support that could significantly mitigate the economic impact of COVID-19 (this negative impact includes the decline in external demand and disruption of domestic supply chains). The efficacy of this financial support in reviving the economy will depend to a large extent on the ability of individuals and businesses to transact online, further enhancing the role of the Internet economy.

Impact on unemployment rates

COVID-19 could raise the unemployment rate across the region as a large number of workers are expected to be affected. McKinsey estimates that the pandemic could cause 9 million to 18 million formal sector employees to lose their jobs, while an additional one-third could see significantly reduced wages and hours.[30] The hardest-hit areas of the economy are predicted to be in the retail, tourism, manufacturing, and construction sectors. Nearly 300 million Africans are employed in the informal sector; approximately one-third of them are expected to face job loss or reduced income during this health crisis.[31]

2 Africa's Growing Internet Economy, Trends, and Projections

Key Takeaways

- By 2025, the Internet economy has the potential to contribute nearly $180 billion to Africa's economy, depending on the usage level of digital technologies by businesses and the right mix of policy actions.
- Internet access is transforming the African continent. Since 2000, the number of people with Internet access has grown to over 520 million, or 40% of the population; and 60% of the population accesses the Internet via mobile. Increasing Internet access to reach 75% of the population could create 44 million jobs.
- A variety of sectors – including fintech, e-Commerce, healthtech, media and entertainment, local transportation, food delivery, and business-to-business (B2B) e-Logistics – are leading the way in Africa's digital transformation.
- Although formal sector businesses (such as large corporations) have historically shaped the economy, the Internet economy offers leapfrog opportunities to address challenges faced by Africa's fast-growing number of informal businesses and workers.

Increased digital connectivity is fostering growth

Internet access is increasing in the African continent. Since 2000, the number of people with Internet access has grown to 522.8 million, or 39.8% of the population.[32] Digital connectivity has rapidly expanded across Africa over the past decade. Between 2010 and 2019, more than 300 million Africans gained access to the Internet, with nearly 500 million new smartphone connections.[33] In the next decade, the number of Internet users in Africa is expected to grow by 11%, representing 16% of the total global amount.

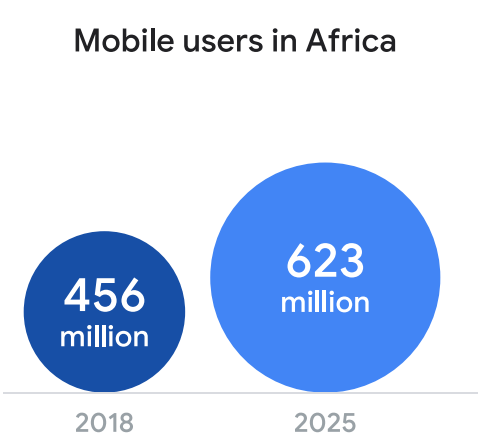
By the numbers: How connectivity leads to economic opportunities

A 10% increase in mobile Internet penetration increases GDP per capita by 2.5% in Africa, compared with 2% globally.[34] In addition, a 10% increase in digitization, the conversion of information into a digital medium, increases GDP per capita by 1.9% in Africa, compared with 1% in non-Organisation for Economic Co-operation and Development (OECD) countries.[35] More generally, increasing Internet access to 75% of the population could create 44 million jobs.[36]

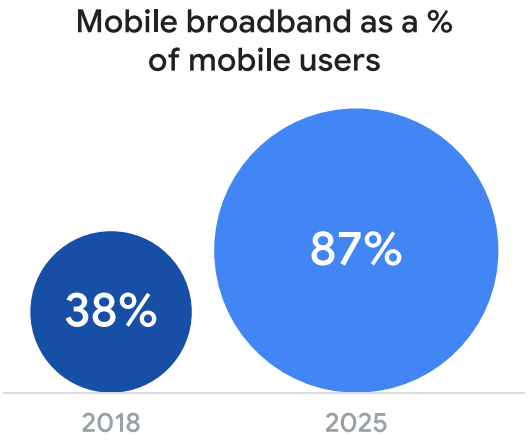
The mobile technology sector is a major contributor of economic value. Of the total GDP for Sub-Saharan Africa in 2018, 8.6% came from mobile technologies and services, translating to a $144.1 billion gain.[37] In addition, nearly 3.5 million people were employed in the mobile sector, and corresponding taxes contributed another $15.6 billion.[38]

Increased connectivity has presented an opportunity for businesses and communities to leapfrog with new technologies, paving the way for economic development. 144 mobile money services are available across Sub-Saharan Africa, serving more than 469 million registered accounts with daily transactions amounting to $1.25 billion by the end of 2019, compared to 298 million registered accounts for traditional bank accounts in 2017. [39] [40]

Mobile devices are the most common means of Internet access. Across the continent, 60% of the population is accessing the Internet via mobile.[41] By 2025, 167 million more people from Sub-Saharan Africa will have subscribed to mobile services reaching 623mm users, and smartphone connections in the region will more than double. [42] In the next decade, the number of Internet users in Africa will grow by 11%, representing 16% of the total global amount.[43]



Source: GSMA, "The Mobile Economy: Sub-Saharan Africa Report 2019" (GSMA Intelligence report, GSMA, London, 2019).



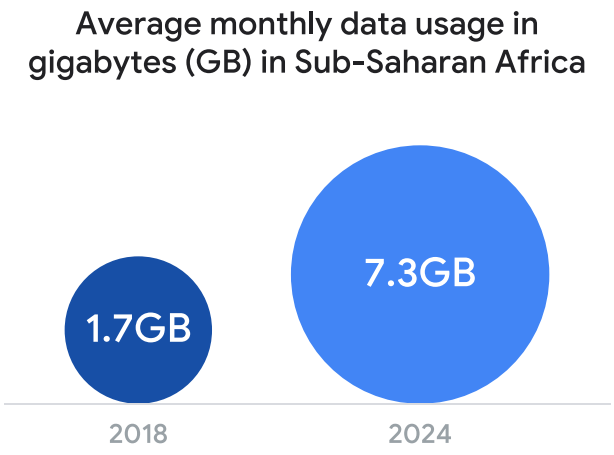
Source: Damian Radcliffe, "Mobile in Sub-Saharan Africa: Can World's Fastest-Growing Mobile Region Keep It Up?" ZDNet, October 16, 2018.

The cost of Internet access and the impact of rising demand

Affordability is a primary barrier to mobile Internet access. Entry-level and secondhand devices have prices ranging from $35 to $40,[44] which is the equivalent of up to 80% of monthly wages in some African countries. Affordability levels exceed the global 2% of monthly income target in more than 75% of countries in Sub-Saharan Africa,[45] largely due to the high import cost of devices. Asian brands account for 70% of the African mobile device market, with the Chinese-owned Transsion leading in volume.[46] As local phone manufacturing grows and structured payment plans become more prevalent, smartphones are expected to become more affordable and available.

There has been significant progress in reducing the cost of data over the past few years. Tariffs have dropped from 13.2% of average monthly income to 6.8% between 2016 and 2019. As governments continue to implement mandates and the supply of mobile devices continues to grow, Internet access will become more widespread and affordable.[47]

There is an increasing demand for high-speed Internet and digital services. While the majority of mobile connections in Africa are slower-speed 2G connections, 3G broadband connections are predicted to account for 54% of all connections by 2025, with 4G connections reaching 31%.[48] Fixed broadband has also grown 15% annually since 2015 and is expected to triple by 2023.[49]



Source: GSMA, "The Mobile Economy: Sub-Saharan Africa Report 2019" (GSMA Intelligence report, GSMA, London, 2019).

Monthly data consumption is forecasted to increase by over 300% between 2018 and 2024. This will lead to a higher demand for faster and more reliable Internet. In addition, digital readiness will also need to increase in order to help drive usage more widely, requiring the development of content in local languages and educational initiatives for digital literacy skills. Based on The Inclusive Internet Index, South Africa, Tunisia, Morocco, Kenya, and Nigeria are currently best positioned for thriving Internet economies.[50]

Internet index by country

Ranking	Country	Availability	Affordability	Relevance	Readiness
89th	Ethiopia	88	95	88	64
70th	Ghana	72	62	66	69
82nd	Ivory Coast	79	65	90	89
64th	Kenya	70	50	35	87
62nd	Morocco	47	66	72	65
65th	Nigeria	80	28	47	73
79th	Rwanda	76	74	87	60
50th	South Africa	51	31	80	4
79th	Tanzania	85	55	69	61
60th	Tunisia	52	45	70	79
85th	Uganda	90	91	44	63

Source: The Economist. 2019. "The Inclusive Internet Index," Intelligence Unit, https://theinclusiveinternet.eiu.com/.

By the numbers: The size of Africa's Internet economy

Market leaders are driving innovation in Africa across emerging verticals, such as fintech, healthtech, media and entertainment, e-mobility and food delivery, and B2B e-Logistics. Over the past decade, Africa's Internet gross domestic product (iGDP) —defined as the Internet's contribution to the GDP— growth has been strong.

In 2012, less than a decade ago, Africa's Internet economy was estimated at roughly 1.1%, or $30 billion, of its GDP.[51] An analysis conducted by Accenture found that iGDP may contribute approximately $115 billion to Africa's 2.554 trillion GDP (4.5%) in 2020, up from $99.7 billion in 2019,[52] with a potential to grow as the economies gradually develop. By way of comparison, in developed economies like the US, the Internet economy contributed to 9% of GDP in 2018.[53]

Africa iGDP Potential

	iGDP (billions)	iGDP as % of GDP	GDP (billions)
2019	$100	3.9%	$2,580
2020	$115	4.5%	$2,554
2025	$180	5.2%	$3,446
2050	$712	8.5%	$8,342

Source: Accenture, "Africa iGDP Forecast, Africa," September 2020.

> By 2025, the Internet economy has the potential to contribute close to $180 billion to Africa's economy.[54]

iGDP Potential

Country	2020 ($B)	2020 (%)	2025 ($B)	2025 (%)	2050 ($B)	2050 (%)
Kenya	7.42	7.70%	12.84	9.24%	51.07	15.17%
Morocco	7.80	6.82%	12.09	7.84%	48.06	12.88%
South Africa	21.55	6.51%	31.45	7.86%	125.08	12.92%
Senegal	1.51	6.22%	2.92	7.11%	11.61	11.68%
Nigeria	24.59	5.68%	36.53	6.86%	145.28	11.27%
Algeria	9.02	5.60%	11.92	6.16%	47.39	10.12%
Cameroon	2.06	5.39%	3.27	6.19%	13.00	10.16%
Côte d'Ivoire	3.18	5.27%	5.53	6.04%	21.98	9.92%
Egypt	15.41	4.98%	25.97	5.99%	103.29	9.83%
Rwanda	0.52	4.98%	0.97	5.96%	3.85	9.79%
Ghana	3.01	4.42%	5.01	5.31%	19.94	8.73%
Tanzania	2.57	3.98%	4.28	4.57%	17.03	7.50%
Uganda	1.36	3.82%	2.26	4.18%	8.97	6.87%
Mozambique	0.37	2.45%	0.67	2.81%	2.65	4.62%
Angola	2.02	2.17%	2.88	2.38%	11.44	3.91%
Ethiopia	1.26	1.27%	2.02	1.39%	8.03	2.28%
Rest of Africa	11.62	1.96%	18.55	2.16%	73.76	3.54%
Total	**$115**	**4.5%**	**$180**	**5.2%**	**$712**	**8.5%**

Source: Accenture, "Africa iGDP Forecast, Africa."

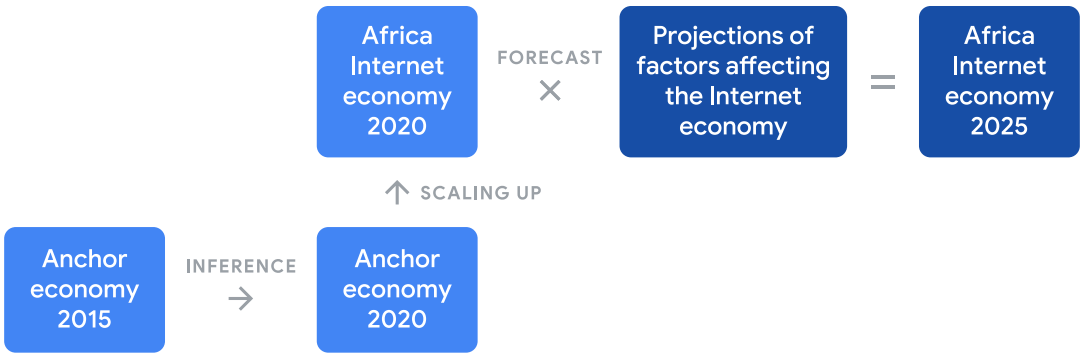
Over the next five years, COVID-19 is expected to delay economic growth both in Africa as well as in the rest of the world. However, despite these headwinds, Accenture's analysis suggests **that by 2025, the Internet economy has the potential to reach 5.2% of the GDP in Africa, contributing almost $180 billion to Africa's total GDP,** with low-income countries likely to remain below and middle-income countries expected to slightly exceed that average.[55] **Crucially, the potential depends on the usage intensity of digital technologies by businesses and the right mix of policy actions.**

After a period of economic recovery, Africa's iGDP should continue to grow from 2025 onwards as the remaining 38 countries catch up to the 16 early-adopting ones mentioned above. So, while COVID-19 will be a shock to the economy in the short term, the underlying factors of Africa's strong Internet economy will not only remain the same but strengthen. The resilience of the Internet economy coupled with investments in infrastructure, private consumption, strong developer talent, public and private investment, and new government policies and regulations will continue to drive this growth in Africa.[56]

> Africa's iGDP may have the long term potential to add $712 billion to the continent's economy by 2050.[57]

Estimation of Africa's iGDP:

Recognizing that the Internet economy can be estimated through various methodologies, in this study, Africa's iGDP has been estimated, by Accenture, using a high-level extrapolation technique (see chart below). First, the size of the Internet economy was estimated for an anchor economy with the most recently available data. The estimation was projected in 2020 using the historical growth rate in the iGDP of the anchor economy. The size of the Internet economy in all other African economies was then estimated by scaling up the iGDP of the anchor economy on the basis of key factors that affect the Internet economy. Main factors include the labor share of the agriculture sector, the penetration rate of the Internet and social media, as well as the population of developers.



In the base case scenario, South Africa was used as the anchor economy, with data from the input-output tables of the OECD in 2015. The estimation has been stress-tested using Morocco as an alternative anchor economy with similar results.

Sector analysis of Africa's Internet economy

Sector: Fintech

Over the past decade, fintech has become a significant driving force in the African Internet economy, contributing directly to GDP growth while also enabling various other sectors. Fintech startups continue to be the most funded startups in Africa, with significant YoY growth. The vertical received $836 million across 65 deals in 2019 and $379 million across 42 deals in 2018, resulting in a 120% growth in funding and a 55% growth in deal volume YoY. [58] **Fintech startups remain the top destination for funding and have grown at a CAGR of 24% over the past 10 years, receiving 54% of all startup investment in 2019.** This is a strong indicator of high investor trust, as well as of the strong growth in the number of fintech startups across the continent.

The fintech sector is growing in Africa, in part, to serve the population that is currently unbanked and financially excluded. However, the rise of these solutions and access to mobile technology are driving demand and growth in this sector. The opportunities arising from the vertical broadening beyond traditional banking services are also contributing factors. These fintech startups address different categories of the banking and finance sector such as lending, payment processing, personal finance, money management and transfers, and consumer banking.

Fintech startups are building solutions that address infrastructure challenges at the local and regional level. Sub-Saharan Africa has 5 commercial bank branches per 100,000 adults, compared with 13 per 100,000 adults globally.[59] Fintech is enabling African countries to leapfrog from physical retail banking to online payments, remittances, microloans, and insurance. Paired with rising mobile connectivity, individuals living in rural areas with poor physical banking infrastructure and limited access to fixed-line Internet access are increasingly able to use mobile devices for financial transactions.[60]

> *"Fintech is clearly exploding on the continent with more and more digital players enabling startups to serve the segment. This is one of the reasons that VC investors now have a much larger pool to play with than the traditional private equity investors did before. We're seeing the latter come into smaller tickets and into the tech space, trying to find interesting opportunities..."* [61]
>
> - Tidjane Dème, General Partner (Partech)

Fintech products that address infrastructure challenges in Africa include M-PESA in Kenya, Fawry in Egypt, and Paystack[62] in Nigeria. M-PESA had 23.6 million active customers in 2019, up by 12.4% from 2018. Savings and lending, through services like M-Shwari, Fuliza, and KCB M-PESA, grew at more than 100% annually. International remittances through M-PESA grew at 44.6% YoY, and payments at 11.0% YoY, of which consumer-to-business (C2B) rose 30.6% YoY.[63]

This performance supports increased access to financial services, thereby improving individual outcomes.[64] For instance, the financial inclusion driven by M-PESA lifted 2% of Kenyan households out of poverty by increasing per-capita consumption.[65] In April 2020, Visa announced its partnership with M-PESA, which will connect the platform with Visa's global network.[66]

Startups such as Flutterwave[67] and Okra are providing platforms and application programming interfaces (APIs) for the next generation of African startups. Several fintech companies rely on agent networks to provide affordable financial services, as these offer a savings of 25% over traditional bank branches.[68]

Nigerian companies dominated fintech investments in 2019, with Interswitch receiving $200 million in equity funding from Visa, in anticipation of a projected 35% growth of the electronic payments market between 2018 and 2023. Interswitch helped transform the infrastructure for the banking system in Nigeria, and it additionally services over 23 other countries.[69] OPay (a payment platform and "super app" by Opera) and PalmPay followed with $120 million and $40 million in investments, respectively.[70]

In July 2020, DPO Group, a Nairobi-based payments processing service, was acquired by Network International for $288 million, and in August, World Remit announced a deal to acquire Sendwave, an African focused digital remittance startup for more than $500 million,[71] signalling resilience and continued growth of the sector, despite COVID-19.[72]

Companies in the Internet economy have generally outperformed other sectors of the economy. Significant growth in mobile payments and money transfer platforms indicates strong demand for and adoption rates of these services. JumiaPay total payment volume was up 95% and transactions were up 262% year-over-year.[73] In digital financial services, especially mobile-money, M-PESA had 23.6m active customers by H1 HY20, up 12.4% from HY19. Savings and lending (M-Shwari, Fuliza, KCB M-PESA) grew at more than 100% YoY.

COVID-19's impact on fintech

With loan volumes already increasing and the need for cashless transactions more important than ever, the pandemic could prompt accelerated digitization of the financial industry.

Countries such as Ghana and Kenya have begun easing charges on lending, and promoting programs that reduce cash handling. As other African countries follow suit, this moment provides an opportunity for new fintech approaches and solutions that can drive economic recovery during and post-pandemic.[74]

Sector: e-Commerce

Africa's e-Commerce industry has shown incredible growth in the past decade, resulting from an improved payment-processing landscape, a rise in mobile technology, and mobile money tech adoption. In prior years, the industry faced some skepticism as consumers raised logistical concerns; more recently, however, the industry has seen substantial growth with its first round of venture capital (VC) funding and the entrance of multiple startups.

In 2019, $134 million in funding across 30 deals was attributed to e-Commerce, indicating a 2% YoY increase in funding and a 36% YoY increase in the number of deals.[75]

Kenyan e-Commerce startup Copia raised $26 million in a Series B funding round in 2019, allowing the business to expand operations.[76] Other substantial e-Commerce companies include Nigeria-founded startup Jumia, and South African startup Takealot. Jumia went public in 2019 with its IPO on the New York Stock Exchange, while Takealot secured another $70 million in funding from Naspers in 2017.[77]

COVID-19's impact on e-Commerce

The partial and full lockdowns mandated in countries on the African continent and globally have necessitated e-Commerce behaviors that may extend beyond the pandemic period. Consumers have initially focused on necessities such as food and medical- or health-related items, due to the uncertainty of the supply chain, low or unreliable discretionary spending, and consumer wariness.

However, e-Commerce markets may experience an increasing volume of shoppers exploring other retail offerings as behaviors change post-pandemic. Already 37% of South Africans have reported shopping online more than usual during this public health crisis.[78]

After the pandemic subsides, the anxiety surrounding large payment transactions that usually results in cash-on-delivery for products such as consumer electronics and clothing items may also subside as consumers become more accustomed to online shopping.[79]

Sector: Healthtech

In the past few years, healthtech has alternated between being the second and the fifth most funded vertical in Africa. This sector received $189 million across 13 deals in 2019—a 969% YoY increase in funding from $18 million in 2018. While a significant number of deals in healthtech were in the form of prizes and grants, the growing interest in and funding of the vertical, coupled with improving mobile connectivity, could result in widespread reform and innovations in healthcare to rural and resource-deprived areas.[80] The African healthcare market was valued at over $85 billion in 2017 and is expected to reach over $100 billion by 2030 at a CAGR of 7.9%.[81] Moreover, healthtech funding provides a substantial opportunity to transform traditional health facilities to better meet global standards and more efficiently address social needs.

On the business-to-business (B2B) front, Zipline, a drone delivery startup, raised $120 million in 2019 to expand its medical supply drone delivery service across Africa, the Americas, South and Southeast Asia. Helium Health,[82]a Nigerian-based company that gives healthcare providers a comprehensive suite of technology solutions to improve their healthcare delivery, raised $10 million in 2020 to expand services into Kenya, Rwanda, Uganda, and Morocco. 54gene[83], a startup building the first pan-African commercial Genetics BioBank, raised $15 million led by Adjuvant Capital. On the business-to-consumer (B2C) front, CarePay, a platform that enables users to save, receive, and fund personal health needs, also raised $45 million to deepen its presence in Kenya, Nigeria, and Tanzania.

COVID-19's impact on healthtech

Patients and doctors around the world have begun using telemedicine more frequently, as the COVID-19 pandemic makes in-person visits ill-advised or impossible due to distancing or lockdown guidelines. Africa is no exception. As a result, the continent has seen telemedicine solutions and last-mile drug delivery gain traction over this period.

Examples of telemedicine growth during the pandemic as a healthcare delivery model include:

1. Telemedicine has expanded in Kenya during COVID-19, with a number of hospitals and practitioners now offering it as an alternative to in-person visit in an effort to expand offerings as well as help stop the spread of the pandemic.[84]

2. The Health Professions Council of South Africa (HPCSA) has been historically slow to allow the growth of telemedicine solutions.[85] However, HPCSA has changed some rules during COVID-19, to allow first-time consultations to take place virtually, with some groups even changing their policies to allow for remote telemedicine consultations to occur at full billing rates.[86]

3. 54gene recently raised $15 million in funding, expanding its value offerings by including mass COVID-19 testing labs across Nigeria.

4. Lifebank, a healthcare and logistics company in Nigeria, has launched drive-through COVID-19 testing centers which, thanks to additional funding from investors, allow it to provide free tests. Lifebank has also expanded its oxygen delivery services to support treatment efforts.[87]

As a result of COVID-19, the following trends will likely continue into the future:

1. Legislation will continue to expand the use of telemedicine after the COVID-19 pandemic;
2. Patients and doctors will continue to use telemedicine services for convenience after the pandemic, resulting in long-term growth of telemedicine in Africa; and
3. Access to skilled health practitioners at lower costs, due to reduced or absent transportation costs, will continue to increase.

Sector: Media and entertainment

The media and entertainment (M&E) industry has grown steadily over the past few years and is expected to continue growing for the next four years. The five largest M&E markets across the continent—South Africa, Nigeria, Kenya, Ghana, and Tanzania (Egypt was not included in the cited study)—showed a CAGR of 11.9% with total revenue of over $17 billion in 2018.[88]

Nigeria's M&E market is significantly influenced by Internet consumption, which will continue to contribute growth. With market revenue reaching $4.5 billion in 2018, earnings are expected to keep rising at a 19.3% CAGR and are estimated to reach more than $10 billion by 2023[89].

The combined M&E market consists of various categories with a range of performance in recent years. Categories such as virtual reality (VR) and e-Sports have seen significant growth; in South Africa from 2018 to 2023 both have forecasted CAGRs of 44% and 26%, respectively.[90] While most categories show growth, print categories such as magazines and newspapers are the lone trouble spot, reporting negative growth figures across the continent. This is largely attributed to the rise of the Internet, shifting consumers away from print and toward online options.

Growth factors for media and entertainment

With the predicted rise in disposable income for millions of people across the continent over the next four years, more consumers will be able to enjoy M&E products and services, leading to growth in this market sector.

Revenue from Internet access is a major contributor to M&E industry growth. The expanding number of mobile technology users and advancements in mobile technology have prompted a greater demand for access and a corresponding increase in revenue. The coming wave of 5G technology is expected to have a transformative effect on the industry by offering more avenues to utilize M&E content, especially via high-speed connectivity for streaming.

In the past, building physical Internet infrastructure has been a challenge since the population of Africa is spread across both rural and urban areas. Innovative strategies such as Alphabet's Project Loon,[91] however, have significantly improved Internet connectivity in rural areas with the use of stratospheric balloons. As a result, countries such as Kenya can provide Internet connectivity to virtually all of its population.[92]

COVID-19's impact on media and entertainment

The pandemic has caused a rapid increase in demand for Internet services. Providers have been forced to temporarily reduce streaming speeds to accommodate this need, and mobile operators in South Africa have issued temporary emergency spectrum licenses to help ease the strain on the industry.[93]

Trends that will continue or grow:

1. Africa-created content on globally-available streaming media platforms, such as Netflix's "Made in Africa" collection[94], will continue to expand.

2. African satellite TV providers will be accelerating their transition to streaming models to keep up with competition and avoid losing customers to existing global streaming media platforms. As one example, Naspers, the owner of DSTV/Multichoice, launched Showmax to compete with Netflix in Africa.

3. To prepare for the streaming-first entertainment world, African satellite and broadcast TV providers will need to find streaming platforms to partner with if they want to stay cost-effective and relevant.

Sector: e-mobility and food delivery

In Africa, there are 44 vehicles per 1,000 inhabitants, compared to 180 globally—one of the lowest car to person ratios in the world.[95] Owning a personal vehicle is prohibitively expensive, an order of magnitude higher than other forms of public or non-motorized transport. Consistent with the continent's low rates of car ownership, communal taxis and moto-taxis account for 75-80% of Africa's total motorized trips.[96] E-mobility solutions have taken off in Africa, in particular, global ride-hailing companies, such as Uber and Bolt, have entered the market in the past seven years, in addition to local players, such as Little, Gokada, Gozem, MaxNG, Safeboda, Yassir.

According to Disrupt Africa's 2019 report, startups within the e-mobility sector in Africa raised $62.2 million over the course of 14 deals in 2019, making it the third-most funded sector on the continent.[97] And with more than 150 startups focused on solving Africa's mobility challenges, this sector is expected to continue to grow.

While food delivery services are not new in Africa, the sector began to gain considerable interest and growth in 2019. This is due largely to ride-hailing startups that have begun to expand by offering their services to the food delivery sector. Many are able to do this by leveraging their already operational fleet of drivers and folding this new service into their existing digital platform.[98]

SafeBoda is a bike-hailing startup in Uganda that added food delivery to their menu of services at the end of 2019. And while Uber is not an African startup, it went live with UberEats in South Africa at the start of 2020. OrderIn and Otlob are some of the longer-standing players on the continent.[99]

South Africa has one of the largest markets for online food delivery on the continent, with revenue amounts estimated to be $965 million in 2020 (+35.4% YoY). The market volume is expected to grow at a CAGR of 9.7%, bringing the total market value to $1.37 billion by 2024.[100]

COVID-19's impact on e-mobility and food delivery

With the movement of people stymied by the pandemic, startups have seen a major decline in ridership and food delivery figures. To make up for these losses, e-mobility and food delivery startups have expanded their offerings beyond rides and the more typical fast-food style deliveries to accommodate orders of items such as medicine, groceries, and essential personal care products.[101] In South Africa, where fast-food delivery is restricted during the COVID-19 pandemic, food delivery firms pivoted to groceries and medicine to meet demand.[102] Examples include Twiga Foods,[103] normally a B2B food supplier, and Jumia Kenya, which have both begun delivering food directly to consumers as a result of COVID-19.

It is likely that more e-mobility startups will begin to expand into the food delivery space, as apps attempt to become more versatile and diversify their service offerings. There will be a sustained increase in food delivery post-pandemic; although the sector will initially contract after the crisis—though not to pre-pandemic levels—it will expand long term.

Sector: B2B e-Logistics

B2B platforms are solving logistical challenges for informal retailers. For example, on-demand fast-moving consumer goods (FMCG) delivery services provide 24/7 marketplaces for retailers to use when ordering products. They also consolidate a highly fragmented supply chain and allow retailers to pay as they go, providing higher profit margins for micro- and small retailers. By aggregating informal retailers and connecting them directly with large FMCG manufacturers and distribution supply bases, these companies allow access to opportunities that were previously unavailable, cost-prohibitive, or otherwise inaccessible to informal retailers. This helps to increase revenues for low-income retailers, particularly those focused on everyday staples.

There is a shortfall in African infrastructure investment of between $67 billion and $107 billion annually, hampering development in the logistics sector as it imposes a 40-60% surcharge on the cost of goods. For this reason, the importance of logistics startups cannot be overstated.[104] Investments in the private logistics sector are enabling an increase in the movement of goods and services; more investments and interest in the sector could catalyze even broader development across the entire ecosystem.

Startups are taking advantage of connectivity to build a more efficient supply chain. Startups are delivering significant efficiency gains, especially in economies dominated by the informal sector. Twiga Foods is bolstering the food supply chain in Kenya by providing a trusted marketplace to connect rural farmers with urban retail vendors. This, in turn, is eliminating waste and lowering food prices. The company has supported the connection of more than 17,000 farmers with 8,000 vendors to date.[105]

E-Logistics platforms such as Kobo360, Lori Systems, Sendy, and Truckr are reducing the cost of cargo and local transportation logistics for businesses. By way of example, Kobo360 connects cargo owners with a network of 10,800 truckers in Nigeria,[106] and Truckr services more than 250 businesses with approximately 18,000 trucks. Trendlines project that long-term growth will rapidly accelerate as e-Logistics companies scale and pivot to support rapid e-Commerce growth; and that e-Logistics companies will expand geographically as they look to connect rural areas with regional supply chains.

COVID-19's impact on B2B e-Logistics

The e-Logistics industry has taken a sizable hit due to COVID-19. As a result of the lockdowns, many truck drivers have been restricted from traveling and transporting goods for other businesses. In April, Kobo360 estimated that nearly 3,000 trucks were essentially stranded in Nigeria, as drivers feared they would be penalized or arrested if they attempted to move them.[107]

Further, the company estimated that there was a 30% reduction in the amount of goods across Africa.[108] Kobo360 and other e-Logistics companies have implemented many creative solutions in response to the pandemic; overall, the industry is poised for rapid growth post COVID-19, particularly as supply chains in sectors such as agriculture, manufacturing, and basic goods would be increasingly deemed critical.

Development Opportunities within the Informal Sector

Businesses in Africa are broadly organized in formal and informal sectors. Businesses in the formal sector are typically large corporations like banks and insurance companies, telecommunication operators, agribusinesses, and oil and mining companies. Small or medium-sized businesses from the formal sector are fairly limited in size and number, especially in Sub-Saharan Africa. In general, African businesses are smaller than other businesses in developing regions, by more than 20% on average.[109] Businesses in the informal sector are typically small, often run by fewer than 5 employees. Examples include retailers, artisans, drivers in urban areas, and smallholder farmers in rural areas.

In most African countries, the informal sector hosts a major portion of economic activity. In Sub-Saharan Africa, the share of economic output from the informal sector ranges from 26% in South Africa, 33% in Kenya, 46% in the Democratic Republic of the Congo, to 57% in Nigeria with the average in 2015 being 40% of GDP.[110] In North Africa, 34% of GDP comes from the informal sector, with a similar share in Egypt. Informal employment in urban areas makes up close to 80% of the total in the average Sub-Saharan Africa country, outside of South Africa at 35%.[111] In Egypt, 54% of non-agricultural workers are employed in the informal sector. In Africa, retailers in the informal sector produce approximately 80% of all household consumer goods.[112] Informal businesses represent 92% of firms in Nigeria and 99% in Ethiopia.[113]

The Internet economy offers leapfrog opportunities to address challenges faced by informal businesses and workers. Businesses in Africa's informal sector have less access to finance and limited use of modern business practices, especially in accounting.[114] They also face higher costs in dealing with suppliers or clients due to poor logistics, multiplicity of middlemen, and the prevalence of cash transactions. In the informal sector, access to electricity is less certain, especially in rural areas, and the overall business environment is unstable. However, the vast majority of workers in the informal sector own a mobile phone, often used for both private and business purposes.[115] Mobile phone ownership in the informal sector is broadly correlated with access to digital connectivity at the national level.[116] There are 1.2 million informal retailers in Sub-Saharan Africa already engaged in the distribution of mobile services.[117]

To date, most successful ventures in the African Internet economy address challenges faced by businesses or workers in the informal sector; this large pool of potential customers helps companies reach scale and become commercially sustainable. The large-scale diffusion of mobile money in several African countries, such as Kenya, Ivory Coast, and Mali, is a case in point. However, the centrality of the informal sector goes beyond digital financial services and encompasses an increasing number of economic sectors such as e-Commerce, delivery services, and employment.

In the informal retail distribution sector, productivity is generally low and is exacerbated by poor logistics infrastructure and transportation networks. These challenges inflate the cost of retail distribution and eliminate the ability of businesses to scale efficiently.

In Nigeria, TradeDepot is improving supply chain management for informal retailers by enabling their connection with manufacturers. In 2018, the number of active retailers on the company's platforms jumped from 2,000 to 15,000; TradeDepot has the potential to serve a large share of the 1.2 million retailers in Nigeria as it scales up rapidly.[118] In Egypt, MaxAB is also connecting informal retailers with manufacturers, serving 22,000 retailers with 12,00 products and 40,000 shipments within one and a half years of its founding.[119]

COVID-19 has emphasized how digital platforms addressing the informal sector can support societal resilience. In several markets, digital platforms were critical in supporting government responses to the outbreak, particularly in reaching the underserved, as they were able to quickly reengineer their platforms. For instance, Twiga Foods has partnered with Jumia to deliver agricultural produce to consumers.[120] The government of Nigeria is relying on payment service providers to provide cash transfers to 3.6 million impoverished households by August 2020.[121]

3 Overview of Africa's Growing Developer and Digital Talent

Key Takeaways

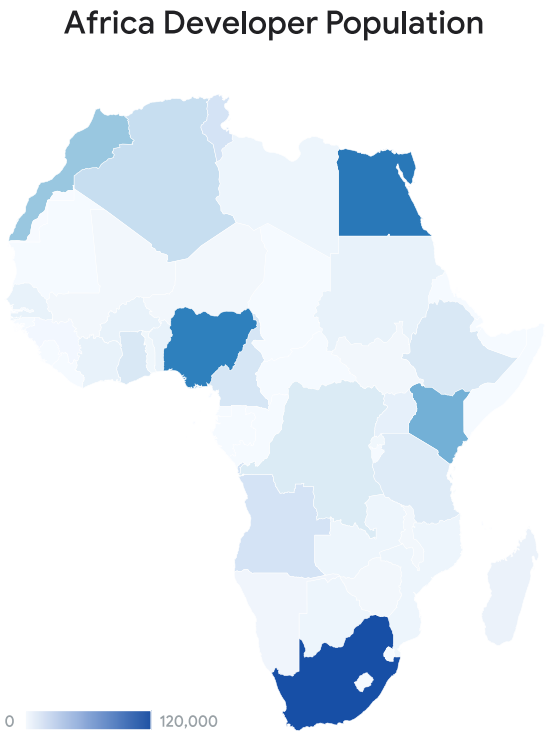
- Tech talent in Africa is at a historical peak and continues to rise. There are nearly 700,000 professional developers across Africa with more than 50% concentrated in five key African markets: Egypt, Kenya, Morocco, Nigeria, and South Africa.
- African developers use both formal and informal education channels to gain skills and access to well-paying jobs. The top two developer training pathways are through university programs and self-taught channels. Yet a skills gap exists, and curricula in engineering programs are often dated and lack opportunities for students to apply skills learned in the classroom.
- Coding classes are driving growth in software development training. Training programs from companies such as Decagon, Gebeya, Google, Moringa School, Semicolon, and Umuzi blend traditional learning with online, flexible learning and bootcamp-style experiences. These STEM-related programs, outside of formal education institutions, fill knowledge and skills gaps and equip participants with the expertise they need for increasingly advanced jobs in technology.
- Women currently comprise one in five of the total population of developers in Africa. While this number is still low, the growth of the ecosystem has begun creating many opportunities for women coders, especially in Egypt, Morocco, and South Africa.
- Developer communities across Africa are helping new developers learn new skills and upskill existing ones, offering shared connections, giving mentors a chance to share their knowledge, sparking curiosity, and encouraging entrepreneurship and creativity.

Tech talent is young and growing fast on the continent

Africa's developer population is young and growing, and the growth of the technology ecosystem, talent pool, and innovation hubs goes hand in hand with the rise of local developer talent. Software development and IT are spreading their influence and affecting how industries are run across the world — especially in Africa, where the effects of leapfrogging are particularly pronounced.

Tech talent in Africa is at a historical peak and continues to rise. There are nearly 700,000 professional developers across Africa, with more than 50% concentrated in 5 key African markets: Egypt, Kenya, Morocco, Nigeria, and South Africa.[122] Through the rise of informal education channels, increasing gender diversity, and more proactive government support, software development is becoming more accessible to wider audiences.

Country	Total Developers
Target Markets	**467,744**
Egypt	86,599
Ethiopia	17,989
Ghana	17,488
Ivory Coast	8,866
Kenya	58,175
Morocco	46,483
Nigeria	83,609
Rwanda	3,983
South Africa	118,541
Tanzania	15,008
Uganda	11,003
Rest of Africa	**220,387**
Total Africa	**688,131**



Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020.

South Africa

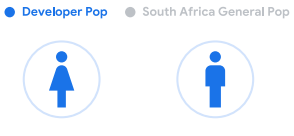
Developer Overview

Developer Population (FY20E)

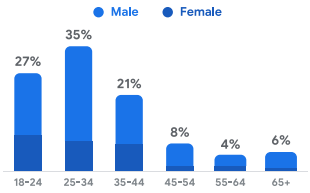
120,000

0.99%
of Non-Agricultural Labor Force

Gender Breakdown[1,2]



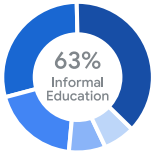
Age Distribution[1,2]



Top Locations for Developers

1. Cape Town
2. Johannesburg & Pretoria
3. Durban

Technical Education



- University Education: 37%
- Self-Taught: 29%
- On-the-Job: 19%
- Coding Bootcamp: 8%
- Online School: 7%

1. n=201
2. Does not include those who refrain from answering, Percentages may not sum to 100% due to rounding

Developer Education

Formal Education: 36%[1]

University[3]

Median Age

25-34

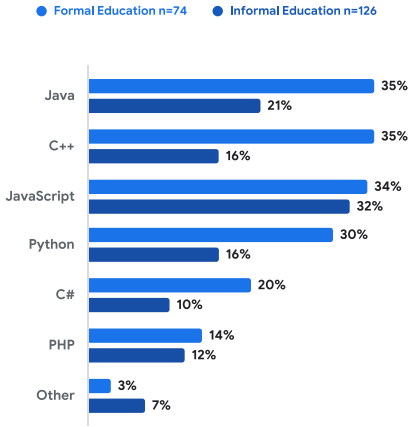
Informal Education: 64%[1]

Bootcamp, online courses, on-the-job, self-taught

Median Age

25-34

Language Proficiency by Education



1. n=201
2. Does not include those who refrain from answering
3. Only universities with ICT programs are included in this analysis

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

South Africa

Developer Roles

Full-Time Role: 52%[1]

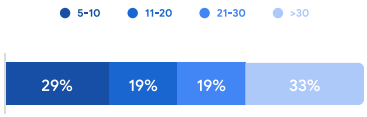
38% Women[2]

62% Men[2]

Avg. Years of Experience

7.3

Hours Coding per Week



Part-Time or Freelance Role: 46%[1]

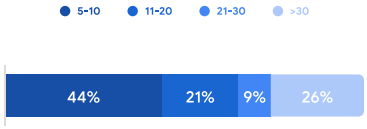
18% Women[2]

82% Men[2]

Avg. Years of Experience

6.8

Hours Coding per Week



1. n=123, 2% answered both full-time and part-time/freelance work
2. Does not include those who refrain from answering

Developer Experience

Junior Developer: 58%[1]

Less than 6 years of coding experience

28% Women[2]

72% Men[2]

Open Repository Contributions

- Have never contributed: **33%**
- Once a week: **34%**
- Once a month: **14%**
- Once every 6 months: **8%**
- Once a year: **11%**

Top Languages

1. JavaScript
2. Java
3. C++

Senior Developer: 42%[1]

Over 6 years of coding experience

28% Women[2]

72% Men[2]

Open Repository Contributions

- Have never contributed: **54%**
- Once a week: **11%**
- Once a month: **5%**
- Once every 6 months: **11%**
- Once a year: **19%**

Top Languages

1. C++
2. Python
3. Java

1. n=201
2. Does not include those who refrain from answering

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

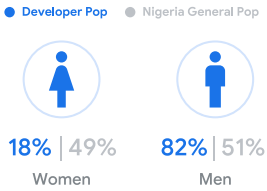
Nigeria

Developer Overview

Developer Population (FY20E)

0.24%
of Non-Agricultural Labor Force

Gender Breakdown[1,2]



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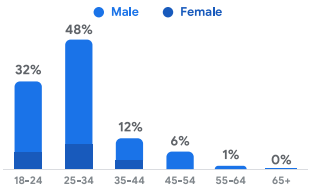
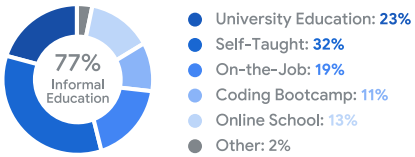


Top Locations for Developers

1. Lagos
2. Abuja
3. Benin City

Technical Education



1. n=200
2. Does not include those who refrain from answering, Percentages may not sum to 100% due to rounding

Developer Education

Formal Education: 23%[1]

University[3]

24% Women[2]

76% Men[2]

Median Age

18-24

Informal Education: 77%[1]

Bootcamp, online courses, on-the-job, self-taught

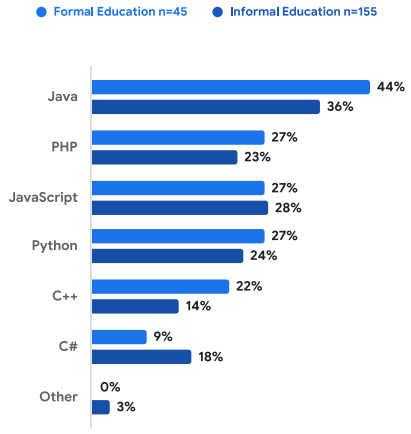
16% Women[2]

84% Men[2]

Median Age

25-34

Language Proficiency by Education



1. n=200
2. Does not include those who refrain from answering
3. Only universities with ICT programs are included in this analysis

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

Nigeria

Developer Roles

Full-Time Role: 25%[1]

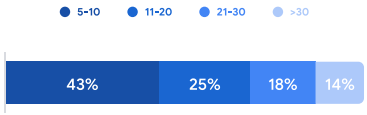
17% Women[2]

83% Men[2]

Avg. Years of Experience

5.5

Hours Coding per Week



Part-Time or Freelance Role: 71%[1]

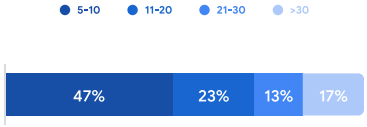
17% Women[2]

83% Men[2]

Avg. Years of Experience

5.0

Hours Coding per Week



1. n=110, 4% answered both full-time and part-time/freelance work
2. Does not include those who refrain from answering

Developer Experience

Junior Developer: 72%[1]

Less than 6 years of coding experience

18% Women[2]

82% Men[2]

Open Repository Usage

- Have never contributed: **30%**
- Once a week: **32%**
- Once a month: **18%**
- Once every 6 months: **9%**
- Once a year: **11%**

Top Languages

1. Java
2. JavaScript
3. Python

Senior Developer: 28%[1]

Over 6 years of coding experience

20% Women[2]

80% Men[2]

Open Repository Usage

- Have never contributed: **39%**
- Once a week: **9%**
- Once a month: **17%**
- Once every 6 months: **18%**
- Once a year: **17%**

Top Languages

1. Java
2. PHP
3. JavaScript/ Python

1. n=200
2. Does not include those who refrain from answering

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

Kenya

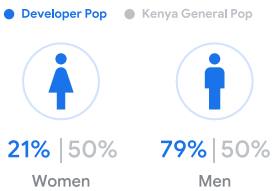
Developer Overview

Developer Population (FY20E)

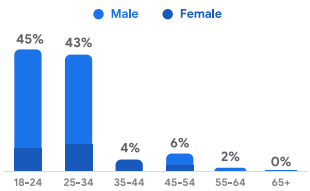
60,000

0.75%
of Non-Agricultural Labor Force

Gender Breakdown[1,2]



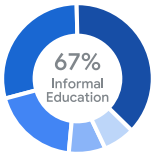
Age Distribution[1,2]



Top Locations for Developers

1. Nairobi
2. Mombasa
3. Nanyuki

Technical Education



- University Education: 33%
- Self-Taught: 30%
- On-the-Job: 20%
- Coding Bootcamp: 9%
- Online School: 8%

1. n=72
2. Does not include those who refrain from answering, Percentages may not sum to 100% due to rounding

Developer Education

Formal Education: 33%[1]

University[3]

Median Age

18-24

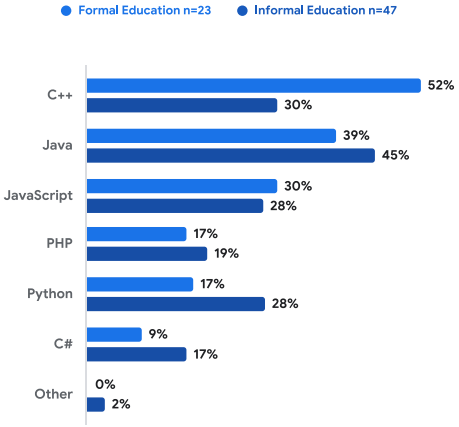
Informal Education: 67%[1]

Bootcamp, online courses, on-the-job, self-taught

Median Age

25-34

Language Proficiency by Education



1. n=74
2. Does not include those who refrain from answering
3. Only universities with ICT programs are included in this analysis

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

Kenya

Developer Roles

Full-Time Role: 14%[1]

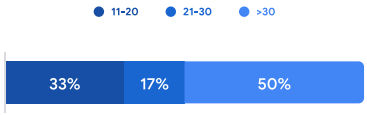
17% Women[2]

83% Men[2]

Avg. Years of Experience

3.8

Hours Coding per Week



Part-Time or Freelance Role: 83%[1]

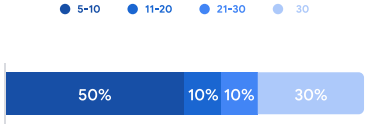
14% Women[2]

86% Men[2]

Avg. Years of Experience

5.3

Hours Coding per Week



1. n=36, 1% answered both full-time and part-time/freelance work
2. Does not include those who refrain from answering

Developer Experience

Junior Developer: 74%[1]

Less than 6 years of coding experience

24% Women[2]

76% Men[2]

Open Repository Usage

Top Languages

1. Java
2. JavaScript
3. C++

Senior Developer: 26%[1]

Over 6 years of coding experience

15% Women[2]

85% Men[2]

Open Repository Usage

Top Languages

1. Java
2. C++
3. Python

1. n=74
2. Does not include those who refrain from answering

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

Egypt

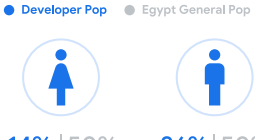
Developer Overview

Developer Population (FY20E)

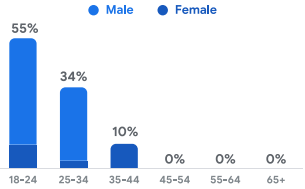
85,000

0.46%
of Non-Agricultural Labor Force

Gender Breakdown[1,2]



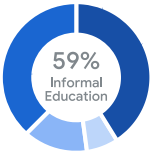
Age Distribution[1,2]



Top Locations for Developers

1. Cairo
2. Giza
3. Mansoura

Technical Education



- University Education: **41%**
- Self-Taught: **38%**
- Coding Bootcamp: **14%**
- Online School: **7%**

1. n=29
2. Does not include those who refrain from answering, Percentages may not sum to 100% due to rounding

Developer Education

Formal Education: 41%[1]

University[3]

Median Age

18-24

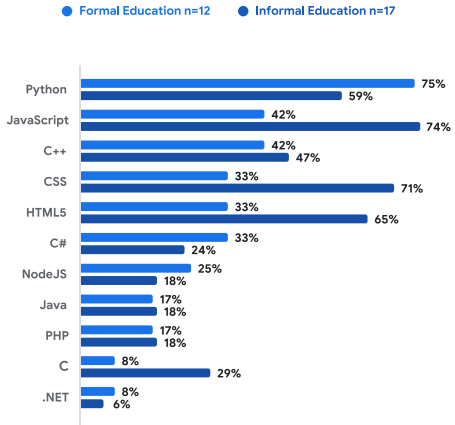
Informal Education: 59%[1]

Bootcamp, online courses, on-the-job, self-taught

Median Age

18-24

Language Proficiency by Education



1. n=29
2. Does not include those who refrain from answering
3. Only universities with ICT programs are included in this analysis

Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

Egypt

Developer Roles

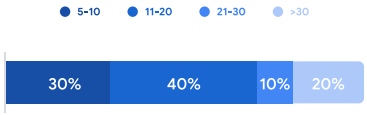
Full-Time Role: 43%[1]

20% Women[2]
80% Men[2]

Avg. Years of Experience

4.1

Hours Coding per Week



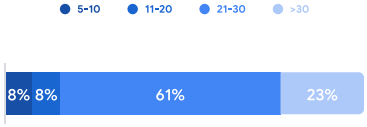
Part-Time or Freelance Role: 57%[1]

N/A Women[2]
N/A Men[2]

Avg. Years of Experience

3.3

Hours Coding per Week



1. n=23, 3 answered both full-time and part-time and are not included
2. Does not include those who refrain from answering

Developer Experience

Junior Developer: 21%[1]
Less than 6 years of coding experience

17% Women[2]
83% Men[2]

Open Repository Usage

Top Languages

1. Python
2. JavaScript
3. CSS

Senior Developer: 79%[1]
Over 6 years of coding experience

N/A Women[2]
N/A Men[2]

Open Repository Usage

Top Languages

1. Python
2. JavaScript
3. CSS, HTML5

1. n=29
2. Does not include those who refrain from answering

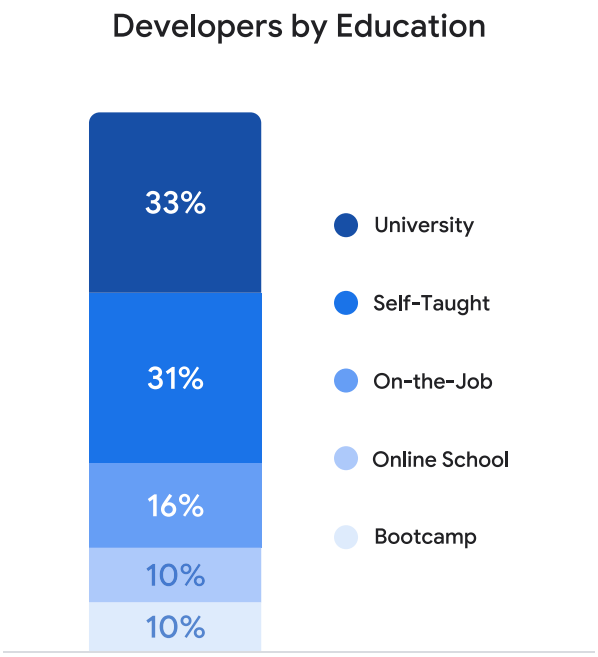
Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020

However, the number of African developers is still small when compared with more mature ecosystems around the world. According to Evans Data, Latin America had 2,162,461 developers in 2019, with Brazil (573,400), Mexico (315,300), and Argentina (304,600) leading the region in total numbers.[123] And in the state of California alone, the number of software developers is 628,414, according to data from Daxx.[124]

African developers skew very young, with junior developers making up a large portion of the developer base. In African countries with smaller and more nascent developer populations, 43% of developers have only one to three years of experience, compared with 22% in the United States.[125]

Pathways to training for Africa's developers

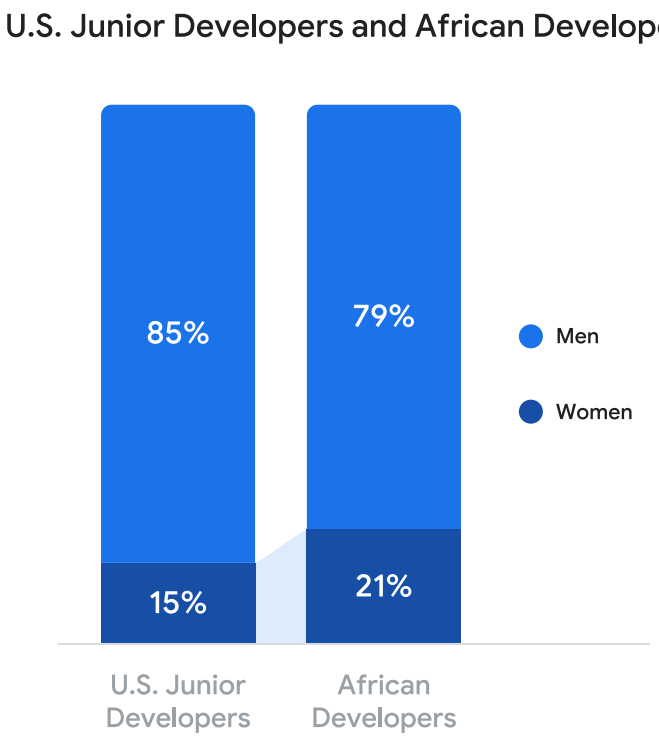
African developers use a mix of both formal and informal education channels to gain skills and access to well-paying jobs, and many developers view a career in software development as an avenue for social mobility. **The top two developer training pathways are through university programs and self-taught channels,** such as online coding lessons and resources. Universities train 33% of software developers in Africa, while 31% are self-taught. Combined, online schools and bootcamps, which continue to grow, produce 21% of developers.[126] On-the-job training makes up the fifth pathway with 16%; some employers fill open software development roles with developers who have been trained and are already proficient on their preferred platforms.[127]



Source: Google/Accenture, "Africa Technology Ecosystem," April 2020.

Google, for its part, aims to train 100,000 developers across Africa in 5 years through Google Developers Training, with the commitment through 2022. The objective is to help "bridge the developer skills gap in Africa by providing better access to high-quality, world-class skilling on mobile technologies and platforms."[128]

The growth of the ecosystem has also created many opportunities for women coders. This group of developers is gaining real traction, especially in Egypt, Morocco, and South Africa. In Africa, women currently comprise 21% of the total population of developers, whereas the percentage of women junior developers in the US is 15%. [129]



Source: Google/Accenture, "Africa Technology Ecosystem," April 2020.

In a push to expand technology proficiency among Africa's youth, after-school programs and coding classes are driving the growth in software development training. Moringa School, Gebeya, Semicolon, and Umuzi are examples of this new wave of education and training, which blends traditional learning with online, flexible learning and bootcamp-style experiences. These STEM-related programs outside of formal education institutions fill knowledge and skills gaps and equip participants with the expertise they need for increasingly advanced jobs in technology. Other initiatives also aim to develop coding skills at earlier stages of education. Ethiopian edtech startup BeBlocky uses gamification to teach children the fundamentals of computer science. By formally integrating these classes into the curricula of primary and secondary schools, teachers can introduce computer science concepts to students earlier and introduce them to a greater segment of the population.

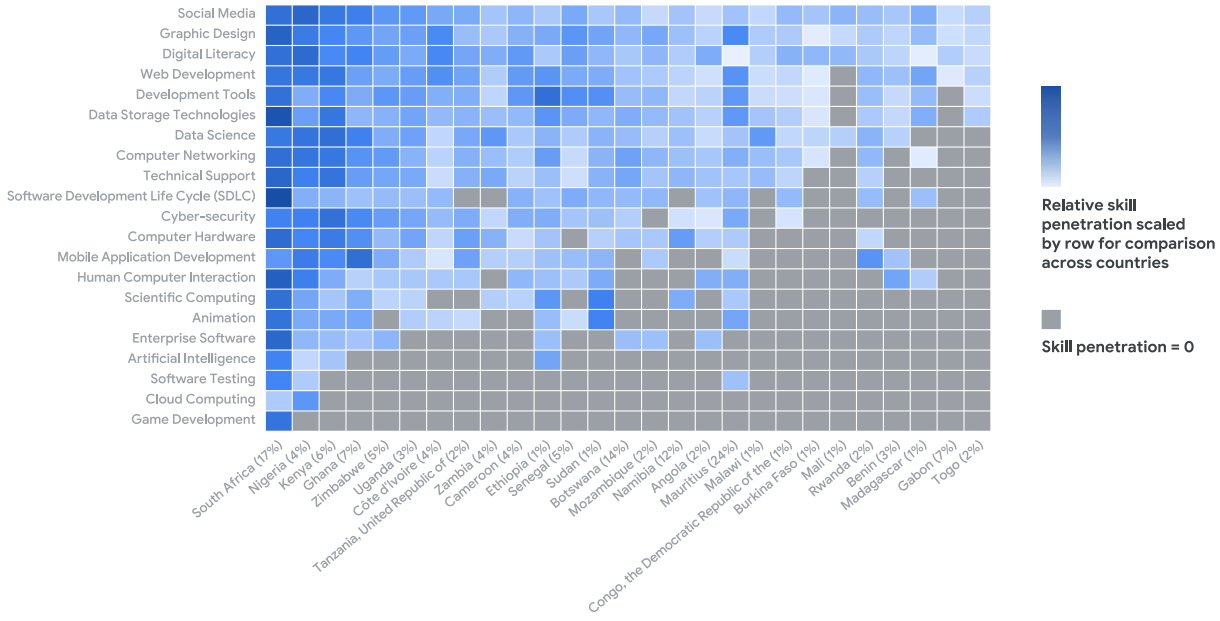
While there is rising interest in developer careers, a growing number of developer communities, and an increasing number of programs springing up to address training, the developer ecosystem is still nascent. The majority of the programs and developers are currently at a junior level, and the next wave of focus for the continent will be to cultivate greater numbers of experienced and senior-level developers.

The skills gap is driving up talent costs

Business scholars, founders, and investors often note that Africa's greatest asset is its people. At the same time, there is a gap in the workforce when it comes to digital skills—such as software engineering, data science, and web development—and business skills—such as people management and communication. The talent gap can be further defined as a lack of affordable talent. Because of the undersupply of developers, startups are often met with staffing shortages, as they are unable to offer competitive salaries compared with larger corporations.

A 2019 World Bank report estimated that most countries across the region have workforces severely lacking in digital skills; in fact, levels are only half that of the global average.[130] South Africa, Nigeria, and Kenya outrank other countries in both the penetration rate and variety of digital skills. Across the continent, the skills with the highest penetration today are social media and graphic design, while the fastest-growing skills are digital literacy and web development. Advanced topics such as artificial intelligence, scientific computing, and human-computer interaction remain relatively unpenetrated.

Digital Skills in Sub-Saharan African Countries



Source: World Bank, "The Future of Work in Africa: Harnessing the Potential of Digital Technologies for All," 2019.

Realizing the economic gains and potential of the information and communication technology (ICT) sector, countries such as Rwanda and Uganda have invested in science, technology, engineering, and mathematics (STEM) education programs to prepare their workforces for the digital economy. Governments are also hoping to tackle rising youth unemployment by introducing graduates to employment opportunities in a sector with an increasing demand for jobs. In its Vision 2020 program, the Rwandan government outlined a proposal to focus on resources for the ICT sector. In recent years, the government has provided scholarships to high school students who take STEM courses, and it has also focused on ensuring gender equality in the classroom by increasing the enrollment of women students in STEM.[131]

Despite increased funding and resources for STEM education, many ecosystem stakeholders acknowledge that university programs still do not adequately prepare their students for the workforce. Curricula in engineering programs are often dated and do not include enough opportunities for students to apply skills learned in the classroom. For example, computer science courses in Kenyan universities teach C++, even though Java and Scala are the programming languages in the greatest demand in the marketplace.[132]

As the ecosystem grows, it is crucial for entrepreneurs to develop soft skills that are vital to launching and managing a startup, such as leadership, communication, and project management. As startups expand into different countries and regions, there is also an increasing demand for employees who are able to navigate the cultural and linguistic differences across regional markets.

The immense potential of African developer talent is evidenced in organizations such as Andela, Gebeya and Decagon. To help those with software development skills find employment, these companies upskill developers and match them with companies in Africa and around the world. As the demand for tech talent continues to accelerate, both the public and private sectors need to allocate more resources to cultivate and strengthen the workforce.

Technical talent such as software developers and other digitally skilled workers are a key indicator of a country's ability to take advantage of the Internet economy and digital trade. The Internet economy is growing 6 times faster than major emerging markets on average; micro, small, and medium-sized enterprises (MSMEs) have been a major driver of this, particularly in emerging markets.[133] Although Africa is a developing region, the share of services in trade, which includes digital trade, already amounts to 38% and is rapidly outpacing that of developed economies.[134] Also, with a higher-than-average share (23%) of women's ownership and management in the tech sector, the digital economy helps women entrepreneurs access global markets.[135] Such trade relies on the ability of information and data to flow seamlessly across global borders. This indicates that countries with a large and growing number of skilled digital workers — such as Egypt and Kenya, among others — are well positioned to take advantage of global digital trade.

How developer communities are fostering talent

Across the continent, developer communities are growing. Communities create a point of entry into the ecosystem and a means for developers to learn and upskill. They help foster connections, spark curiosity, and encourage entrepreneurship and creativity. Growing communities is good; growing them as a connected network is even better.

The demand for developer communities is increasing as their member bases expand and they offer more frequent events. These groups present an array of opportunities — from hackathons to meetups to "by devs for devs" conferences — stimulating both inspiration and healthy competition for the ecosystem. These efforts create regional cohesion and are bolstered by developer groups, technical experts, mentors, local communities, and student groups.

Developers look across regions to challenge themselves and derive inspiration from what is happening outside their borders. While the presumption is often that eyes are set on the West, this is not always the case. Developers increasingly look intra-regionally to understand trends and best practices from other communities in Africa.

Pan-African conferences and programs, such as Deep Learning Indaba and African Masters of Machine Intelligence, contribute to the ecosystem's growth by bringing people and businesses together, sharing discoveries, and creating connections that would not otherwise exist. Increased collaboration has led to growing alliances and networks across the continent as hubs, corporations, communities, and both public and private institutions expand their presence and efforts.

Supporting these efforts, there are more than 150 active Google Developer Groups (Figure 1) and 100 Developer Student Clubs (Figure 2) in Africa.[136]

Figure 1
Google Developer Groups[137]

Figure 2
Developer Student Clubs[138]

When looking at the growth of open source software development in Africa, GitHub's 2019 State of the Octoverse report[139] found that "developers from Africa created 40% more open-source repositories on the software engineering marketplace in 2019 than they did in 2018 — recording a higher growth percentage than any other continent globally." This growth is being realized both in countries renowned for their large developer communities and in historically smaller ecosystems.[140]

The positive impact of mentors and well-trained managers

Mentors are successful thought leaders in their field who are dedicated to giving back some of their time to the development of their local and global ecosystem. They help guide startups and developers in solving their challenges by sharing their knowledge and building meaningful connections. They mentor individuals or groups, lead workshops, write blogs, and give talks at professional events and universities.

There are two types of mentors: experienced entrepreneurs who mentor startups, and technical experts who mentor developers. These experts who publicly share their skills are a catalyst and inspiration for the ecosystem, providing invaluable expertise to those with whom they engage. Their trusted guidance impacts and accelerates community growth.

In Africa, managerial skills and capabilities have room for improvement. Qualified managers who can successfully solicit profitable projects and usher them through completion are in short supply. Managers could also address the skill gap in pitching effectively to potential investors, which makes it harder for certain startups to receive funding. Lastly, well-trained managers could improve startups' ability to recruit, train, and motivate talent. Working to improve management expertise through formal training, skill development, mentorship, and experience will bolster company growth across the continent.

The emerging digital workforce and risks of talent loss

It is estimated that every single year, for the next 30 years, 15—20 million increasingly well-educated people will join the African workforce. This begs the question: Are local tech ecosystems large enough to absorb the forthcoming wave of new talent? The Fourth Industrial Revolution, and the occupations that it is projected to necessitate, offer one way to match and find quality jobs for the continent's new demographic.[141]

Reversing “brain drain” by retaining skilled workers

A major challenge in Africa is the number of skilled workers who leave their home countries to seek employment abroad. This so-called “brain drain” hampers the growth and development of the industries and economy of the country these workers are leaving behind. According to the AU, around 70,000 Africans are lost to brain drain annually.[142] They emigrate to seek a higher quality of life or a better education, or to escape political instability, violence, or extreme poverty.

In seeking these economic opportunities, many Africans are emigrating to countries in the Organisation for Economic Co-operation and Development (OECD). Over the past five years, the number of Nigerian immigrants moving to Canada has tripled.[143] As Africa’s growing youth population outpaces job creation on the continent, global skill-based immigration as a path to citizenship is increasingly appealing to many Africans. The number of people trying to join the labor market exceeds the number of new jobs created every year by 7 million to 9 million. [144]

At the G7 Summit in 2017, the president of the African Development Bank, Akinwumi Adesina, said: “The future of Africa’s youth does not lie in migration to Europe; it should not be at the bottom of the Mediterranean; it lies in a prosperous Africa. We must create greater economic opportunities for our youth right at home in Africa.”[145] The African Union Migration Policy Framework is a set of recommendations created to curb the negative impact of this phenomenon and retain talent on the continent.[146]

4 A Review of Africa's Venture Capital and Funding Landscape

Key Takeaways

- Africa's venture capital landscape is expanding at an unprecedented rate, as are the number of Africa-based and Africa-focused venture capital firms and funds, with venture capital investment in Africa reaching an all-time high in 2019.
- Historically, African startups have faced challenges in securing funding. Key issues include insufficient seed funding, limited follow-on funding, and a lack of angel investors. In a 2019 Google survey, 82% of African startups reported difficulties in accessing funding.
- Access to a large single market is key: Nigeria is currently the largest single market in Africa and remains the continent's leading investment destination. However, when the AfCFTA rolls out across the continent, markets should become easier to access.
- The full impact of COVID-19 remains unknown, and as investors become more risk-averse amid economic uncertainty, the landscape will likely shift away from early- and seed-stage investments and toward more established companies with clearer paths to profitability.

Africa's growing attractiveness for investors

Record-breaking amounts of funding are being raised by African tech startups each year. While the specifics of exactly how much is being invested differ, **figures indicate that every year for the last five years, venture capital funding into African startups has increased.**

Africa's appeal as a venture capital investment destination is growing, attracting investors who are willing to take some initial risks to expand the digital ecosystem on the continent, based on the exciting opportunities and the market's long-term commercial potential. Drivers of positive investor sentiment and confidence are underpinned by the macro tailwinds and demographic dividends on the continent. Bolstering this growth are the increasing ease of doing business, improved business environments, and the youngest and fastest-growing working population in the world. Enhanced government policies, promoting better cooperation both between regions on the continent and between various sectors of the economy, further instill confidence in investors. [147]

While there are a wide-ranging number of challenges confronting startups in the African ecosystem, there are also an abundance of opportunities. Venture capital funds are growing and expanding across the continent, with existing funds increasing the capital they have available and new funds opening to target specific sectors and regions.

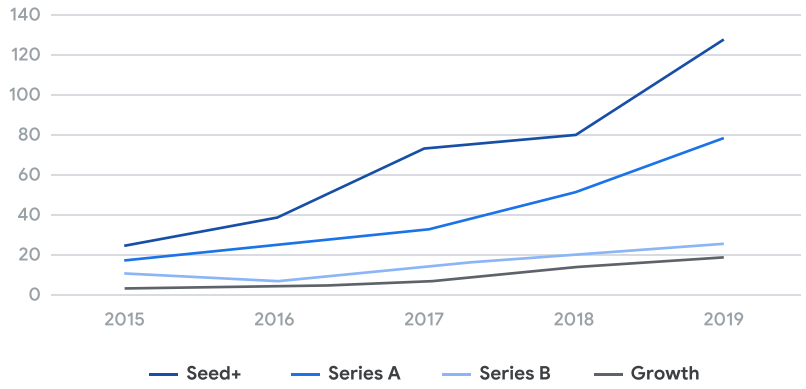
Africa's venture capital landscape is expanding at an unprecedented rate, as are the number of Africa-based and Africa-focused venture capital firms. According to Ventureburn, more than 20 new funds or funding initiatives were launched or were in the process of being launched in 2019.[148] However, despite this progress, Africa is still in an early stage when compared with other emerging multi-country markets such as Southeast Asia. Much opportunity remains for venture capital investment in Africa, and for governments to become more investor-friendly. **Africa's venture capital landscape is poised for continued significant expansion in the coming years. In 2019, more investments were made in earlier stages and deal sizes were growing, highlighting increasing investor confidence and the attractiveness of the African startup ecosystem.**

An overview of the funding landscape*

Investment in African tech startups continues to grow year over year. According to Partech Ventures Africa, African tech startups reached a new milestone in 2019 with $2.02 billion raised in equity funding, representing 74% YoY growth with 250 equity rounds and an average deal size of $8.08 million. These deals took place across 18 countries, with Nigeria, Kenya, Egypt, and South Africa as the major investment destinations. Notably, Partech's report shows **massive densification at the early stages (Seed and Series A), which accounted for 206 of the 250 transactions in 2019 and was over $600 million, signaling increasing investor confidence.** The fact that investors are making earlier bets is a positive sign for pipeline generation for Africa's digital ecosystem.[149]

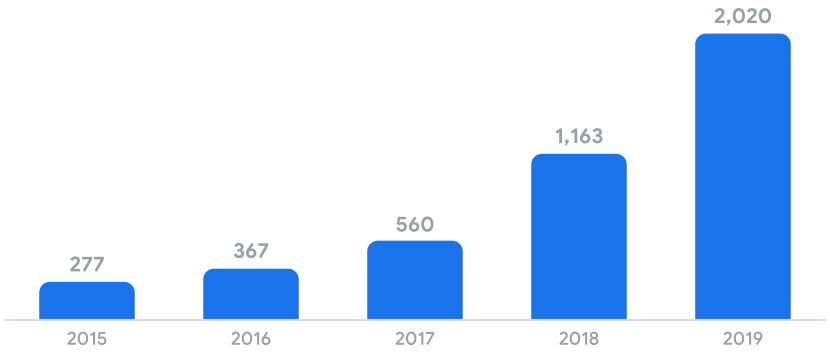
* "There have been multiple comprehensive analyses of the African startup landscape. Our goal is not to try to replicate the reports that have been done but rather to highlight commonalities of the funding stories and call out key trends across the sources."

Number of round by stage, 2019 (in US$ B)



Source: Partech Africa Team. "2019 Africa Tech Venture Capital Report" (Partech Partners, Paris, January 2020).

Total funding, 2015 to 2019 (in US$ B)



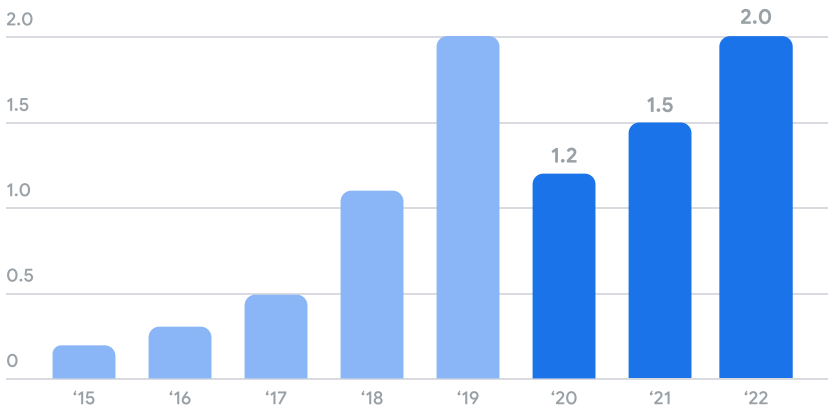
Source: Partech Africa Team. "2019 Africa Tech Venture Capital Report" (Partech Partners, Paris, January 2020).

The first quarter of 2020 closed with **$350 million** of total funding, according to a study by Briter Bridges, with South Africa ($112 million), Nigeria ($74 million), Kenya ($62 million), and Egypt ($51 million) leading the way as the top funding destinations. These same countries also collectively received the largest share of funding in 2019.[150] While January and February funding numbers in 2020 were mostly in line with expectations, March saw an 80% drop in funding, as the COVID-19 pandemic reached the continent. Notable rounds in Q1 2020 are Jumo's $55 million debt and equity finance round in South Africa, Flutterwave's $35 million round in Nigeria, and Sendy's $20 million round in Kenya.[151]

African startups raised $143.5 million in the second quarter of 2020, according to findings from a Briter Bridges study. Their study also shows a 60% decrease in Q2 funding from their Q1 report.[152] In light of COVID-19, healthtech startups saw some of the largest funding rounds in H2. In May alone, Ghana's mPharma brought in $17 million while two startups from Nigeria, 54gene and Helium Health brought in $15 million and $10 million respectively.[153]

The full impact of COVID-19 is yet to be realized, and as investors become more risk-averse amid economic uncertainty, the landscape will likely shift away from early- and seed-stage investments and toward companies that are more established and with clearer paths to profitability. Early estimates by the accelerator AfricArena predict that startups across the continent could lose up to 40% of funding—or $800 million—this year, with full economic recovery not expected until 2022.[154]

Annual investment in African startups (in US$ B)



Source: Yomi Kazeem, "African Startups Funding Is Set to Drop by Nearly Half in 2020," Quartz Africa, May 4, 2020.

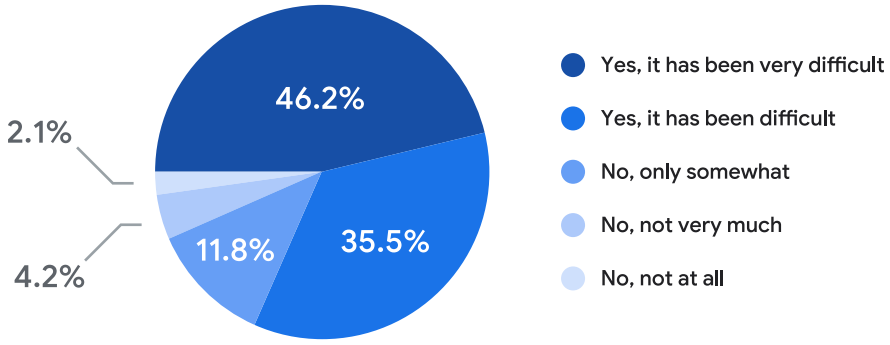
By the numbers: Emerging funding trends

The size of rounds is increasing. WeeTracker's 2019 report shows that 26 deals – or just 6% of the total deals – accounted for 83% of total funding that year.[155] Partech's report also noted the increase in average round size across stages between 2015 to 2019, with seed rounds moving from $800,000 to $1.2 million (+20% YoY); Series A moving from $3.8 million to $5.9 million (+46% YoY); Series B from $11 million to $20 million (+35% YoY); and growth moving from $25 million to $48 million (+12% YoY) over that time period.[156]

> Access to early stage and pre-seed funding is still lacking across most of the continent, especially for ticket sizes ranging from $50,000 to $500,000.

However, WeeTracker noted that seed and Series A deals saw an all-time high from 2018 to 2019, where seed deal funding rose from 16% to 30.7%.[157] Being able to capitalize on these earlier-stage funding types is integral for businesses to develop and build their ideas. When businesses do not have this runway, they tend to start raising Series A rounds too early. Local investors have to step up to fill in early-stage funding gaps, to pave the way for larger investments down the line.[158] Trends in 2019 showed a major increase in Series A deals, where investors funneled $300.4 million into 43 Series A deals, compared with $76.9 million in 2018—a 277.7% YoY increase.[159] **In a 2019 Google survey, 82% of African startups reported difficulties in accessing funding.** Among different sources of funding, equity finance and grants were identified by 92% of startups as difficult to access; and 78% identified access to debt finance as a challenge.[160]

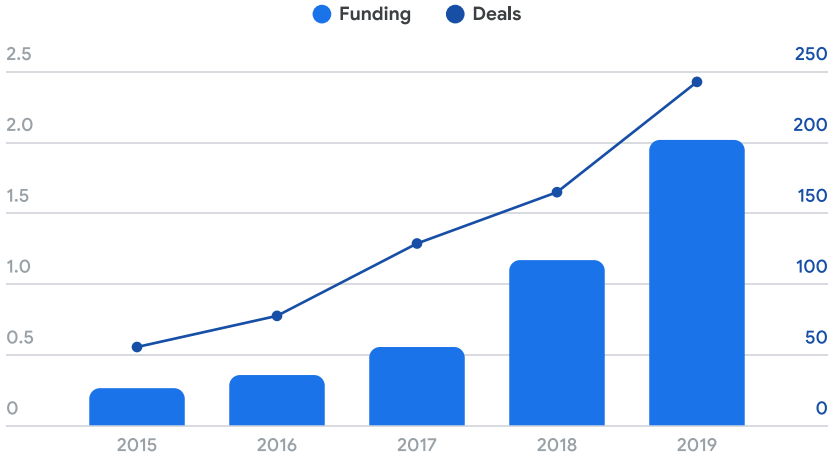
Has it been difficult for your startup to gain access to funding?



Source: Accelerator Research survey, Google Form, Africa, November 2019. Note: n=186 African startups

African-founded startups across the region continue to garner interest from American, European, and Asian funds, as foreign players are penetrating the continent and attempting to capture the more active markets.

Venture funding in Africa (in US$ B)



Source: Partech Africa Team. "2019 Africa Tech Venture Capital Report" (Partech Partners, Paris, January 2020).

The number of deals has also grown by over 340% in the last half-decade, spread across seed, Series A, Series B, and growth companies. Nigeria, South Africa, and Egypt lead both in deals and funding, capturing 37%, 26%, and 10% of funding, respectively, with 15 other countries sharing the remaining 27%.[161] With the recent shift in interest from purely infrastructure investments to venture capital funding by Chinese corporations, there may be even greater interest from investors and higher funding opportunities for startups both in terms of deal size and in total number of deals. Any notable liquidations may further amplify funding inflow for Africa and give investors a benchmark for investment lifecycles.

Mapping geographic trends

One commonality across all funding reports is the rise and domination of Nigeria as an investment destination. **Boasting Africa's largest population and economy, Nigeria is the top destination for startup venture capital investment on the continent.** Averaging the funding amounts documented in the Partech, Disrupt Africa, and WeeTracker 2019 Africa tech startup funding reports, Nigeria received twice as many investment dollars as Kenya, the country with the second-highest average of funding. **Egypt has replaced South Africa's 2018 standing at third in the top three African investment destinations in 2019.**

While venture capital investments are increasing across most of the continent, French-speaking countries in Africa have not yet benefited from the same rising equity figures. The current landscape is heavily siloed, with a far smaller percentage of funding being invested in francophone Africa than in Anglophone Africa. According to Partech, **only $54 million out of a total $1.1 billion—or 0.5%—was invested in tech startups in Francophone countries in 2019,** with Senegal the leading non-Anglophone funding recipient, raising $22 million in four deals. This highlights the immense disparity in investing between Africa's French- and English-speaking regions.[162]

Many issues factor into this disparity, but language is critical. The language barrier hampers investors' ability to engage with information about the markets, such as in publications and press releases. **Yet sprouting angel networks, new funds, government policies, and startup acts are beginning to address the imbalance across the continent, creating a more favorable environment for startups in Francophone Africa.**

Challenges across the continent

Historically, African startups have faced many challenges in securing funding. **Key issues include insufficient seed funding, limited follow-on funding, and a lack of angel investors.** Angel investment from high-net-worth individuals is virtually non-existent in some parts of the continent. Some ecosystem stakeholders attribute this to local investors' risk-averse nature, while others note that unintentional bias skews funding opportunities toward entrepreneurs with male, urban, internationally educated, or expat backgrounds.[163]

Another difficulty is the lack of uniformity in corporate structures across Africa's 54 countries, which creates challenges in scaling operations across the continent. Because of banking regulations and intellectual property (IP) laws, the speed of business can be painfully slow. Some measures have been taken to change this. In one such instance, the South African Reserve Bank (SARB) in 2017 implemented IP exchange control approvals to ease the process of getting IP transferred out of South Africa. Now, certain authorized dealers, in addition to SARB, can grant approvals, reducing the time it takes to process requests by 75%. This change should also help startups looking to source funding offshore.[164]

Many investors are also unfamiliar with the regional investment landscape and business challenges that startups encounter, such as longer times to exit. Other challenges include incorporating overseas, to help facilitate payments from customers; business growth; and attracting investors. However, solutions are emerging to simplify the process of getting a startup off the ground, which has helped numerous startups in Africa incorporate their businesses in the U.S., providing easier access to investment funds and the global venture capital markets.[165]

Possible solutions to these hurdles are the new funds being created to address financing needs, especially foreign and local funds that focus specifically on the African startup ecosystem. According to a study conducted by Crunchbase, there are 51 Africa-focused venture capital funds globally. Just under half of these funds — 22 or 43% — are headquartered on the continent and are managed by Africans. Of these 22, nine are less than five years old. [166] Once more capital becomes publicly available and disbursed, startups will begin to more broadly realize and receive investor support.

The emergence and growth of new opportunities

Access to a large single market is key. Currently, Nigeria remains the largest single market in Africa. With an estimated population of 205.9 million in 2020, Nigeria is the seventh most populous country in the world,[167] and its population is estimated to grow to 402 million by 2050, at which point it would eclipse the predicted population of the United States.[168] Already with a population of 22 million, Lagos is set to become the world's most populated city by 2100, with up to 100 million inhabitants.[169] As a comparison, Tokyo is currently the most populous city in the world, with 37.4 million people as of 2020.[170] Nigeria's current size and projected growth are a large part of what makes it the leading investment destination by a wide margin.

A major step toward achieving a single market was established in the AU's Agenda 2063: The Africa We Want. This plan presents a road map for creating a more unified and global Africa and addressing increased globalization and the ICT revolution. The agenda states that it is "Africa's blueprint and master plan for transforming Africa into the global powerhouse of the future[...]to prioritise inclusive social and economic development, continental and regional integration, democratic governance and peace and security amongst other issues aimed at repositioning Africa to becoming a dominant player in the global arena."[171]

Comparing venture capital in Africa to that in other single markets such as India can be misleading. Despite having comparable population sizes in 2019—India with 1.37 billion people and Africa with 1.32 billion — tech funding figures for the past year are vastly different, even considering that both markets experienced record-breaking years. According to research conducted by Tracxn, Indian tech startups experienced a monumental year for fundraising, netting $14.5 billion over 1,185 financing rounds from 817 investors.[172] In Africa, according to WeeTracker's 2019 investment report, the total amount invested in tech companies was $1.3 billion over 427 deals.[173] So while the continent of Africa also experienced its own unprecedented numbers, those numbers seem dwarfed by India, with total investments in India more than 11 times greater.

Scaling in a single, homogenous market is generally quicker and easier than expanding to multiple markets, but each provides its own unique obstacles and regulatory hurdles. While success in one of Africa's few key large single markets is undoubtedly a win on its own, a startup's chances of longevity and sustained growth will be marked by their ability to expand into multiple markets across the continent. **The need to scale across Africa seamlessly is an important, but currently complicated, task.** The existence of 54 countries means 54 different regulatory environments are in play. The inability to scale fintech companies across countries due to different financial regulations, for example, is a huge headwind facing the ecosystem. Creating a more cohesive and unified environment that is easier for startups to expand in will propel the ecosystem forward, increase innovation, encourage collaboration, and **change what it means to be able to do business within, outside of, and across the African continent.**

5 The Role of Africa's Hubs and Accelerators

Key Takeaways

- The number of active hubs (physical locations with resources that support digital entrepreneurship) in Africa has doubled in just three years, from 314 in 2016 to almost 650 in 2019.
- In 2019 there were more than 90 active accelerator programs across the continent. These cohort-based programs accelerate startup growth through in-depth mentorship, workshops, targeted networking, and/or funding over a fixed period of time.
- According to a survey of accelerator founders across Africa, sourcing startups and building a solid pipeline of high-quality, high-value startups are among the biggest challenges facing accelerators. Lack of reliable data and of data-backed evidence of positive impact are challenges for accelerators and hubs.
- Technology companies, including Google, Facebook, and Opera. have launched products and services in Africa with a focus on local relevance, minimizing of data consumption, and tailoring of products for local demographics and user behavior.

The evolution and impact of Africa's hubs and accelerators

Broadly defined as **organizations with a physical location and a wide network of actors supporting digital entrepreneurship,** hubs have become a mainstay in Africa's digital ecosystems. The growth of hubs as an organizational form began in 2010 and 2011, when trailblazers such as iHub in Kenya, CcHub in Nigeria, and Bongohive in Zambia were founded.[174] Since then, hubs have consistently increased their reach in Africa's entrepreneurial ecosystems, with the number of active hubs doubling in just three years, from 314 in 2016 to between 618 and 643 in 2019.[175]

By offering office space, mentoring, and networking events, hubs have become an essential part of a startup's support infrastructure, acting as a backbone for the ecosystem.[176] The hub ecosystem is continuing to develop in a fluid environment, highlighted by two of Africa's powerhouse tech hubs, CcHub and iHub, joining forces in 2019 when CcHub acquired iHub.[177] While it is too early to see exactly how developments such as this acquisition will impact the ecosystem, the question remains whether these support organizations effectively increase the talent and startup pipeline across the continent.

As African ecosystems have matured, different forms of hubs have become more prevalent. In particular, the presence of accelerator programs is growing across the continent. **Accelerators are cohort-based programs that accelerate the growth of startups by providing a more narrow scope of services compared to other hubs, focusing on in-depth mentorship, targeted networking, workshops, and funding over a fixed period of time.** In 2019, there were more than 90 active accelerators across the continent.[178] The majority of these accelerators—73%— are based in Egypt, Kenya, Nigeria, and South Africa, some of the most advanced ecosystems on the continent.[179]

Yet even among accelerator programs, there is diversity. A significant number of accelerators are backed by corporations and are known as corporate accelerators. These organizations aim to make a return on investment (ROI) and create an impact, but tend to face fewer financial constraints and do not rely on client startups for their sustainability. Other accelerators are run as independent businesses and do not have corporate backing; these accelerators often face greater financial difficulties in addition to other challenges. Lastly, virtual accelerators are the most recent type of accelerator to emerge.

While virtual accelerators are still quite scarce on the continent, their benefit for startups is that they allow more flexibility, do not interrupt business operations, and are more inclusive toward all types of businesses. COVID-19 has forced many accelerators to move online, furthering the rise of these virtual operations while also allowing all accelerator programs, regardless of type, to continue running despite the current pandemic. Virtual accelerator programs often still have ground support in the form of local mentors who assist the startups; however, unlike physical accelerators, these programs have the potential to be more scalable as most resources like networking events and mentorship can happen online. The virtual platform allows startups from less-developed African ecosystems to receive more comparable levels of support and guidance to their counterparts in countries with more mature startup ecosystems.

Accelerator funding and pipeline challenges

Running an accelerator program in Africa is not easy; due to the dynamic nature of the ecosystem and the challenges it brings, many accelerators fail.[180] Being able to secure adequate funding to run an accelerator, and providing funding to the startups in their programs, are often seen as the biggest difficulties, especially for those without corporate backing. Given the low rate of exits across the continent, accelerators have difficulty attracting the attention of external investors. This forces accelerators to find other sources of funding, most often generated through coworking spaces and membership fees. Accelerators also rely on startups to grow, with 40% of funding to startups coming in the form of direct equity investments.[181]

While securing and providing funding remains a serious challenge everywhere in Africa, significant disparities remain between the more developed startup ecosystems of Egypt, Kenya, Nigeria, and South Africa, and those from less developed ecosystems.[182] Typically, entrepreneurial talent, the startup foundation, and previously received support are likely to be weaker for startups in less developed ecosystems. With Egypt, Kenya, Nigeria, and South Africa attracting 74.5% of the total foreign investment in startups across the continent, [183] accelerators are more cautious about entering less-developed ecosystems and initiating operations there.[184]

Another struggle for accelerators is building a solid pipeline of promising startups that provide the potential future investment opportunities. Accelerator founders across the continent were interviewed for this report, and when asked what they felt the biggest challenges for their accelerators were, **every single one mentioned sourcing startups and building a solid pipeline of high-quality, high-value startups.** Many accelerators now choose to actively source startups for their programs, since relying on organic program applications has been historically unproductive. The Baobab Network estimates that they source around 50% of the startups that join their accelerator, highlighting the importance of having a team on the ground to assist with finding high-quality startups.[185] Vetting high-quality startups and raising revenue to run accelerators are interconnected, as high-quality startups with better ROI help to fund future programs.

Data collection and partnership challenges for hubs and accelerators

Lack of reliable data and data backed evidence of positive impact are challenges for accelerators and hubs. While accelerator impacts are positive, on average around the globe, the results of their impact are more mixed (or absent) in emerging markets.[186] Most accelerators conduct limited monitoring and evaluation at the organizational level, but without data to back up decisions, many accelerators and hubs waste time and money testing out different models, investing in different verticals, and trying different projects in an attempt to find out what works and what doesn't. Ultimately, they either find success or shut down their operations.[187] However, as more emphasis is placed on data collection, this challenge should be mitigated over time, allowing accelerators to make more data-backed and data-driven decisions.[188]

Direct partnerships between hubs and investors have remained rare. Formal agreements between individual investors and individual hubs, such as shared equity schemes, require immense patience and risk tolerance, and are thus likely to continue to be the exception. Still, there is untapped potential for innovative pan-African partnerships, where pipelines and funds get pooled across locations. Hubs often have significant on-the-ground structures in place in local ecosystems, close to grassroots entrepreneurs.

An interesting example of such an investor-hub partnership is Catalyst, a program launched by African Business Angel Network (ABAN) and AfriLabs in 2019,[189] with a fund seeded by the Agence Française de Développement (AFD). Investments are being administered to startups through AfriLabs' hub network. Hubs conduct due diligence and fund monitoring on the ground, in exchange for a small investment percentage. In April 2020, ABAN and AfriLabs also launched a worldwide investor needs assessment to align the hubs' efforts more closely with investors' interests.[190] The success of these developing partnerships could spark the creation of more hub-investor collaborations across the continent.

Response to COVID-19 by hubs and accelerators

As COVID-19 began to spread across the region, hubs and accelerators quickly responded by offering a range of online, pan-African initiatives, including accelerators across the continent taking their programs online. The AfriLabs Hubs Learning Week dedicated a session to how hubs can set up sustainable, virtual incubation services and provide grants to actualize startup innovations. Injini, an edtech-focused accelerator, had been scheduled to inaugurate its fourth physical accelerator in Cape Town in March 2020, but as the spread of COVID-19 increased, the team decided to cancel all travel and quickly re-designed the program for remote delivery.[191] By utilizing a number of communication and collaboration platforms, as well as building their own web app, Injini has successfully transitioned to an online program, enhancing the sustainability, resilience, and impact potential of startups in their current class. [192]

Meltwater Entrepreneurial School of Technology (MEST), an entrepreneur training program, seed fund, and incubator, is one of the many organizations having to make adjustments because of the pandemic.[193] They have launched online challenges for startups to pitch their solutions, provide mentorship, and access funds for growth and rapid implementation.[194] Accelerators and hubs in Africa are also being affected, with funding—for both them and their startups—harder to acquire. In one prediction from AfricArena, startups on the continent might see only 60%, or $1.2 billion, of their anticipated $2 billion in investments for the year.[195] While much of the ecosystem will be negatively impacted by COVID-19, some companies, such as the logistics startup Paps in Senegal,[196] have a business model more conducive for success and have seen a 33% increase in demand for their services since the outbreak.[197]

Hubs and accelerators: Opportunities and successes

Despite the challenges faced by accelerators and the startups in their programs, there are numerous success stories that highlight the impact these partnerships can have. Some accelerators have been able to prosper, both financially and from an impact perspective, by seeing startups in their programs raise noteworthy funds or make impressive exits. For example, Egyptian dating startup Harmonica attended the Flat6Labs accelerator in 2017, received a $150,000 investment from the accelerator, and was subsequently acquired in August 2019 by online dating giant Match Group, whose market cap is over $20 billion.[198] Meanwhile, Google's accelerator has supported promising startups like Twiga Foods, which raised $30 million in Series B venture funding in 2019, Kenya's largest known financing round for that year.[199]

The services offered by accelerators have evolved since the first accelerator program emerged in Africa. **Today's accelerator ecosystem has an influx of specialized and niche programs optimized specifically for certain industries and verticals.** As accelerators continue to develop their own industry knowledge, they are becoming better equipped to support and stimulate startup growth, in turn benefiting the wider tech and startup ecosystem in Africa.

Looking ahead: The future of Africa's hubs and accelerators

Due to the temperamental nature of the environments in which they operate, most African accelerators have to remain patient and focus on long-term returns. In the coming years,the accelerator ecosystem is likely to diversify, with accelerators focusing on specific industries to provide better expertise, mentorship, and networks. Accelerators will also be forced to stay agile and adaptable to fulfill the future needs of startups in Africa. The COVID-19 pandemic has affected every industry, and the accelerator ecosystem is no exception; the impact of the virus is likely to significantly alter how accelerators operate in both the short and long terms. The message remains the same regardless: proving that an accelerator can get funding for its startups can go a long way in securing its reputation.

Ultimately, present-day accelerators have to prove their worth. The ecosystem is becoming more crowded, and the competition to onboard the most promising startups will drive accelerator success. **While the startup ecosystem in Africa continues to mature and address the many challenges it faces, including the current pandemic, accelerators will continue to play a role in supporting startups, expediting growth, and helping to develop the ecosystem.**

The Impact of Global Tech Initiatives on Africa's Internet Economy

The vast market potential of the African Internet economy increasingly attracts technology companies from around the world. In addition to their investment activities and local office footprints, many global technology companies are both building new products and adapting existing ones for African consumers.

Companies including Google, Facebook, and Opera have launched products and services in Africa, with a focus on local relevance, minimization of data consumption, and tailoring of products for local demographics and user behavior.

Efforts to increase connectivity and lower usage cost

Technology companies have aimed to address high data costs by providing direct Internet access, minimizing data consumption on their products, and lowering the cost of data.

Google has released versions of its products intended for users with high data costs and slower Internet connections. Google Go, which launched in South Africa in 2018, is designed to be a best-in-class search experience for users in emerging markets and offers a 40% reduction in data consumption. Google has also released Android Go Edition, a leaner version of the Android OS intended to improve performance on devices with 2 GB of RAM or less.

Internet access providers may stimulate product increase by waiving data charges, or "zero rating", usage of a specific app or website. Facebook has partnered with providers in multiple African countries, including South Africa and Zambia, to offer access to its platform through its Free Basics program. Wikipedia offered a similar product in Africa, Wikipedia Zero, through partnerships with regional carriers before the product was discontinued in 2018.

Another approach for Internet access providers is selling prepaid "bundles" of access, either limited or unlimited, to a specific app, such as a mobile operator selling unlimited access to WhatsApp for a single monthly fee.

After Google Chrome, Opera is the second most-commonly used mobile browser in countries such as Nigeria and Kenya, due to its low consumption of data. Through data compression, Opera Mini lets users save up to 90% of mobile data when browsing, compared with other browsers that do not offer data compression.[200] As a result, Opera, owned by Chinese investors and headquartered in Norway, reported 120 million users in Africa, or 20% of all mobile users on the continent.[201]

The importance of localizing for user demographics and behavior

Global technology companies are increasingly building and updating products for African users, accounting for different levels of digital readiness and sociocultural contexts.

For example, Google Maps in Nigeria offers directions for common transportation modes such as motorcycles, while also providing navigation instructions in a Nigerian voice to accurately pronounce local place names.[202]

A major component of product localization is language. Although English is spoken as a first or second language in many African countries, there are thousands of other languages spoken on the continent, with French and Arabic also prominent. Facebook is available in at least 7 African languages, while Google Translate currently provides translation services in 13 African languages, including Amharic, Swahili, Zulu, and others that are widely spoken.

Opera has launched multiple widely used products on the continent. The best known is OPay, a financial services platform that offers mobile payment services in several African countries. The OPay app also powers other services such as OMall, an online marketplace, and OTrade, a B2B trading platform.

Separately, Opera News has become one of the most downloaded news apps in countries such as South Africa, Nigeria, and Kenya by offering local news content.[203] Facebook has also catered to news readers in Africa by partnering with a regional nonprofit to provide third-party fact checking on news articles posted on the platform.[204]

6 Infrastructure Is Key: Increasing Connectivity on the Continent

Key Takeaways:

- Increased investment in subsea and terrestrial fiber-optic infrastructure has driven rapid growth in international Internet capacity, resulting in both greater availability and lower price for high-speed transmission capacity. As of 2019 only the Central African Republic, Eritrea, and South Sudan lacked connections to submarine cables.

- Technology companies including Google and Facebook are continuing to improve African connectivity by expanding their undersea cable networks. The first phase of Google's new submarine cable, Equiano, is expected to be completed in 2022, connecting Portugal and South Africa to bring unprecedented bandwidth to the region. The first branch is planned to land in Nigeria, with other countries to follow.

- Internet access in Africa mainly relies on mobile networks, with a 28% penetration rate of mobile broadband versus less than 5% penetration for fixed broadband in most countries across Sub-Saharan Africa (excluding South Africa). By the end of 2019, mobile Internet in Africa covered 78% of the population for 3G and 54% for 4G.

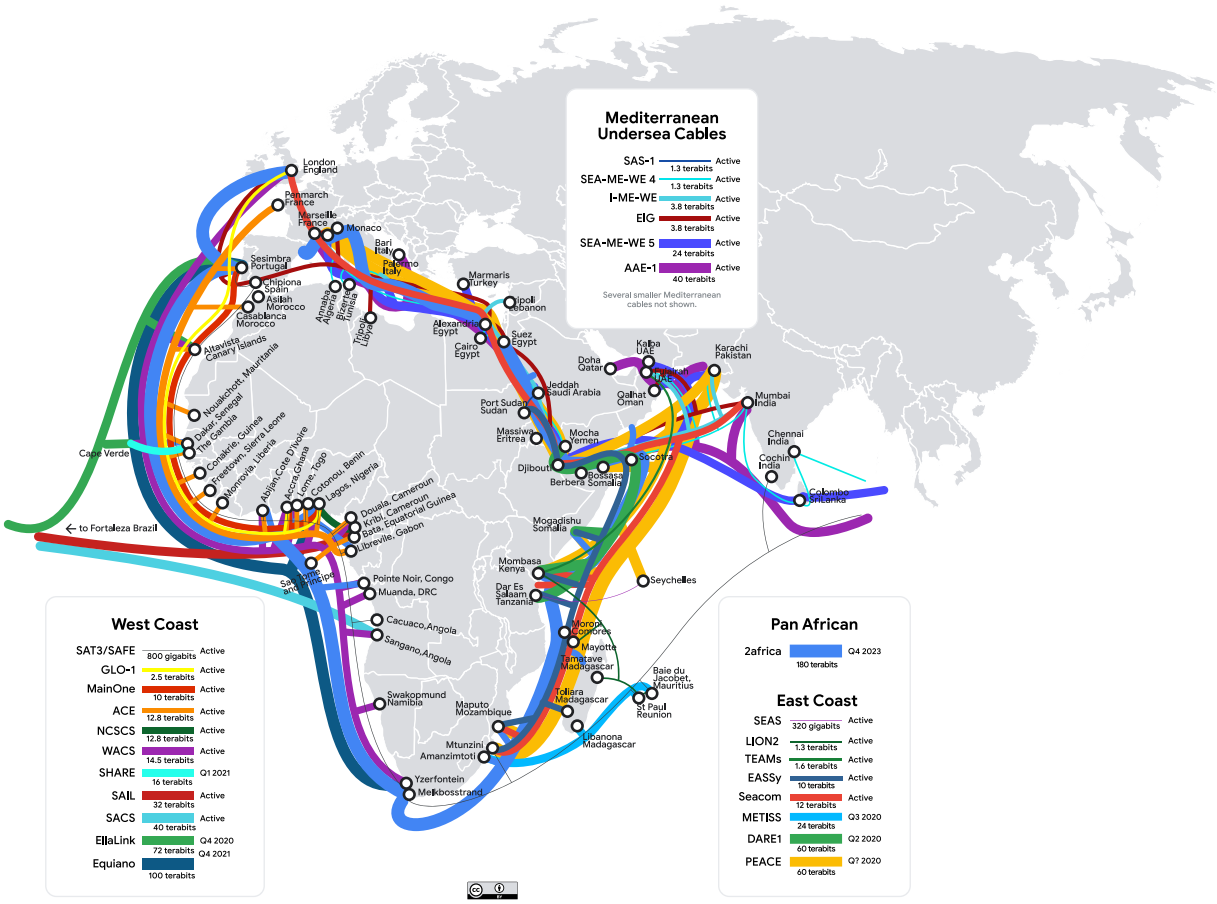
- An increasing number of data centers, Internet exchange points (IXPs), hubs, and content delivery networks (CDNs) are also driving faster access. Going forward, ambitious national digital strategies and a continent-wide effort to reach universal access by 2030 will significantly ramp up digital activity in Africa.

Improving the infrastructure from sea to land

Digital infrastructure is the backbone of the Internet economy around the globe and in Africa. Submarine cables, terrestrial fiber, telecom towers, and data centers all play an important role in enabling connectivity, extending access of individuals, businesses, and governments alike, and supporting the storage and processing of data. Investment in this infrastructure is crucial to allowing Africa's digital economy to compete on a global level.

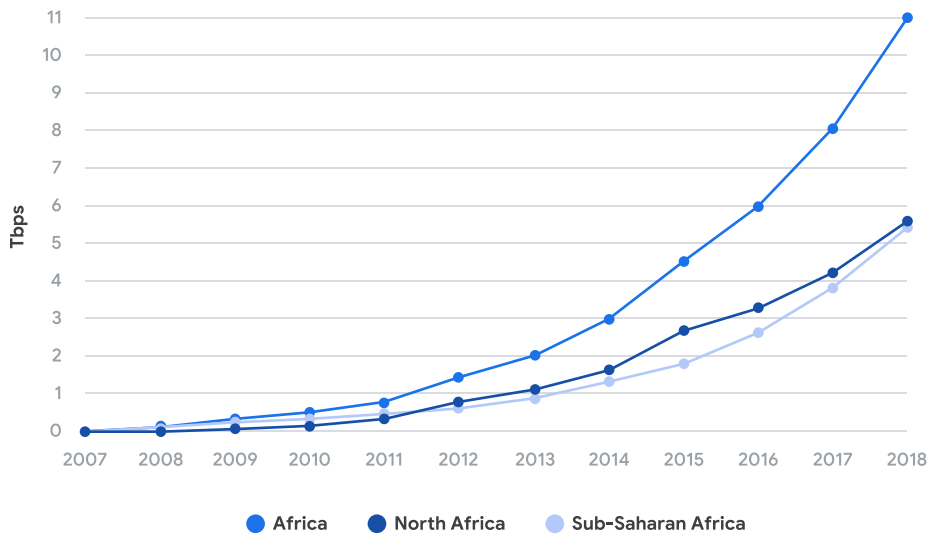
Increased investment in subsea and terrestrial fiber-optic infrastructure, in particular, has given rise to rapid growth in international Internet capacity, resulting in both greater availability and lower price for high-speed transmission capacity.[205] As of 2019, only the Central African Republic, Eritrea, and South Sudan lacked connections to submarine cables; all other African countries were connected either directly or through terrestrial fiber systems (Figure 3).[206] International Internet bandwidth has increased by a factor of 10 over the past decade, to 12 terabits per second (Tbps) (Figure 4);[207] however, such capacity is still less than half that of China (36 Tbps) or Singapore (37 Tbps), leaving significant room for further growth.[208]

Figure 3: Map of African Undersea Cables (2023)



Source: "African Undersea Cables," map version 51, ManyPossibilities.net, July 2020, http://manypossibilities.net/african-undersea-cables. License: CC BY 2.0

Figure 4: International Internet Bandwidth, 2007–2018



Source: Africa Bandwidth Maps, Hamilton Research, Bath, UK.

How tech companies are improving connectivity across the continent

Technology companies such as Google and Facebook are continuing to improve connectivity by expanding their undersea cable networks. For example, the first phase of Google's new submarine cable, Equiano, is expected to be completed by 2022 and will connect Portugal and South Africa, bringing unprecedented bandwidth to the region. The first branch is planned to land in Nigeria, with other countries to follow.

As noted in Google's blog announcing the initiative, once complete, Equiano will start in western Europe and run along the west coast of Africa, between Portugal and South Africa, with branching units along the way that can be used to extend connectivity to additional African countries.[209]

Equiano will use optical switching at the fiber pair level, making it easier to allocate capacity as needed, simpler to deploy, and less expensive than other systems built to date.[210] Fully funded by Google, the cable is expected to have **20x the capacity of the last cable built to serve the region.**[211] In partnership with Internet service providers (ISPs) and telcos, Equiano will bring capacity to even more countries across the African continent.[212]

Equiano is important from a capacity standpoint for two key reasons:

1. The increased bandwidth Equiano will bring to the continent will allow for more latency-sensitive products to function and be developed.

2. Equiano begins to tackle the acute need for redundancy. Given the limited number of cables currently serving the region, redundancy is extremely important from a connectivity, consistency, and reliability perspective. If or when cables are damaged or break, end users experience slow Internet speeds and may not be able to perform simple functions, such as sending emails or making international phone calls.

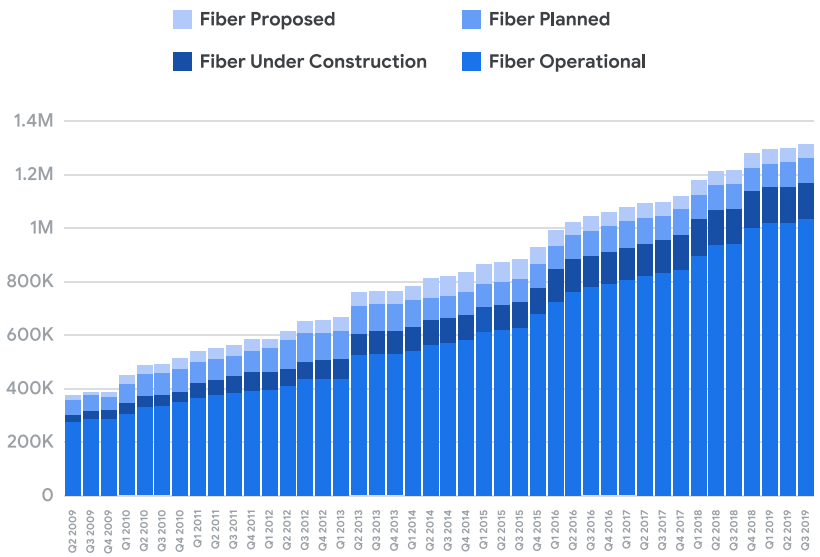
Similarly, Facebook is launching 2Africa, a new venture that will lay 37,000 kilometers of submarine cable to provide connectivity to 23 countries in Africa, Europe, and the Middle East. According to Facebook, it will expand Africa's Internet capacity almost threefold by supporting the growth and development of 4G, 5G, and broadband access.[213] These combined efforts, in addition to others, will significantly transform current Internet access and connectivity for Africa.

By the numbers: Africa's bandwidth and network capacity

According to Hamilton Research's Africa Bandwidth Maps, progress in expanding the infrastructure has not been limited to undersea cables; the terrestrial fiber network has grown considerably as well. An additional 300,000 kilometers of terrestrial links are proposed, planned, or under construction, on top of the 1,000,000 kilometers currently in existence (Figure 5).[214]

Africa's terrestrial network capacity, measured by the kilometer of fiber deployed, has grown at an annual rate of 12.5% over the past decade. In mid 2010, 259 million people in Sub-Saharan Africa lived within 25 km of a functioning fiber-optic network node. By mid-2018, that number had increased to 566 million, and a year later, those close to an operational node had increased to 584 million (about 52% of the region's population). Those numbers will continue to increase as fiber networks under construction come into service.[215] Between 2016 and 2019, last-mile fiber network expanded significantly, recording a 96% average annual growth rate and totalling more than 3 million fiber subscribers across the continent, mostly concentrated in South Africa (>2 million), Kenya, and Morocco.[216]

Figure 5: Route-Kms of Terrestrial Transmission Network, Africa 2009 – 2019



Source: Africa Bandwidth Maps, Hamilton Research, Bath, UK.

Internet access in Africa mainly relies on mobile networks, with 28% penetration rate of mobile broadband[217] when compared to less than 5% penetration for fixed broadband in most countries across Sub-Saharan Africa (excluding South Africa).[218] Mobile operators have substantially increased network capacity by ramping up the deployment of base stations, which are increasingly backed by specialized infrastructure companies that are managing the telecom towers (also known as towercos). **By the end of 2019, mobile Internet in Africa covered 78% of the population for 3G and 54% for 4G.[219]**

A growing number of data centers, IXPs, hubs, and CDNs are also driving faster access

The number of data centers is also increasing across the continent, almost doubling between 2014 and 2017. [220] South Africa is home to a number of cloud service providers, including Amazon, Microsoft, and Huawei. According to the Africa IXP Association (Af-IX), there were about 45 active IXPs across 33 countries in Africa by the end of 2019, an increase of 275% over the past 10 years.[221]

The African Peering & Interconnection Forum (AfPIF), which addresses interconnection, peering, and traffic exchange opportunities and challenges on the continent, aims to increase the level of content exchanged locally to 80% by 2020.[222] New hubs in cities such as Cotonou, Dakar, and Abidjan are joining well-established ones in more traditional tech centers like Lagos and Cape Town.[223] Locally hosted content reduces the latency and cost for users, supporting local Internet economy development.[224] According to the Internet Society, "local content hosting helps to develop vibrant data centers and web hosting providers, which in turn help to support the development of more local content and services. The availability of this local content brings new users online, and also contributes to jobs and revenues for local entrepreneurs."[225]

Online service providers (OSPs) such as Google, Netflix, and Facebook have invested in CDN nodes to cache content closer to end users. By doing so, OSPs are able to improve quality and reliability, as well as reduce costs, by minimizing the duplication of content that is transported over backbone networks to reach end users. CDNs have grown in importance due to the rise in video content and cloud services.

By 2021, 48% of Internet traffic will pass through in-house, or private, CDNs, whereas just 22% will be delivered through commercial CDNs.[226] Google Global Cache (GGC), an edge server that stores YouTube videos and other content, has been deployed across the continent since its launch in 2008, and offers improved quality and higher-resolution videos.[227] By using caches and by hosting and accessing this content locally, latency can be drastically reduced. Lower latency enhances the performance of applications, leading to increased usage and driving traffic growth.[228]

Map of metros with at least one GGC

Source: Google Edge Network.

These expansions have been supported by an improved regulatory environment, which an increasing number of countries are embracing.[229]

Going forward, ambitious national digital strategies and a continent-wide effort to reach universal, affordable and quality Internet access by 2030 will significantly ramp up digital activity in Africa. In February 2020, the AU adopted its Digital Transformation Strategy for Africa, which seeks to "harness digital technologies and innovation to transform Africa's societies and economies to promote Africa's integration, generate inclusive economic growth and stimulate job creation."[230] To facilitate its implementation, the World Bank Group's DE4A initiative is supporting policy reforms and interventions, and leveraging the public and private investment needed to build the foundations for a digitally-ready Africa.

The DE4A aims to ensure that every individual, business, and government in Africa is digitally-enabled by 2030, including enabling affordable and high-quality broadband access across the continent by 2030, as laid out in the United Nations Broadband Commission report, *Connecting Africa Through Broadband.*[231] The overall goal will require a concentrated effort to build up the core foundations of the digital economy including digital infrastructure, digital public platforms, digital skills, digital financial services and an environment supportive of digital business and entrepreneurship. Over 35 countries have already embarked on WBG-supported operations in line with the DE4A initiative to undertake key reforms and public investments, and 30 countries have partnered with World Bank Group (WBG) to conduct digital economy assessments and identify priority actions,[232] among them Nigeria,[233] South Africa,[234] and Senegal.[235]

International Internet bandwidth is expected to grow at an average annual rate of 36%, from 12 Tbps in 2019 to 100 Tbps by 2026. This would make Africa the fastest-growing region of the world, with significant improvement in the quality of Internet access potentially supporting higher usage.[236] And mobile network operators are thinking beyond cables; geostationary satellites such as Alphabet's Project Loon, mentioned in Section 2, are one option to provide access to remote, rural areas.[237] [238] Early rollout of 5G technology has already begun in South Africa (Johannesburg and Cape Town) and Lesotho, with substantial expansion expected from 2025 forward.[239] [240] However, access to reliable electricity is essential to realize the full potential of these advances (see "Powering the African Internet economy" below).

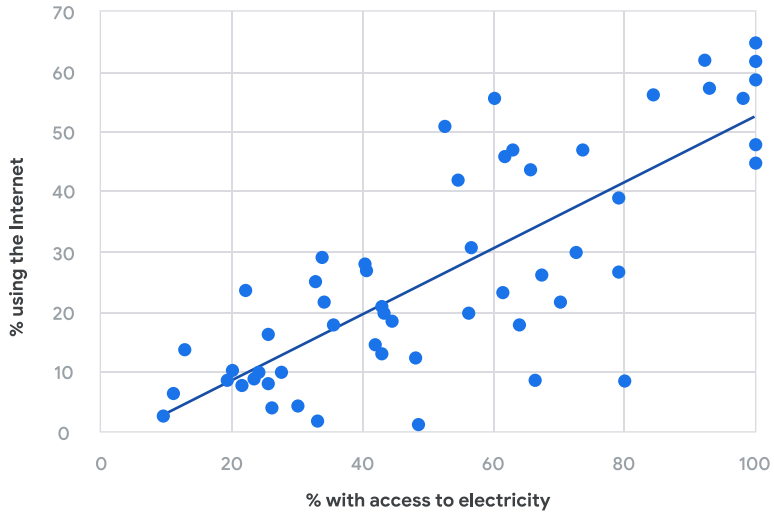
How COVID-19 has impacted Internet usage

The COVID-19 pandemic has resulted in increased Internet usage across Africa, typically by as much as 20%, as individuals, businesses, and governments shift their activities online in compliance with stay-at-home and distancing advisories. The Moroccan network operator Maroc Telecom reported a 25-30% increase in data traffic, while in Senegal, mobile operator Free saw a 20% increase in data traffic.[241] As a result, the quality of digital experiences declined; download speed on fixed broadband declined by 22% in Morocco and 13% in South Africa. The current health crisis highlights the need to reinforce investment in digital infrastructure to ensure resilience. [242]

Powering the African Internet economy

Access to electricity is essential for supporting the electronic devices and IT infrastructure that drive the expansion of the Internet economy. It enables users to power their devices, especially smartphones and tablets, and telecom operators to run their IT infrastructure, including main distribution frames, base stations, and Internet exchange points. Data center operators also need access to reliable electricity to provide data storage and processing services. While such access is a given in most parts of the world, Africa, especially the Sub-Saharan region (with South Africa as a partial exception), is still home to more than half a billion people with no electricity.[243] Even in those countries with decent access to electricity, power supply remains limited and unreliable. In Africa, electricity consumption per capita represents only 6% of the global average.[244]

Figure 6: Access to electricity and the Internet



Source: Reproduced using data from the International Telecommunication Union and the World Bank

The percentage of individuals using the Internet is shown on the y-axis (from the International Telecommunication Union), and the percentage of population with access to electricity on the x-axis (from the World Bank's World Development Indicators database).

These challenges are constraining the expansion of the Internet economy, especially in rural areas and for small- and medium-sized businesses that suffer disproportionately. As suggested by Figure 6, countries with low access to electricity, such as the Democratic Republic of the Congo (DRC), Niger, and Madagascar, also have low access to the Internet, while the reverse holds true for countries with higher access to electricity, such as South Africa, Ghana, and Senegal. Only 23% of rural inhabitants have access to electricity, and Internet penetration is below 15%.[245]

Powering the African Internet economy

While large businesses can rely on electric generators, electric generators, small and medium-sized enterprises (SMEs) pay the price of power outages when their ability to conduct business is disrupted along with their digital connectivity. Unreliable power sources typically inflate the cost of running energy-intensive infrastructure like data centers as well. According to projections, electricity consumption for data centers is expected to outstrip increases in overall electricity generation in several countries, further straining the power grid.[246]

However, the private sector has been devising innovative solutions to overcome the energy challenges in Africa. For telecom operators, not being able to count on power at their tower sites is the most significant obstacle in providing dependable mobile phone service. As part of their growth strategy, they increasingly outsource the supply of electric power and the maintenance of electrical equipment to specialized energy service companies (ESCOs) to minimize energy cost.[247]

Telecom operators are also engaging in infrastructure sharing through towercos to further reduce energy costs. In many cases, this has resulted in increased network coverage and service quality, potentially expanding the Internet economy. This means that the boundaries of the power market may continue to blur as non-traditional energy providers (telcos, fintech) continue to innovate in this space and generate electricity, especially for solutions outside of traditional large stand-alone utilities. Data center operators are taking advantage of energy-efficient cooling technologies to minimize energy cost. These technologies include using piped water, immersing servers in non-conductive oil or mineral baths, or directing the heat produced by the servers into the district heating system. Recent data center construction projects in Africa exhibit high levels of power usage effectiveness, a measure of how efficiently a data center uses energy. For instance, a recent data center construction project across several African countries has had a power usage effectiveness (PUE) measure of 1.5, compared to the global average of 1.2. This higher level of efficiency is enabling the expansion of data storage and processing capacity in previously challenging markets like Ghana, Nigeria, and Ivory Coast.[248]

On the consumer side, a number of innovations are being tested to enable the use of smartphones, especially in rural areas. The most prominent are decentralized energy systems, including pico-solar systems (PLS), solar-home systems (SHS), and mini-grids based on solar, using a distribution network and financing strategies tailored to low-income users. For instance, M-KOPA SOLAR, a Kenya-based solar energy company, distributed 750,000 off-grid solar systems by 2018 in Kenya, Uganda, and Tanzania, providing 3 million people with access to electricity and the ability to recharge their mobile handsets.[249] More than 2 million off-grid solar systems were distributed across Sub-Saharan Africa in 2019.[250] At a more macro level, governments are ramping up the effort to alleviate energy challenges, thereby bolstering the expansion of the Internet economy. Many countries are collaborating on an effort to increase the number of people gaining access to electricity annually from the current 20 million to above 60 million. [251] While the DRC will remain home to the vast majority of individuals without access to electricity in 2030, Kenya, Ethiopia and Senegal are all set to achieve universal access to electricity before 2030. South Africa and Ghana are expected to reach full electrification by 2030. Strong efforts in Nigeria are expected to increase access to electricity, reaching 80% of the population by 2030.

7 Regulatory Hurdles and Opportunities for Africa's Internet Economy

Key Takeaways:

- The fast growth of new and disruptive business models is challenging regulators to keep up. Startups need to collaborate with regulators to build trust and assist with any knowledge gaps.
- As businesses expand into new countries and markets across the continent, there is often no unified approach to easily navigate regulatory environments across different countries, posing challenges for startups seeking to scale across Africa.
- Given the technology-related regulatory challenges governments are facing, it is important for entrepreneurs, investors, and policymakers to continue dialogue, encouraging environments where digital startups and businesses can thrive.
- Startup acts, regional harmonization, and global frameworks for digital business are initiatives that are driving mutually beneficial growth for both African governments and startups.

The regulation and growth of startups in Africa

As Africa's technology ecosystem continues to grow, government support is increasingly crucial to the success of startup ecosystems and developer populations. At the same time, the regulatory environment is often cited as one of the barriers that African startups face.

Regulatory uncertainty can impact startup viability and investment decisions. This chapter provides examples from West and East Africa of how regulatory issues have impacted the everyday operations of startups. At the same time, for policymakers, keeping up with the fast pace of technology disruption and innovation and deciding how to regulate startups created from rapidly evolving technologies requires a careful balancing act. However, countries that create venture-friendly legal and regulatory environments are more likely to support the creation and growth of startups.

Startups need to be able to navigate regulations related to business growth and innovation, as well as regulations specific to their business model or industry. Elements of regulating startups and providing an enabling regulatory environment in complementary markets can be roughly divided into five categories: 1. Innovation and Firm Growth, 2. Doing Business Digitally, 3. Sector and Industry, 4. Taxation of Digital Business, and 5. Africa Pension Fund Reform.

Examples of regulation specifically relevant to digital startups and established digital businesses:

1. Innovation and Firm Growth

- Accelerated incorporation and registration changes (e.g., mergers, acquisitions, listings)
- Ability to attract global expertise and the use of gig workers, such as contractors and e-Labor
- Ability to raise capital, complete mergers and acquisitions, and effectively repatriate foreign investments
- Access to agile regulation such as sandboxes to enable testing of business model (e.g., self-driving vehicles, use of drones)
- Trust in intellectual property rights, including fair use
- Access to shared services and reusable public-sector data
- Effective competition (interoperability such as open platforms, access to APIs, and data sharing)

2. Doing Business Digitally[252]

- Connectivity, including universal access, spectrum management,[253] Internet connectivity policies,[254] domain name registration, and data infrastructure (data center, cloud computing, artificial intelligence)
- Data privacy and security, including the rights of data subjects, cross-border data transfers, and cybersecurity and enforcement
- Payments, including licensing of payment service provider, and payment authorization and processing
- Logistics, including connecting online transactions to offline production, and customs processes (cross-border e-Commerce)
- Digital market regulations, including electronic documents and signatures, consumer protection, and intermediary liability

3. Sector and Industry

- Technical regulation for digital business in fintech, mobility, tourism, e-Commerce, etc.
- Examples include licensing, quality and certification standards, occupational health and safety, environment protection, etc.

4. Taxation of Digital Business

- Business may be taxed based on its digital presence or service
- Taxation harmonization for online and offline services (i.e., application of existing tax statutes, sector-specific taxes, tax collection responsibilities)

5. Opportunity for Africa Pension Fund reform to spur local investments in digital platforms

- As the precedent shows in other developed tech ecosystems, pension reforms are needed in Africa to enable local pension funds to invest in regionally focused venture capital firms and serve as catalysts for the sector

Navigating Africa's complex regulatory environments

Startups in many African countries must navigate complex regulatory environments with multiple regulators and agencies. Across the continent, there is often no unified approach between countries, or in some cases even across subnational boundaries, posing additional challenges for startups seeking to scale within Africa. **As businesses move and grow into new countries and new markets, they need to scan each regulatory framework separately.**

To illustrate this from a business perspective, Table 1 gives an example from South Africa with a non-exhaustive list of the various regulators, departments, and agencies a digital startup (as well as an established digital business) may need to be aware of, while also keeping an eye on potential new legislative and regulatory measures that are being prepared or are soon to take effect.

Table 1: Examples of digital business specific regulation in South Africa

Categories	Relevant Regulators, Departments, and Agencies
Innovation and Firm Growth	
Accelerated incorporation and registration changes (e.g., mergers, acquisition, listing, etc.)	Department of Trade and Industry (DTI) Companies and Intellectual Property Commission (CIPC) Department of Small Business (DSB)
Ability to attract global expertise and the use of gig workers (i.e., contractors and e-Labor)	Department of Labor (DOL) South African Qualifications Authority (SAQA) Industry Accreditation Bodies Quality Council for Trades and Occupations (QCTO) Council on Higher Education (CHE) Umalusi Council for Quality Assurance in General and Further Education and Training Department of Higher Education & Training (DHET)
Ability to raise capital and effectively repatriate foreign investments	National Treasury Financial Services Board (FSB) South African Revenue Service (SARS) South African Reserve Bank (SARB)
Access to agile regulation such as sandboxes to enable testing of business models	South African Reserve Bank (SARB) Financial Sector Conduct Authority (FSCA) Financial Services Board (FSB) Intergovernmental Fintech Working Group (IFWG)
Trust in intellectual property rights (including fair use)	Companies and Intellectual Property Commission (CIPC) Department of Science and Innovation (DSI)
Access to shared services and re-usable public sector data	Open Government Partnership (OGP)
Fair competition (market dominance, antitrust, interoperability)	The Competition Commission (CIPC)

Categories	Relevant Regulators, Departments, and Agencies
Doing Business Digitally	
Connectivity, including universal access, Internet connectivity, domain name registration, spectrum management, and computing infrastructure	.za Domain Name Authority (ZADNA) Independent Communications Authority of South Africa (ICASA) Department of Communications and Digital Technologies (DCDT)
Data privacy and security, including the rights of data subjects, cross-border data transfers, data security and enforcement	Information Regulator (South Africa) Department of Communications and Digital Technologies (DCDT)
Payments, including licensing of payment service provider, payment authorization and processing	South African Reserve Bank (SARB) Payments Association of South Africa (PASA) Financial Sector Conduct Authority (FSCA)
Logistics, including connecting online transactions to offline production, and customs processes (cross-border e-Commerce)	Transnet National Ports Authority (TNPA) Transnet Port Terminals (TPT) International Trade Administration Commission of South Africa (ITAC) Ports Regulator of South Africa (PRSA)
Digital market regulations, including electronic documents and signatures, consumer protection, and intermediary liability	Independent Communications Authority of South Africa (ICASA) South African Accreditation Authority (SAAA) Department of Communications and Digital Technologies (DCDT) Consumer Affairs Committee The Competition Commission
Sector and Industry	
Technical regulation for digital business in fintech, mobility, tourism, e-Commerce, etc.	Varies (based on industry)
Licensing, quality and certification standards, specific registries, etc.	South African Bureau of Standards (SABS)
Taxation of digital business	South African Revenue Service (SARS)

The fast growth of new and disruptive business models is challenging regulators to keep up. Startups with disruptive business models are realizing that their speed of development and deployment, ranging from new economic models to transforming traditional sectors of the economy, have introduced several new challenges to regulators. These challenges include changing competition dynamics (such as network effects, winner-takes-all strategies, and online businesses avoiding stringent sector regulations that traditional businesses face), regulatory gray zones or jurisdictional overlaps, lack of licensing categories for new business types or products, lack of social protection of gig workers, and job displacements related to the creation and growth of startups.

Startups need to collaborate with regulators to build trust, and assist with any knowledge gaps. Regulators are sometimes seen as having limited knowledge on both new technology developments and emerging modern regulatory approaches such as sandboxing or co-regulation – exceptions include the Kenyan regulators who were instrumental when services such as M-PESA and M-Akiba were introduced to the market. Regulators are sometimes perceived to be risk averse and slow to react to new business models, which is particularly challenging for disruptive startups, where the ability and willingness to innovate is critical.

Assessing regulatory environments in light of the digital economy

Data fuels the go-to-market decisions made by entrepreneurs and investors. However, in regulatory environments, globally relevant information is still relatively scarce.[255] To understand the regulatory environment better in Africa, 11 digital economy country diagnostic reports, prepared by the World Bank in 2019, were reviewed.[256] Tables 2 and 3 summarize and highlight regulatory issues from these reports that were particularly relevant to startups.

As illustrated in Table 2, Kenya and South Africa appear to have the most comprehensive regulations in place, while Ghana, Mozambique, Nigeria, Rwanda, and Seychelles require some major amendments to their frameworks. Cameroon, Gabon, Madagascar, and Senegal have fragmented and dispersed individual regulations, with much room for improvement. Table 3 provides examples of regulatory gaps the diagnostics highlighted, as well as an indication of the countries where these gaps were prominent.

Table 2: Indicative analysis of the regulatory environment based on 11 digital economy diagnostic reports prepared as a part of the Digital Economy for Africa initiative

Country	No substantial regulation	Only barebones framework or dispersed individual regulation	Comprehensive regulatory framework, but with major additions or amendments needed	Comprehensive regulation in place, but small additions or upgrades recommended	Comprehensive and modern regulation in place
Cameroon	✗	✓	✗	✗	✗
Gabon	✗	✓	✗	✗	✗
Ghana	✗	✗	✓	✗	✗
Kenya	✗	✗	✗	✓	✗
Madagascar	✗	✓	✗	✗	✗
Mozambique	✗	✗	✓	✗	✗
Nigeria	✗	✗	✓	✗	✗
Rwanda	✗	✗	✓	✗	✗
Senegal	✗	✓	✗	✗	✗
Seychelles	✗	✗	✓	✗	✗
South Africa	✗	✗	✗	✓	✗

Table 3: Examples of regulatory issues relevant to startups in 11 African countries in 2019

Category of Regulatory Gap	Regulatory Gaps	Country Examples
Innovation and Firm Growth	Regulatory challenges related to starting a business, enforcing contracts, and trading across borders. Examples include: built-in regulatory bias against new products and business models, as regulators tend to be somewhat risk-averse and protectionist. Outdated and ineffective policies for stimulating investment in the digital industry; gaps in insolvency and investor liability legislation; lack of regulatory frameworks for high initial investments, and access to finance and markets. In addition, there is a lack of labor-related policies and regulations on hiring full-time employees for startups. Strong employee protection policies and administrative burden can prevent hiring decisions of startups that often face financial uncertainty.	Gabon, Ghana, Kenya, Mozambique, Nigeria, Senegal, Seychelles, South Africa
Competition and Market Dominance	Legal and regulatory gaps related to licensing, fair competition, and spectrum allocation.	Ghana, Kenya, Senegal, Seychelles
Connectivity and Access	Legal and regulatory gaps related to access to digital infrastructure, and to access and use of mobile-enabled and digital services.	Cameroon, Kenya, Madagascar
Data Privacy, Security, Ownership, and Localization	Legal and regulatory gaps related to data storage, data ownership, privacy and cybersecurity, and cross-border data flows. Examples include: lack of legal framework on ownership and licensing of government data; access to shared services and re-usable public sector data.	Cameroon, Gabon, Ghana, Mozambique, Nigeria, Rwanda, Senegal
Payments	Legal and regulatory gaps related to licensing of payment service providers, payment authorization, and processing. Examples include: Failing to address the emergence of new business models where platforms that act as payment intermediary have been developed; legal vacuum around digital signatures; banking regulation to allow banks to deliver financial services remotely.	Cameroon, Ghana, Madagascar, Nigeria
Tax Registration, Filing, and Reporting	Lack of legal clarity regarding the number of taxes and costs that are still high and mostly unknown by digital entrepreneurs. Examples include: onerous Value Added Tax (VAT) and corporate tax legislation and procedures[247]; numerous emerging business models not being recognized in tax laws.	Mozambique, Nigeria, Seychelles

Regulatory spotlight: Nigeria's okada and keke ban disrupts ride-hailing startups

In recent years, the ride-hailing industry has emerged across Africa with several startups concentrated in Lagos. Examples such as MAX.ng, Gokada, and ORide were reported to employ more than 14,000 employees in early 2020,[258] providing income for low-skilled individuals. However, in February 2020, all commercial motorcycles (called okada) and tricycles (keke) were banned from major highways in the state, with the government highlighting safety and security as reasons for imposing the ban.[259]

Okada and keke are some of the most popular modes of transport in Lagos, providing alternatives to otherwise packed public transportation.[260] They are able to reach key commercial and residential areas and help individuals arrive at their destinations on time, even during traffic gridlock, saving work-hours that would be otherwise lost.[261] It is estimated that Lagosians spend an average of 30 hours in traffic each week.[262] MAX.ng reported that prior to the okada ban, they had completed over 2 million trips since August 2015.[263]

This ban is an example of challenges that regulators face as a result of digital disruption, and since the ban, there have been concerns that the steps leading up to the okada ban have sent negative signals to international investors. Based on an interview with Techpoint.africa,[264] Kayode Adegbola, founder of Golborne Road Advisory and an ex-director of Gokada, said that the government had not anticipated the growth of the transport industry around bike-hailing companies when initial laws were drawn up. These laws included the exemption for bikes with 200cc capacity and above, which provided the opportunity for bike-hailing companies to build their business.

Looking ahead: Regulatory changes that may impact Africa's Internet economy

Since the onset of COVID-19, many individuals, startups, and investors have heeded governments' calls to support local businesses. While only a few countries around the world have introduced targeted measures for the tech sector at the time of this writing, startups in Africa may qualify for programs under broader support options for businesses. The World Bank has been cataloging announced policies around the world as part of its efforts to support governments in their policy response packages.[265]

Given the technology-related regulatory challenges governments are facing, it can be particularly beneficial for entrepreneurs, investors, and policymakers to continue dialogue and encourage environments in which digital startups and businesses thrive. These initiatives include startup acts, regional harmonization, and global frameworks for digital business.

Startup acts: In 2018, Tunisia was the first African country to pass legislation related to startups. The Tunisian Startup Act was created with the intention of making it easier for local entrepreneurs to start and run a business.[266] In December 2019, Senegal followed suit, becoming the second African country to create a startup act as a part of the country's greater Digital Senegal 2025 strategy. Most notably, the act promotes innovation and entrepreneurship, creates support and governance frameworks, and launches a resource center dedicated to startups.[267] When new approaches such as startup acts are introduced, it is important to measure and evaluate impact and share lessons among entrepreneurs and investors.

Startup acts send a strong signal to existing and potential entrepreneurs—and their investors—that the government recognizes the importance of entrepreneurship and will incentivize it. The development of startup acts can galvanize the entrepreneurship community and socialize the government with entrepreneurship issues (as in the case of Tunisia). However, while such legislation assumes that startups generate a set of spillovers and benefits that other firms do not, the recent WBG High Growth Firm Study has found that this story is much more nuanced. Moreover, any type of legislative intervention that provides a particular set of regulatory or tax benefits to one set of firms can be critiqued as a second-best measure, as improving the business environment for all firms should be the priority. Furthermore, success of such initiatives hinges upon implementation support from the donor community and progress on complementary reforms outside the act (amendments of commercial code).[268]

Regional harmonization: Regulatory inconsistency can complicate or impede market access and limit investment opportunities for startups. Regional harmonization and infrequent regulatory changes are key to startup success. As highlighted in Section 1 of this report, the African Continental Free Trade Area (AfCFTA) agreement–originally signed by 44 countries, with the number growing to 54 by the end of 2019–is one major milestone toward harmonization for digital businesses. There are also sub-regional efforts, such as the East Africa Single Digital Market Initiative,[269] that aim to create integrated digital markets, covering key issues related to connectivity, data, and online markets.

Global frameworks related to digital business models and markets: Digital startups and businesses should monitor global developments that can influence their business model operations, such as customs, taxation, data policy, and technical standards. For example, the moratorium on customs duties on electronic transmissions by the World Trade Organization (WTO) is negotiated on a regular basis. Similarly, there are multilateral efforts led by the OECD that would address current tax challenges and loopholes, with the goal of having fair and equitable taxation of digital businesses across the globe. Compliance with data policy frameworks such as the General Data Protection Regulation has meant that some startups are less concerned about their ability to comply with national and regional standards that may be established in the future. Participating in and helping to develop technical standards for emerging and disruptive technologies, such as 5G and the Internet of Things (IoT), can help companies keep up with important developments.

Novel and participatory processes: Policymakers and regulators need to understand emerging digital technologies and business models in order to adapt their regulatory approaches and tools. This includes new principles such as agile regulation and regulatory sandboxes in select industries that can accelerate the development of technologies and business models, while also eliminating negative consequences. Agile regulations are able to incorporate various approaches to experimentation, co-creation, knowledge acquisition, feedback loops, and course correction. This form of regulation is counter to the long-employed static approach of predicting future outcomes the basis of historical data. Other notable approaches include "Rules as Code," which translates regulations to simple, business-friendly language that is readable by both humans and machines. Craig Atkinson, a research fellow at the World Trade Institute, suggests that such an approach would be suitable for agreements such as AfCFTA, making the legal agreement easier to access, understand, and apply.[270]

One positive trend is that many governments are seeking input from industry associations and startup organizations when crafting and implementing regulations. In recent years, the World Bank and organizations such as the Innovation for Policy Foundation (i4Policy) have helped facilitate participatory processes by conducting policy hackathons to encourage debate about current challenges the entrepreneurial community is facing and to design feasible solutions.[271]

For example, the Startup Act in Senegal benefited from a participatory process that started over a year and a half before the act was passed. The process brought together over 60 individuals involved in the startup ecosystem for the Dakar Policy Hackathon in July 2018, where they discussed how best to modify and develop policies to benefit businesses—especially startups—in Senegal. The hackathon concluded with a draft proposal for Senegal's new Startup Act, which was refined with help from Senegal's Presidential Commission for Rapid Entrepreneurship and an online consultation before it was publicly presented to the country's president.[272]

More data and evidence needed for improved regulatory oversight

At present, information on the existence and quality of regulations for startups in Africa is limited, and current datasets are insufficient to track the development and impact of startups and more established digital businesses. However, without sufficient data and limited understanding of digital business models, decisions on far-reaching and complex issues are being made in a vacuum. By having access to more robust public data infrastructure, including sectoral data, investors would be able to analyze and identify opportunities more easily. The World Bank's Digital Business Indicators initiative is working to address this gap on regulatory enablers with 21 pilot countries, including Burkina Faso, Kenya, Senegal, Tanzania, and Tunisia.[273]

With sufficient data on markets, a better understanding of the effects of regulations on digital business models and access to good practices, regulators are able to prepare better assessments of specific regulatory needs. Combining improved understanding with the participatory process and a more agile regulatory approach discussed in this section, regulators will be able to implement regulatory reforms that promote innovation and inclusive economic growth.

Abbreviations and Acronyms

ABAN	African Business Angel Network
Af-IX	Africa IXP Association
AfCFTA	African Continental Free Trade Area
AFD	Agence Française de Développement
AfPIF	The African Peering & Interconnection Forum
API	Application programming interface
AU	African Union
B2B	Business-to-business
B2C	Business-to-consumer
C2B	Consumer-to-business
CAGR	Compound annual growth rate
CDN	Content delivery network
DE4A	World Bank Group Digital Economy for Africa
DRC	Democratic Republic of the Congo
ESCOs	Energy service companies
FMCG	Fast-moving consumer goods
GB	Gigabyte
GDP	Gross domestic product
GGC	Google Global Cache
HY	Half year
i4Policy	Innovation for Policy Foundation
ICT	Information and communications technology
IFC	International Finance Corporation
iGDP	Internet gross domestic product
IMF	International Monetary Fund
IoT	Internet of Things
IP	Intellectual property
ISP	Internet service provider
IXP	Internet exchange points
M&E	Media & entertainment
MEST	Meltwater Entrepreneurial School of Technology
MSMEs	Micro, small, and medium-sized enterprises
OECD	The Organisation for Economic Co-operation and Development
OSP	Online service provider
PLS	Pico-solar systems
PUE	Power usage effectiveness
ROI	Return on investment
SARB	South African Reserve Bank
SHS	Solar-home system
SME	Small and medium-sized enterprises
STEM	Science, technology, engineering, and mathematics
Tbps	Terabits per second
VR	Virtual reality
WBG	World Bank Group
YoY	Year over year

References

1 For the purposes of this report, "Africa" includes Sub-Saharan Africa and North Africa.

2 Elzy Kolb, "Countries with the Top 20 Fastest-Growing Populations," USA Today, July 10, 2019, https://www.usatoday.com/story/money/2019/07/10/world-population-day-fastest-growing-countries-guinea-chad-mali/39584997/.

3 United Nations Statistics Division, "Methodology: Standard Country or Area Codes for Statistical Use (M49)," United Nations, New York, 1999, https://unstats.un.org/unsd/methodology/m49/.

4 Population Reference Bureau, "2018 World Population Data Sheet," August 2018, https://www.prb.org/wp-content/uploads/2018/08/2018_WPDS.pdf.

5 African Union Commission, "African Youth Charter," July 2, 2006, https://www.un.org/en/africa/osaa/pdf/au/african_youth_charter_2006.pdf.

6 United Nations Department of Economic and Social Affairs, Population Division, "World Urbanization Prospects," rev. 2018, https://population.un.org/wup/Download/.

7 Somik Venay Lall, J. Vernon Henderson, and Anthony J. Venables, "Africa's Cities: Opening Doors to the World," World Bank, Washington, DC, 2017. https://openknowledge.worldbank.org/bitstream/handle/10986/25896/9781464810442.pdf

8 Landry Signé and Chelsea Johnson, "Africa's Consumer Market Potential,"Brookings Institution, Washington, DC, 2018. https://www.brookings.edu/wp-content/uploads/2018/12/Africas-consumer-market-potential.pdf.

9 African Union Commission (AUC) and the Organisation for Economic Co-operation and Development (OECD), Africa's Development Dynamics 2019: Achieving Productive Transformation (Addis Ababa: AUC/Paris: OECD Publishing, 2019).

10 Landry Signé, "Africa's Consumer Market Potential: Trends, Drivers, Opportunities, and Strategies," (Africa Growth Initiative, paper, Brookings Institution, Washington, DC, 2018), https://www.brookings.edu/wp-content/uploads/2018/12/Africas-consumer-market-potential.pdf.

11 Damian Hattingh, Acha Leke, and Bill Russo, "Lions (Still) on the Move: Growth in Africa's Consumer Sector," Perspectives on Retail and Consumer Goods 6 (Autumn 2018), McKinsey & Company, https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/lions-still-on-the-move-growth-in-africas-consumer-sector.

12 Theodore Ahlers, Harinder S. Kohli, and Anil Sood, "Africa 2050: Realizing the Continent's Full Potential," Global Journal of Emerging Market Economies 5, no. 3 (2013): 153–213. https://journals.sagepub.com/doi/abs/10.1177/0974910113505790

13 Landry Signé, "Africa's Consumer Market Potential: Trends, Drivers, Opportunities, and Strategies" (Africa Growth Initiative, paper, Brookings Institution, Washington, DC, 2018), https://www.brookings.edu/wp-content/uploads/2018/12/Africas-consumer-market-potential.pdf.

14 Landry Signé, "Capturing Africa's High Return" (Africa Growth Initiative, paper, Brookings Institution, Washington, DC, 2018), https://www.brookings.edu/opinions/capturing-africas-high-returns/

15 Data from 2016 (AUC and OECD, Africa's Development Dynamics 2019): In Southern Africa, 15% of growth comes from private sector investment versus 4% from public investment. These figures are respectively 18% versus 6%- in Central Africa, 18% versus 8% in East Africa, 17% versus 9% in North Africa, and 11% versus 4% in West Africa.

16 Acha Leke, Mutsa Chironga, and Georges Desvaux, "Africa's Overlooked Business Revolution," excerpt from Africa's Business Revolution: How to Succeed in the World's Next Big Growth Market (Brighton, MA: Harvard Business Press, 2018), https://www.mckinsey.com/featured-insights/middle-east-and-africa/africas-overlooked-business-revolution.

17 For the purposes of this report, we used the African Development Bank definition of "middle class," which focuses on daily purchasing power: "middle class" daily purchasing power ranges from $4-$20 per person.

18 Considered middle class are those individuals who have a disposable income (not spending more than 75% of income on utilities); are employed, run a business, or receiving further education; and who have attended at least secondary school.

19 Hendrik van Blerk, "African Lions: Who Are Africa's Rising Middle Class?" (IPSOS Views 15, IPSOS Knowledge Centre, Paris, 2018), https://www.ipsos.com/sites/default/files/ct/publication/documents/2018-02/20180214_ipsos_africanlions_web.pdf.

20 Examples of these countries include Burkina Faso, Ethiopia, Ghana, Namibia, Rwanda, Tunisia and Zambia. World Bank, Global Database of Shared Prosperity, https://www.worldbank.org/en/topic/poverty/brief/global-database-of-shared-prosperity.

21 World Bank Group, "Doing Business in Sub-Saharan Africa 2020," fact sheet, 2020, https://www.doingbusiness.org/content/dam/doingBusiness/pdf/db2020/DB20-FS-SSA.pdf.

22 Mo Ibrahim Foundation, Agendas 2063 and 2030: Is Africa on Track? (African Governance Report, London: Mo Ibrahim Foundation, 2019), https://mo.ibrahim.foundation/sites/default/files/2020-02/African_Governance_Report_2019.pdf.

23 Trade Law Centre (tralac), "African Continental Free Trade Area (AfCFTA) Legal Texts and Policy Documents," tralac website, https://www.tralac.org/resources/our-resources/6730-continental-free-trade-area-cfta.html.

24 International Monetary Fund (IMF), "Regional Economic Outlook: Sub-Saharan Africa" (IMF, Washington, DC, June 2020).

25 Kartik Jayaram, Acha Leke, Amandla Ooko-Ombaka, and Ying Sunny Sun, "Tackling COVID-19 in Africa," McKinsey & Company, April 1, 2020, https://www.mckinsey.com/featured-insights/middle-east-and-africa/tackling-covid-19-in-africa#.

26 International Monetary Fund (IMF), "Regional Economic Outlook: Sub-Saharan Africa" and "Regional Economic Outlook: Middle East and Central Asia" (IMF, Washington, DC, April 2020).

27 International Monetary Fund (IMF), "Regional Economic Outlook: Sub-Saharan Africa" (IMF, Washington, DC, June 2020). https://www.imf.org/~/media/Files/Publications/REO/AFR/2020/Update/June/English/SREOENG202006.ashx?la=en

28 IMF, "Regional Economic Outlook."

29 IMF, "Regional Economic Outlook."

30 Kartik Jayaram, Acha Leke, Amandla Ooko-Ombaka, and Ying Sunny Sun, "Finding Africa's Path: Shaping Bold Solutions to Save Lives and Livelihoods in the COVID-19 Crisis," McKinsey & Company, April 17, 2020, https://www.mckinsey.com/featured-insights/middle-east-and-africa/finding-africas-path-shaping-bold-solutions-to-save-lives-and-livelihoods-in-the-covid-19-crisis.

31 Jayaram, Leke, Ooko-Ombaka, and Sunny Sun, "Finding Africa's Path."

32 Internet World Stats, "Internet Penetration in Africa," Miniwatts Marketing Group, Q2 2020, https://www.internetworldstats.com/stats1.htm.

33 Barbara Arese Lucini, "Connected Society: Consumer Barriers to Mobile Internet Adoption in Africa" (GSMA Intelligence report, GSMA, London, 2016). https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/07/Consumer-Barriers-to-mobile-internet-adoption-in-Africa.pdf.

34 International Telecommunication Union (ITU), "Economic Contribution of Broadband, Digitization, and ICT Regulation: Econometric Modelling for Africa" (research paper, ITU Publications, Geneva, 2019), https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.BDT_AFR-2019-PDF-E.pdf.
35 ITU, "Economic Contribution of Broadband, Digitization, and ICT Regulation."
36 Deloitte, "Value of Connectivity: Economic and Social Benefits of Expanding Internet Access" (report prepared for Facebook, Deloitte LLP, London, 2014), https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/TechnologyMediaCommunications/2014_uk_tmt_value_of_connectivity_deloitte_ireland.pdf.
37 GSMA, "The Mobile Economy."
38 GSMA, "The Mobile Economy."
39 Nika Naghavi, "State of the Industry Report on Mobile Money - 2019," (GSMA, London, 2020). https://www.gsma.com/sotir/wp-content/uploads/2020/03/GSMA-State-of-the-Industry-Report-on Mobile-Money-2019-Full-Report.pdf
40 Mutsa Chironga et al., "Roaring to life: Growth and Innovation in African retail banking," McKinsey & Company, February 28, 2018. https://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/african%20retail%20bankings%20next%20growth%20frontier/roaring-to-life-growth-and-innovation-in-african-retail-banking-web-final.pdf
41 StatCounter, Global Stats, accessed June 26, 2020. https://gs.statcounter.com/platform-market-share/desktop-mobile-tablet/africa
42 GSMA, "The Mobile Economy: Sub-Saharan Africa Report 2019" (GSMA Intelligence report, GSMA, London, 2019), https://www.gsma.com/mobileeconomy/sub-saharan-africa/.
43 Euromonitor, "Shifting Market Frontiers."
44 GSMA, "The State of Mobile Internet Connectivity 2019" (GSMA Intelligence report, GSMA, London, 2019), https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/GSMA-State-of-Mobile-Internet-Connectivity-Report-2019.pdf
45 GSMA, "The State of Mobile Internet Connectivity 2019."
46 Alexandria Williams, "China is making more of Africa's phones than you think," Quartz Africa, December 12, 2019, https://qz.com/africa/1764356/china-makes-majority-of-africas-smartphones/
47 GSMA, "The Mobile Economy."
48 GSMA Intelligence, 2020. Online database. https://data.gsmaintelligence.com/data/custom-metrics-search
49 EABW Editor, "Fixed Broadband Growth in Sub Saharan Africa an Opportunity for ISPs," East African Business Week, April 15, 2019, https://www.busiweek.com/fixed-broadband-growth-in-sub-saharan-africa-an-opportunity-for-isps/.
50 The Economist. 2019. "The Inclusive Internet Index," Intelligence Unit, https://theinclusiveinternet.eiu.com/.
51 Michael Kende, "Promoting the African Internet Economy," (Internet Society, Reston, VA, November 2017). https://www.internetsociety.org/resources/doc/2017/africa-internet-economy/.
52 Accenture, "Africa iGDP Forecast, Africa," September 2020.
53 Nicholson, Jessica R. 2020. New Digital Economy Estimates. Bureau of Economic Analysis. https://www.bea.gov/system/files/2020-08/New-Digital-Economy-Estimates-August-2020.pdf
54 Accenture, "Africa iGDP Forecast, Africa."
55 Accenture, "Africa iGDP Forecast, Africa."
56 Accenture, "Africa iGDP Forecast, Africa."
57 Accenture, "Africa iGDP Forecast, Africa."

58 Partech Africa Team. "2019 Africa Tech Venture Capital Report" (Partech Partners, Paris, January 2020). https://partechpartners.com/documents/12/2020.01_Partech_Africa_-_2019_Africa_Tech_VC_Report_FINAL.pdf

59 IMF Financial Access Survey, "Commercial Bank Branches (per 100,000 Adults) - Sub-Saharan Africa," data, The World Bank, August 4, 2020, https://data.worldbank.org/indicator/FB.CBK.BRCH.P5?locations=ZG.

60 Onkokame Motobi and Lukasz Grzybowski, "Infrastructure Deficiencies and Adoption of Mobile Money in Sub-Saharan Africa," Information Economics and Policy 40 (2017), https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2017&paper_id=105

61 Partech Africa Team, Press Release for "2019 Africa Tech Venture Capital Report" (Partech Partners, Paris, January 2020). https://partechpartners.com/news/2019-partech-africa-report-here-and-its-best-yet-us-2-02-b-raised/

62 Paystack graduated from Google's accelerator program in 2018.

63 Safaricom PLC, "HY20 Results Presentation," November 1, 2019, https://www.safaricom.co.ke/images/Downloads/Resources_Downloads/HY2020/H1_HY20_Resuts_Presentation.pdf.

64 Isaac Mbiti and David N. Weil, "Mobile Banking: The Impact of M-Pesa in Kenya" (NBER Working Paper 17129, National Bureau of Economic Research, Cambridge, MA, June 2011), https://www.nber.org/papers/w17129.pdf.

65 Tavneet Suri and William Jack, "The Long-Run Poverty and Gender Impacts of Mobile Money," Science 354, no. 6317 (2016), https://science.sciencemag.org/content/354/6317/1288.

66 Jake Bright, "Africa Roundup: Visa Connects to M-Pesa, Flutterwave Enters e-Commerce." TechCrunch, May 4, 2020, https://techcrunch.com/2020/05/04/africa-roundup-visa-connects-to-m-pesa-flutterwave-enters-e-commerce/.

67 Flutterwave graduated from Google's accelerator program in 2018.

68 International Finance Corporation (IFC), Digital Access: The Future of Financial Inclusion in Africa (Washington, DC: World Bank Group, 2018), https://www.ifc.org/wps/wcm/connect/96a4f610-62b1-4830-8516-f11642cfeafd/201805_Digital-Access_The-Future-of-Financial-Inclusion-in-Africa_v1.pdf?MOD=AJPERES&CVID=mdz-QF0.

69 Interswitch Group, "Interswitch and Visa enter into strategic partnership," press release, November 12, 2019. https://www.interswitchgroup.com/articles/visa-interswitch-partnership.html.

70 Andrew Fassnidge, "Big Investment In African Tech Set to Continue in 2020," Ventures Africa, January 6, 2020, http://venturesafrica.com/big-investment-in-african-tech-set-to-continue-in-2020/.

71 Nabila Ahmed, "WorldRemit to Acquire Sendwave in $500 Million Payments Deal," Bloomberg, August 25, 2020, https://www.bloomberg.com/news/articles/2020-08-25/worldremit-agrees-to-buy-sendwave-in-500-million-payments-deal

72 Yomi Kazeem, "An Africa-focused payments provider has been acquired for $288 million," Quartz, July 29, 2020, https://qz.com/africa/1886203/african-fintech-dpo-group-bought-by-dubais-network-international/

73 Jumia Technologies, https://investor.jumia.com

74 Tunde Kehinde and Ercin Eksin, "How Fintech Can Help SMEs Recover from the Impact of COVID-19," World Economic Forum, May 12, 2020, https://www.weforum.org/agenda/2020/05/fintech-can-help-smes-recover-covid-19/.

75 Partech Africa Team. "2019 Africa Tech Venture Capital Report."

76 Tom Jackson, "Kenyan e-Commerce Startup Copia Nets 26M Series B Funding," Disrupt Africa, November 28, 2019, https://disrupt-africa.com/2019/11/kenyan-e-commerce-startup-copia-nets-26m-series-b-funding/.

77 Jake Bright, "Africa Roundup: Jumia's IPO, DHL Launches Africa e-Shop, Cathay's 168m VC Fund, ConnectMed Acquired," Tech Crunch, May 2, 2019, https://techcrunch.com/2019/05/02/africa-roundup-jumias-ipo-dhl-launches-africa-e-shop-cathays-168m-vc-fund-connectmed-acquired/.

78 Mwangi Githahu and Marvin Charles, "SA Sees Surge in Online Shopping during Covid-19 Lockdown," IOL, Apr 30, 2020, https://www.iol.co.za/capeargus/news/sa-sees-surge-in-online-shopping-during-covid-19-lockdown-47388977.

79 Fitch Solutions, "Covid-19 Impact Will Boost e-Commerce Demand and Development in Africa," May 12, 2020, https://www.fitchsolutions.com/corporates/retail-consumer/covid-19-impact-will-boost-e-commerce-demand-and-development-africa-12-05-2020; Damian Shore, "Six Ways in which Covid-19 Will Impact Consumer Behaviour in Africa." Sagaci Research, March 31, 2020, https://www.sagaciresearch.com/six-ways-in-which-covid-19-will-impact-consumer-behaviour-in-africa/.

80 Partech Africa Team. "2019 Africa Tech Venture Capital Report" (Partech Partners, Paris, January 2020).

81 FitchSolutions. "Sub-Saharan Africa's Pharmaceuticals & Healthcare Report (Q1 2019)," September 24, 2019.

82 Helium Health graduated from Google's accelerator program in 2018.

83 54gene graduated from Google's accelerator program in 2019.

84 XinhuaNet. "Telemedicine Takes Root in Kenya amid COVID-19 Infection Fears." (May 12, 2020). http://www.xinhuanet.com/english/2020-05/12/c_139050942.htm

85 Altron HealthTech, "Telemedicine in SA – an Untapped Resource?" IT Web, May 14, 2020. https://www.itweb.co.za/content/KA3WwqdDoogqrydZ

86 James De Villier, "Medical Schemes Are Now Paying Full Rates for Your Online Therapy Sessions," Business Insider SA, April 17, 2020. https://www.businessinsider.co.za/medical-schemes-are-now-paying-full-rates-for-your-online-therapy-sessions-2020-4

87 Aisha Salaudeen, "Lifebank Is Providing Coronavirus Drive-Through Mobile Test Centers in Nigeria," CNN, April 28, 2020. https://www.cnn.com/2020/04/28/africa/lifebank-nigeria-coronavirus-testing/index.html.

88 PWC, "Africa Entertainment & Media Outlook, 2019-2023." https://www.pwc.co.za/en/publications/entertainment-and-media-outlook.html

89 PWC, "Africa Entertainment."

90 PWC, "Africa Entertainment."

91 Project Loon is a network of stratospheric balloons designed to bring Internet connectivity to rural and remote communities worldwide. https://loon.com/

92 Darrell Etherington, "Alphabet's Loon Deploys Internet Connectivity Balloons to Kenya for First Commercial Service Launch," TechCrunch, April 21, 2020. https://techcrunch.com/2020/04/21/alphabets-loon-deploys-internet-connectivity-balloons-to-kenya-for-first-commercial-service-launch/.

93 Emma Rumney, "S. Africa's mobile operators granted Emergency Lockdown Spectrum to Meet data demand," Reuters, April 17, 2020.https://www.reuters.com/article/health-coronavirus-safrica-spectrum/safricas-mobile-operators-granted-emergency-lockdown-spectrum-to-meet-data-demand-idUSL8N2C527B

94 Netflix, "Netflix Celebrates Africa Month with Made in Africa Collection," press release, May 7, 2020. https://media.netflix.com/en/press-releases/netflix-celebrates-africa-month-with-made-in-africa-collection

95 Demand @ASME, "The African Commute: city transport trends.," May 3, 2018, https://medium.com/impact-engineered/the-african-commute-city-transport-trends-cf369e5106bd.

96 Demand @ASME, "The African Commute".

97 Disrupt Africa, "African Tech Startups Funding Report 2019." https://disrupt-africa.com/funding-report/.
98 Andrew Christian, "Why The Famished Business Of Food Delivery In Africa Is Ripe For A Feast," WeeTracker, January 6, 2020, https://weetracker.com/2020/01/06/food-delivery-africa/.
99 Christian, "Why the Famished."
100 Statista, "Online Food Delivery, " South Africa, https://www.statista.com/outlook/374/112/online-food-delivery/south-africa.
101 Nqobile Dludla and Mfuneko Toyana, "S.Africa's delivery firms switch to meds, groceries during pandemic," Reuters, April 28, 2020, https://www.reuters.com/article/health-coronavirus-safrica-ecommerce/rpt-s-africas-delivery-firms-switch-to-meds-groceries-during-pandemic-idUSL5N2CG7YW
102 Dludla and Toyana, "South Africa's delivery firms." April 28, 2020,
103 Twiga Foods graduated from Google's accelerator program in 2018.
104 Dario Giuliani and Lisa Hannah With, "Digitising Logistics in Africa: How Technology Companies Are Improving Africa's Supply Chain and Goods Delivery" (Briter Bridges, London, September 2019).
105 Twiga, "Our Story," Twiga Foods website, https://twiga.ke/twiga-story/.
106 Tope Alake and Anthony Osae-Brown, "IFC-Backed Uber of Trucks Reshapes Nigeria's Haulage Market," Bloomberg, September 1, 2019, https://www.bloomberg.com/news/articles/2019-09-01/ifc-backed-uber-of-trucks-reshapes-nigeria-s-haulage-market.
107 African Business Magazine, "Keeping Africa Moving: How One Logistics Company is Responding to COVID-19," African Business Magazine, April 7, 2020, https://africanbusinessmagazine.com/sectors/health-sectors/covid-19/keeping-africa-moving-how-one-logistics-company-is-responding-to-covid-19/.
108 African Business Magazine, "Keeping Africa Moving."
109 Leonardo Iacovone, Vijaya Ramachandran, and Martin Schmidt, "Stunted Growth: Why Don't African Firms Create More Jobs?" (Policy Research Working Paper 6727, World Bank, Washington, DC, 2013), http://documents.worldbank.org/curated/en/678211468191960165/pdf/WPS6727.pdf.
110 Leandro Medina and Friedrich Schneider, "Shadow Economies around the World: What Did We Learn over the Last 20 Years?" (IMF Working Paper 18/17, International Monetary Fund, Washington, DC, 2018), https://www.imf.org/~/media/Files/Publications/WP/2018/wp1817.ashx.
111 International Labour Organization, "SDI Indicator 8.3.1: Proportion of Informal Employment in Non-agricultural Employment, Harmonized Series (%) Annual," ILOSTAT Explorer, 2020. https://www.ilo.org/shinyapps/bulkexplorer13/?lang=en&segment=indicator&id=SDG_B831_SEX_RT_A.
112 Lieze Langford, Abi Gleek, and Katherine van Wyk, "Unlocking the Power of Informal Retailers: Mobile Solutions for Commercial and Social Impact in Emerging Markets," NextBillion, July 24, 2019, https://nextbillion.net/informal-retailers-mobile-solutions-emerging-markets/.
113 Mariama Deen-Swarray, Mpho Moyo, and Christoph Stork, "ICT Access and Usage among Informal Businesses in Africa," Info 15, no. 5 (2013), https://researchictafrica.net/publications/Other_publications/2013_Deen-Swarray_Moyo_Stork_-_ICT_access_and_usage_among_information_businesses_in_Africa.pdf.

114 Darma Mahadea and Luther-King Junior Zogli, "Constraints to Growth in Informal Sector Activities and Formalisation: A Case Study of Ghanaian Slums," Southern African Journal of Entrepreneurship and Small Business Management 10, no. 1 (2018), https://sajesbm.co.za/index.php/sajesbm/article/download/130/151.
115 Jean-Philippe Berrou and Kevin Mellet, "Téléphonie mobile et secteur informel à Dakar : la grande polarisation des usages professionnels," Conversation, September 10, 2018, https://theconversation.com/telephonie-mobile-et-secteur-informel-a-dakar-la-grande-polarisation-des-usages-professionnels-97978.
116 Deen-Swarray, Moyo, and Stork, "ICT Access and Usage."
117 GSMA, "The Mobile Economy: Sub-Saharan Africa Report 2019" (GSMA Intelligence report, GSMA, London, 2019), https://www.gsma.com/mobileeconomy/sub-saharan-africa/.
118 Partech, "How TradeDepot Is Transforming the African Retail Landscape," Medium, December 10, 2018, https://medium.com/@partechpartners/how-tradedepot-is-transforming-the-african-retail-landscape-b9d1d6a0be3a.
119 "About Us," MaxAB, accessed June 20, 2020, https://www.maxab.io/.
120 Jake Bright, "Goldman-Backed Ventures Jumia and Twiga Partner on Produce in Kenya," TechCrunch, April 28, 2020, https://techcrunch.com/2020/04/28/goldman-backed-ventures-jumia-and-twiga-partner-on-produce-in-kenya/.
121 Human Rights Watch, "Nigeria: Protect Most Vulnerable in COVID-19 Response," April 14, 2020. https://www.hrw.org/news/2020/04/14/nigeria-protect-most-vulnerable-covid-19-response#.
122 Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020.
123 Evans Data Corporation. 2019. "Worldwide Developer Population and Demographic Study" vol. 2, Santa Cruz, CA, 2019).
124 "How Many Software Developers Are in the US and the World?" Daxx (blog), February 9, 2020, https://www.daxx.com/blog/development-trends/number-software-developers-world.
125 Google/Accenture, "Africa Technology Ecosystem."
126 Google/Accenture, "Africa Technology Ecosystem."
127 Google/Accenture, "Africa Technology Ecosystem."
128 Google Developers, "Google Developers Training," accessed May 20, 2020, https://developers.google.com/training/programs/africa.
129 Google/Accenture, "Africa Technology Ecosystem."
130 Jieun Choi, Mark Dutz, and Zainab Usman, The Future of Work in Africa: Harnessing the Potential of Digital Technologies for All (Washington, DC: World Bank, 2019). https://openknowledge.worldbank.org/handle/10986/32124.
131 Collins Mwai,. "Empowering women critical to achieving Vision 2020 agenda," February 5, 2014 https://www.newtimes.co.rw/section/read/72876.
132 Botho Emerging Markets Group, "Competing in a Digital Age: The Development of IT Skills and Jobs in Kenya and Uganda" (Produced for Youth Impact Labs, Mercy Corps, Nairobi, 2019).
133 United Nations Conference on Trade and Development (UNCTAD), "Digital Economy Report: Value Creation and Capture: Implications for Developing Countries ," (United Nations, Geneva, Switzerland, 2019). https://unctad.org/en/PublicationsLibrary/der2019_en.pdf.
134 United Nations Conference on Trade and Development (UNCTAD), "Handbook on Services, 2019" (United Nations, New York, 2019). https://unctad.org/en/PublicationsLibrary/tdstat44_en.pdf.
135 International Trade Centre (ITC), "Unlocking Markets for Women to Trade" (ITC, Geneva, 2015); Jennifer Freedman, "Digital Economy Unlocks Doors for Women Entrepreneurs in Africa," International Trade Forum 2016, no. 2, The Digital Economy, 2016.
136 Google Developers, https://developers.google.com/

137 Google Developers, "GDG Chapters Worldwide," accessed May 7, 2020, https://developers.google.com/community/gdg/groups.
138 Google Developers, "Developer Student Clubs Worldwide," accessed May 7, 2020. https://developers.google.com/community/dsc/clubs.
139 GitHub, "The State of the Octoverse." GitHub, 2019, https://octoverse.github.com/.
140 GitHub, "The State of the Octoverse."
141 World Economic Forum, "The Future of Jobs and Skills in Africa: Preparing the Region for the Fourth Industrial Revolution," (executive briefing, World Economic Forum, Geneva, May 2017), http://www3.weforum.org/docs/WEF_EGW_FOJ_Africa.pdf.
142 African Union, "The Revised Migration Policy Framework for Africa and Plan of Action (2018–2027)," draft, March 27, 2018, https://au.int/sites/default/files/newsevents/workingdocuments/32718-wd-english_revised_au_migration_policy_framework_for_africa.pdf.
143 Yomi Kazeem, "The Number of Nigerian Immigrants to Canada Has Tripled in the Last Five Years," Quartz Africa, February 12, 2020, https://qz.com/africa/1801529/over-12000-nigerians-moved-to-canada-in-2019/.
144 Mo ibrahim Foundation, "Brain Drain: A Bane to Africa's Potential."
145 Remarks by Akinwumi A. Adesina, President of the African Development Bank, at the G7 Summit, May, 2017, Taormina, Italy. Press release, May 26-27, 2017. https://www.afdb.org/en/news-and-events/remarks-by-akinwumi-a-adesina-president-of-the-african-development-bank-at-the-g7-summit-may-26-27-2017-taormina-italy-17054
146 Mo Ibrahim Foundation, "Brain Drain."
147 Adam Bennot, "Private Equity in Africa: The Myth of the Weak Exit Environment," RisCura website, May 9. 2019, https://www.riscura.com/media-articles/private-equity-in-africa-the-myth-of-the-weak-exit-environment/.
148 Stephen Timm, ed., "African Tech Startups Can Tap Millions of Dollars from New Funds Launched in 2019," Ventureburn, December 19, 2019, https://ventureburn.com/2019/12/african-startups-new-funds-2019/.
149 * "There have been multiple comprehensive analyses of the African startup landscape. Our goal is not to try to replicate the reports that have been done but rather to highlight commonalities of the funding stories and call out key trends across the sources." Partech Africa, "2019 Africa."
150 Briter Bridges, "State of Funding in Africa, Quarterly Bulletin," map, Q1 2020, https://briterbridges.com/innovation-maps.
151 Jackson Okoth, "African Startups Raise $350 Million in Q1, 2020," Kenyan Wall Street, April 26, 2020, https://kenyanwallstreet.com/african-startups-raise-350-million-in-q1-2020/.
152 Tage Kene-Okafor, "So far in 2020, African startups have raised about $500m but see a big Q2 slump," Techpoint Africa, July 8, 2020, https://techpoint.africa/2020/07/08/african-startups-second-quarter-funding/
153 Tage Kene-Okafor, "So far in 2020"
154 Yomi Kazeem, "African Startups Funding Is Set to Drop by Nearly Half in 2020," Quartz Africa, May 4, 2020, https://qz.com/africa/1849312/coronavirus-african-startup-investment-to-slow-down-report/.
155 WeeTracker, "Decoding Venture Investments in Africa—2019 Annual Report" (WeeMedia, Nairobi, January 2020).
156 Partech Africa, "2019 Africa."
157 WeeTracker, "Decoding."

158 Tom Jackson, "African Startups Need Local Investors to Fill Early-Stage Funding Gap," Disrupt Africa, December 5 , 2019, https://disrupt-africa.com/2019/12/african-startups-need-local-investors-to-fill-early-stage-funding-gap/.
159 WeeTracker, "Decoding."
160 Accelerator Research survey, Google Form, Africa, November 2019. Note: n=186 African startups.
161 Partech Africa, "2019 Africa."
162 Jake Bright, "Dakar Network Angels Begins Startup Investments in Francophone Africa," TechCrunch, March 28, 2019. https://techcrunch.com/2019/03/28/dakar-network-angels-begins-startup-investments-in-francophone-africa.
163 Eunice Baguma Ball, Maya Adereth, and Stav Bar-Shany, "Catalysing Local Innovation Ecosystems in Kenya and Ghana: The Role of Development Finance" (Africa Technology Business Network, London, November 2018).
164 Stephen Timm, "Reserve Bank Changes to IP Exchange Have Had no Impact—Venture Capitalist," VentureBurn, March 27, 2018, https://ventureburn.com/2018/03/reserve-bank-blocking-ip-exchange/.
165 Daniel Mpala, "Should African Startups Looking to Go Global Consider Registering in the US?," VentureBurn, August 17, 2018, https://ventureburn.com/2018/08/african-startups-go-global-us-registration/.
166 Jake Bright, "Local Venture Capital Fund Formation Is on the Rise in Africa, Led by Nigeria," TechCrunch, October 23, 2018, https://techcrunch.com/2018/10/22/local-venture-capital-fund-formation-is-on-the-rise-in-africa-led-by-nigeria/. The study counted "viable" funds, defined as "formally established entities with 7–10 investments or more in African startups, from seed to series stage."
167 World Population Review, "Nigeria Population 2020 (Live)," https://worldpopulationreview.com/countries/nigeria-population/.
168 Voice of America, "Nigeria's Population Projected to Double by 2050," VOA News, April 12, 2019, https://www.voanews.com/africa/nigerias-population-projected-double-2050.
169 Kabous le Roux, "Lagos to Become the World's Largest City with a Population of 100 Million," 702, June 4, 2019, http://www.702.co.za/articles/350778/lagos-to-become-the-world-s-largest-city-with-a-population-of-100-million.
170 World Population Review, "Tokyo Population 2020 (Live)," https://worldpopulationreview.com/world-cities/tokyo-population/.
171 African Union, "Agenda 2063: The Africa We Want (Overview)" (African Union, Addis Ababa, September 2015), https://au.int/en/agenda2063/overview.
172 Manish Singh, "Indian Tech Startups Raised a Record $14.5B in 2019," TechCrunch, December 30, 2019, https ://techcrunch.com/2019/12/29/indian-tech-startups-funding,-amount-2019/.
173 WeeTracker, "Decoding."
174 iHub and CcHub are partners of Google for Startups, along with MEST (Ghana), JoziHub (South Africa), GreenHouse Lab / Venture Garden Group (Nigeria), Outbox Hub (Uganda), and Grindstone Accelerator / Knife Capital (South Africa) https://developers.google.com/community/accelerators/partners
175 AfriLabs, and Briter Bridges, "Building a Conducive Setting for Innovators to Thrive" (AfriLabs, Abuja, Niberia, and Briter Bridges, London, October 2019), https://www.afrilabs.com/wp-content/uploads/2019/11/AfriLabs-Innovation-Ecosystem-Report.pdf; GSMA, "A Few Things We Learned about Tech Hubs in Africa and Asia." GSMA Mobile for Development (blog), August 5, 2016, https://www.gsma.com/mobilefordevelopment/english/things-learned-tech-hubs-africa-asia/.

176 Toby Shapshak, "Africa's Booming Tech Hubs Are 'Backbone of Tech Ecosystem' Having Grown 40% This Year," Forbes (blog), July 11, 2019, https://www.forbes.com/sites/tobyshapshak/2019/07/11/africas-booming-tech-hubs-are-backbone-of-tech-ecosystem-having-grown-40-this-year/.
177 Jake Bright, "Nigeria's CcHub Acquires Kenya's iHub to Create Mega Africa Incubator," TechCrunch, September 26, 2019, https://techcrunch.com/2019/09/26/nigerias-cchub-acquires-kenyas-ihub-to-create-mega-africa-incubator/.
178 AfriLabs, and Briter Bridges, "Building;" GSMA, "A Few Things."
179 Maxime Bayen, "Africa: A Look at the 442 Active Tech Hubs of the Continent," GSMA Mobile for Development (blog), March 22, 2018, https://www.gsma.com/mobilefordevelopment/blog-2/africa-a-look-at-the-442-active-tech-hubs-of-the-continent/.
180 Aline Mayard, "6 Tips from Failed Accelerators." Wamda, August 4, 2014, https://www.wamda.com/2014/08/accelerators-closed-down-tips-from-seeqnce-meydan-tahrir2L.
181 A survey was conducted by Afrilabs, with 95 respondents consisting of hubs and entrepreneurs supported by hubs. The respondents were based in 27 African countries.
182 Kristina Davidson, interviewed by Mike den Hartog, Google, December 18, 2019.
183 African Business Roundtable, "Nigerian Startups Raise a Lot of Foreign Cash, but How Much Impact Do They Have on the Economy?" 2019, https://abrnetwork.org/nigerian-startups-raise-a-lot-of-foreign-cash-but-how-much-impact-do-they-have-on-the-economy/.
184 Adabara Abdullahi, interviewed by Mike den Hartog, Google, December 17, 2019.
185 Toby Hanington, interviewed by Mike den Hartog, Google, December 16, 2019.
186 Saurabh A. Lall, Li-Wei Chen, and Peter W. Roberts, "Are We Accelerating Equity Investment into Impact-Oriented Ventures?," World Development 131(July 2020), https://www.sciencedirect.com/science/article/abs/pii/S0305750X20300784; Peter W. Roberts et al., "Accelerating Startups In Emerging Markets: Insights from 43 Programs" (Global Accelerator Learning Initiative [GALI], Aspen Network of Development Entrepreneurs and Emory University, May 2017), https://www.galidata.org/assets/report/pdf/Accelerating%20Startups%20in%20Emerging%20Markets.pdf.
187 Abdullahi, interview.
188 Innovation maps, Briter Bridges, accessed February 12, 2020, https://briterbridges.com/maps.
189 Tom Jackson, "ABAN, AfriLabs Partner to Launch African Matching Fund Catalyst," Disrupt Africa, September 6, 2019, https://disrupt-africa.com/2019/09/aban-afrilabs-partner-to-launch-african-matching-fund-catalyst/.
190 "African Business Angels Network (ABAN) and AfriLabs Partner to Launch Catalyst, a New Investment Solution for African Startups," AfriLabs, September 6, 2019, https://www.afrilabs.com/african-business-angels-network-aban-and-afrilabs-partner-to-launch-catalyst-a-new-investment-solution-for-african-startups/.
191 Kristina Davidson, interviewed by Mike den Hartog, Google, December 18, 2019.
192 Davidson, interview.
193 MEST is a partner of Google for Startups.
194 "Home Page," MEST Africa Challenge, accessed May 20, 2020, https://www.mestafricasummit.com/.
195 Kazeem, "African Startups.'
196 Paps Senegal graduated from Google's accelerator program in 2019.
197 Bamba Lô, interviewed by Mike den Hartog, Google, May 12, 2020.

198 Flat6Labs, "Flat6Labs Exits 'Harmonica'—Leading Marriage Matchmaking App, following Acquisition by American Internet Giant Match Group," Medium, August.2019, https://insights.flat6labs.com/flat6labs-exits-harmonica-leading-marriage-matchmaking-app-following-majority-investment-by-7cde492ec23.

199 Jake Bright, "Kenya's Twiga Foods Eyes West Africa after $30M Raise Led by Goldman," TechCrunch, October 2019, https://techcrunch.com/2019/10/28/kenyas-twiga-foods-eyes-west-africa-after-30m-raise-led-by-goldman/?guccounter=1.

200 Alejandro Viquez, "Opera is leading the digital revolution in Africa with nearly 120 million users," Opera, August 27, 2019, https://blogs.opera.com/mobile/2019/08/opera-is-leading-the-digital-revolution-in-africa/.

201 Viquez, "Opera is leading."

202 Juliet Ehimuan-Chiazor, "Google in Africa," Google, July 24, 2019, https://www.blog.google/around-the-globe/google-africa/google-nigeria/.

203 Julia Szyndzielorz, "Opera News Becomes the Most Popular News App in the World," Operate Blogs, August 28, 2019, https://blogs.opera.com/mobile/2019/08/opera-news-most-popular-news-app-in-the-world/.

204 APO Group, "Facebook, together with Africa Check, expands its local language coverage as part of its Third-Party Fact-Checking Programme," APO Group, August 14, 2019, https://www.africa-newsroom.com/press/facebook-together-with-africa-check-expands-its-local-language-coverage-as-part-of-its-thirdparty-factchecking-programme?lang=en.

205 TeleGeography, "Global Internet Geography, Regional Analysis: Africa," subscription service, https://www.telegeography.com/products/global-internet-geography/analysis/regional-analysis/africa/index.html.

206 Broadband Commission Working Group on Broadband for All: A Digital Moonshot for Africa, Connecting Africa through Broadband: A Strategy for Doubling Connectivity by 2021 and Reaching Universal Access by 2030 (Geneva/Paris: Broadband Commission for Sustainable Development, October 2019), https://www.broadbandcommission.org/Documents/working-groups/DigitalMoonshotforAfrica_Report.pdf.

207 TeleGeography, "Global Internet Geography."

208 TeleGeography, "Global Internet Geography."

209 Michael D. Francois, Chris George, and Jayne Stowell, "Introducing Equiano, a Subsea Cable from Portugal to South Africa," Google Cloud blog, June 28, 2019. https://cloud.google.com/blog/products/infrastructure/introducing-equiano-a-subsea-cable-from-portugal-to-south-africa.

210 Yevgeniy Sverdlik, "Google's New Switching Tech Makes Its Latest Subsea Cable Cheaper, Simpler," Data Center Knowledge, July 17, 2019. https://www.datacenterknowledge.com/networks/google-s-new-switching-tech-makes-its-latest-subsea-cable-cheaper-simpler

211 Frederic Lardinois, "Google Is Building New Private Subsea Cable between Portugal and South Africa," TechCrunch, June 28, 2019. https://techcrunch.com/2019/06/28/google-is-building-a-new-private-subsea-cable-between-portugal-and-south-africa/

212 "Introducing Equiano, a subsea cable from Portugal to South Africa," Infrastructure, Google Cloud, accessed June 29, 2020, https://cloud.google.com/blog/products/infrastructure/introducing-equiano-a-subsea-cable-from-portugal-to-south-africa.

213 Emmanuel Paul, "Facebook to Build $1 Billion Undersea Internet Cable for Faster Internet in Africa," Techpoint Africa, May 15, 2020, https://techpoint.africa/2020/05/15/facebook-internet-cable-africa/.

214 Africa Bandwidth Maps, Hamilton Research, Bath, UK, http://www.africabandwidthmaps.com/?p=6158.

215 Africa Bandwidth Maps.
216 TeleGeography, Global Comms Database, "Country Broadband Statistics," 2019, subscription service. https://www.telegeography.com/products/globalcomms/search-export/search_country_broadband/index.
217 GSMA Intelligence, "Number of Unique Mobile Broadband Subscribers in Percentage of Population" in Africa, including Northern Africa, by the end of 2019.
218 TeleGeography. Fixed broadband penetration measured as the number of subscribers, in percentage of number of households in 2019.
219 GSMA Intelligence, 2020. Online database.
220 "The African Data Center Boom," Report Summary, Xalam Analytics, accessed June 29, 2020, https://xalamanalytics.com/research/investor-reports/the-african-data-center-boom-2018/.
221 The African IXP Association, "List of Active Internet Exchange Points in Africa," accessed May 20, 2020. https://www.af-ix.net/ixps-list
222 The African Peering & Interconnection Forum, "AFPIF-10 Summary Day 1," 2019. https://www.afpif.org/afpif-10/summary-day-1/.
223 The African Peering & Interconnection Forum, "AFPIF-10 Summary Day 2," 2019 .https://www.afpif.org/afpif-10/summary-day-2/,
224 Michael Kende and Bastiaan Quast, "A Case Study in Local Content Hosting: Speed, Visits, and Cost of Access," Internet Society, Reston, VA, April 11, 2017. https://www.internets.ociety.org/resources/doc/2017/a-case-study-in-local-content-hosting-speed-visits-and-cost-of-access/.
225 Kende and Quast, "Case Study."
226 David Abecassis, Richard Morgan, and Shahan Osman, "Infrastructure Investment by Online Service Providers," Analysys Mason, London, December 2018. https://www.analysysmason.com/Consulting/content/reports/Online-service-providers-Internet-infrastructure-Dec2018.
227 Abecassis, Morgan, and Osman, "Infrastructure."
228 TeleGeography, "Global Internet Geography."
229 International Telecommunication Union (ITU), ICT Regulatory Tracker.
230 African Union. "The digital transformation strategy for Africa (2020-2030)." https://au.int/sites/default/files/documents/38507-doc-dts-english.pdf
231 Broadband Commission Working Group on Broadband for All: A Digital Moonshot for Africa, Connecting Africa through Broadband: A Strategy for Doubling Connectivity by 2021 and Reaching Universal Access by 2030 (Geneva/Paris: Broadband Commission for Sustainable Development, October 2019), https://www.broadbandcommission.org/Documents/working-groups/DigitalMoonshotforAfrica_Report.pdf.
232 Lending operations include ongoing and pipeline projects for FY19-21. For additional information, see World Bank, "The Digital Economy for Africa Initiative," n.d., https://www.worldbank.org/en/programs/all-africa-digital-transformation/measuring-success. (Information as of April 30, 2020).
233 Siegfried Zottel, Marc Jean Yves Lixi, Maria Isabel A. S. Neto, "Nigeria Digital Economy Diagnostic Report (English)," World Bank Group, December 1, 2019, http://documents.worldbank.org/curated/en/387871574812599817/Nigeria-Digital-Economy-Diagnostic-Report
234 Toni Kristian Eliasz, Alexandra Nelle Fraser, and Justine White, "South Africa Digital Economy Assessment: Digital Entrepreneurship Pillar" (World Bank, Washington, DC, 2018), http://documents.worldbank.org/curated/en/699031586325347439/South-Africa-Digital-Economy-Assessment-Digital-Entrepreneurship-Pillar
235 Jerome Bezzina and others, Country Diagnostic of Senegal (Washington, DC: World Bank Group, 2019), http://documents.worldbank.org/curated/en/814111559645179494/Country-Diagnostic-of-Senegal.

236 TeleGeography, "Global Bandwidth Forecast Service, Summary Tables, Regional Totals, Geography, Regional," subscription service, https://www.telegeography.com/products/global-bandwidth-forecast-service/summary-tables/regional-totals/index.html.
237 Christine Fisher, "Kenyan Government Finally Approves Loon's Internet-Delivery Balloons," Engadget, March 23, 2020, https://www.engadget.com/2020-03-23-alphabet-loon-balloons-approved-kenya.html.
238 Mark Williams, "Google Loon balloon-internet for Mozambique," The New Publishing Standard, June 14, 2020. https://thenewpublishingstandard.com/2020/06/14/google-loon-balloon-internet-for-mozambique/.
239 "Ookla 5G Map," Speedtest, accessed June 20, 2020, https://www.speedtest.net/ookla-5g-map.
240 Victor Immanuel Oloo, "List of African Countries Testing 5G Technology," Ignited, May 16, 2020. https://www.dignited.com/56084/countries-testing-5g-in-africa/.
241 Quentin Velluet, "L'explosion du trafique," Jeune Afrique, May 14, 2020. https://www.jeuneafrique.com/945166/economie/internet-comment-les-telcos-africains-ripostent-a-l'explosion-du-trafic/.
242 Ookla, "Tracking COVID-19's Impact on Global Internet Performance," March 13, 2020. https://www.speedtest.net/insights/blog/tracking-covid-19-impact-global-internet-performance/#/.
243 International Energy Agency (IEA), "Africa Energy Outlook 2019," country report, November 2019,. https://www.iea.org/reports/africa-energy-outlook-2019.
244 Moussa P. Blimpo and Malcolm Cosgrove-Davies, Electricity Access in Sub-Saharan Africa Uptake, Reliability, and Complementary Factors for Economic Impact (Africa Development Forum series, Washington, DC: World Bank, 2019), https://openknowledge.worldbank.org/bitstream/handle/10986/31333/9781464813610.pdf?sequence=6&isAllowed=y.
245 GSMA Intelligence, "Connected Society: The State of Mobile Internet Connectivity" (GSMA, London, 2019), https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/GSMA-State-of-Mobile-Internet-Connectivity-Report-2019.pdf.
246 World Bank, "Sector focus #5: Energy," World Development Report 2016: Digital Dividends (Washington, DC: World Bank, 2016), http://documents.worldbank.org/curated/en/896971468194972881/310436360_201602630200212/additional/102725-PUB-Replacement-PUBLIC.pdf.
247 "Read our latest ESCO research," ESCO Roundtable, TowerXchange, accessed June 29, 2020, https://www.towerxchange.com/meetup/esco-roundtable/esco-research/.
248 IFC Research
249 M-KOPA Solar, "Impact Report 2019: Upgrading Lives," (M-KOPA, Nairobi, 2019), http://www.m-kopa.com/wp-content/uploads/2019/09/M-KOPA-IMPACT-REPORT-2019.pdf.
250 GOGLA, "Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data," (Public report, GOGLA, Utrecht, the Netherlands, July–December 2019), https://www.gogla.org/sites/default/files/resource_docs/global_off_grid_solar_market_report_h22019.pdf.
251 International Energy Agency (IEA), "Africa Energy Outlook 2019," country report, November 2019, .https://www.iea.org/reports/africa-energy-outlook-2019.
252 Adaptation of the current methodology of the World Bank's Digital Business Indicators initiative. For more information about the initiative, see "Digital Business Indicators," June 25, 2019, https://www.worldbank.org/en/research/brief/digital-business-indicators.
253 Particularly relevant in Africa given the limited coverage of fixed networks. This includes transparency on frequency assignments, methods for assigning spectrum, spectrum pricing and possibility of trading spectrum.
254 Policy areas of particular relevance to Africa encompass access to backbone infrastructure (including deployed by the state), infrastructure sharing, deregulation of international gateways, and effective implementation of rules on significant market power.

255 The Harvard Business Review created an Ease of Doing Digital Business scorecard that ranked 42 countries, including one African country (South Africa). For more information, see Bhaskar Chakravorti and Ravi Shankar Chaturvedi, "Ranking 42 Countries by Ease of Doing Digital Business," Harvard Business Review (blog), September 5, 2019, https://hbr.org/2019/09/ranking-42-countries-by-ease-of-doing-digital-business.

256 Note that not all the reports have been disclosed at the time of publication. Nigeria and Senegal diagnostics are available at the World Bank website. Reports include Lixi , Nigeria Digital Economy Diagnostic Report and Jerome Bezzina and others, Country Diagnostic of Senegal (Washington, DC: World Bank, 2019), http://documents.worldbank.org/curated/en/814111559645179494/Country-Diagnostic-of-Senegal. In addition, the digital entrepreneurship assessment has been made available for South Africa: South Africa Digital Economy Assessment (Washington, DC: World Bank, 2019), https://openknowledge.worldbank.org/handle/10986/33632. Highlights of the key findings and recommendations of the digital economy assessments are provided in special focus sections of the World Bank's Economic Update for Rwanda (World Bank, June 2019), http://documents1.worldbank.org/curated/en/593831561388957701/pdf/Rwanda-Economic-Update-Lighting-Rwanda'.pdf; Kenya Economic Update (World Bank, April 2020), http://documents1.worldbank.org/curated/en/683141588084127834/pdf/Kenya-Economic-Update-Turbulent-Times-for-Growth-in-Kenya-Policy-Options-during-the-COVID-19-Pandemic.pdf; Securing Future Growth: Policies to Support Kenya's Digital Transformation , (Washington, DC: World Bank, October 2019), https://documents.worldbank.org/en/publication/documents-reports/documentdetail/968481572468094731/kenya-economic-update-securing-future-growth-policies-to-support-kenya-s-digital-transformation; and Aghassi Mkrtchyan and others, Accelerating Digital Transformation in Rwanda, (Washington, DC: World Bank, January 2020), http://documents.worldbank.org/curated/en/912581580156139783/Rwanda-Economic-Update-Accelerating-Digital-Transformation-in-Rwanda.

257 Lixi, Nigeria Digital Economy Diagnostic Report

258 Abubakar Idris, "The Multifaceted Implications of a Ban on Okada and Tricycles in Lagos," TechCabal, February 14, 2020, https://techcabal.com/2020/02/14/lagos-ban-okada-tricycles-not-solving-problems/.

259 Idris, "Multifaceted Implications."

260 Daniel Obi, "Lagos Commuters Lose 75% of Weekly Working Hours to Traffic," Business Day, December 11, 2018, https://businessday.ng/uncategorized/article/lagos-commuters-lose-75-of-weekly-working-hours-to-traffic/.

261 Obi, "Lagos Commuters."

262 Obi, "Lagos Commuters."

263 "About Us," Motorcycle Transport and Delivery Services Company, accessed May 6, 2020, https://max.ng/about.

264 Emmanuel Paul, "Lagos Okada Ban: A Policy Expert Walks Us through Some Burning Questions," Techpoint Africa, February 4, 2020, https://techpoint.africa/2020/02/04/okada-ban-burning-questions/.

265 Caroline Freund and Alfonso Garcia Mora, "Keeping the Lights On: Supporting Firms and Preserving Jobs from Crisis through Recovery," Private Sector Development Blog .World Bank, April 30, 2020, https://blogs.worldbank.org/psd/keeping-lights-supporting-firms-and-preserving-jobs-crisis-through-recovery.

266 Abdi Latif Dahir and Yomi Kazeem, "Tunisia's 'Startup Act' Could Show Other African Governments How to Support Tech Ecosystems," Quartz Africa, April 16, 2018, https://qz.com/africa/1252113/tunisia-startup-act-to-boost-african-tech-ecosystem-and-innovation/.

267 Tom Jackson, "Senegal Becomes 2nd African Nation to Pass Startup Act," Disrupt Africa, December 30, 2019, https://disrupt-africa.com/2019/12/senegal-becomes-2nd-african-nation-to-pass-startup-act/.

268 Arti Grover Goswami, Denis Medvedev, and Ellen Olafsen, "High-Growth Firms: Facts, Fiction, and Policy Options for Emerging Economies," Washington, DC : World Bank Group, November 16, 2018, https://www.worldbank.org/en/news/feature/2018/11/16/high-growth-firms-facts-fiction-and-policy-options-for-emerging-economies.

269 Casey Torgusson and others, A Single Digital Market for East Africa: Presenting Vision, Strategic Framework, Implementation Roadmap, and Impact Assessment (Washington, DC: World Bank, March 8, 2019), http://documents.worldbank.org/curated/en/809911557382027900/A-Single-Digital-Market-for-East-Africa-Presenting-Vision-Strategic-Framework-Implementation-Roadmap-and-Impact-Assessment.

270 Craig Atkinson, "Algorithms Could Give the World Its First 'Born Digital' Free Trade Agreement in Africa," World Economic Forum, July 24, 2019, https://www.weforum.org/agenda/2019/07/algorithms-could-give-the-world-its-first-born-digital-free-trade-agreement-in-africa-16a8d3d463.

271 Alexandre Laure and Jon Stever, "Policy Hackathon Explained: How an All-Society Approach Can Engage Entrepreneurs and Governments to Develop Better Policy in West Africa," Private Sector Development Blog (World Bank), January 30, 2019, https://blogs.worldbank.org/psd/policy-hackathon-explained-how-all-society-approach-can-engage-entrepreneurs-and-governments-develop.

272 Laure and Stever, "Policy Hackathon."

273 These indicators are currently being refined. As part of the World Development Report 2021, the module on data regulation has been expanded and applied to more than 80 countries worldwide including 20 countries in Africa.