Standard Bank
Also trading as Stanbic Bank

27 November 2020

Insight & Strategy

Africa | Africa Macro

Ten years on –reviewing the trends driving Africa's allure

Trend 3: Leapfrogging through technology

- **In this report we continue our review of the five structural trends that we outlined, almost a decade ago, to be behind Africa's underlying economic and institutional appeal.** Thus far we have reviewed Africa's demographic and income developments (see here), as well as the opportunities and risks that emerge as a result of the continent's rapid urbanisation (see here). We now look to the **ICT sector**, considering how technological advancements in Africa continue to drive economic activity; attract investment; enable income and efficiency gains; and, in so doing, allow the potential for institutional and developmental leapfrogging in key economies on the continent.

- **In surveying a decade of change in this area, progress continues to be driven by the increasing uptake of mobile telephony across the continent.** Today there are over 840m mobile subscribers in Africa, up from 400m in 2010. As a result, Africa's mobile penetration rate has doubled, from 44% in 2010 to over 80% today. And there is still profound room for growth: for Africa to reach the global average mobile subscription rate of 108%, an additional 400-500m subscriptions would need to be added across the continent. To this point, in the next five years over 140m new mobile subscriptions will likely be added in Africa, accounting for one-quarter of global mobile subscriber growth.

- **The growth in mobile phone usage has also inspired telecommunications providers to substantially improve coverage across the continent.** Today, around 90% of Africa's population is covered by a mobile cellular network, and 80% is covered by at least a 3G mobile network, up from 50% five years ago.

- **Mobile telephony continues to play a powerful role in elevating levels of internet usage across the continent.** Today, fixed broadband connectivity in Africa remains extraordinarily low, at just 0.4 subscriptions per 100 inhabitants, compared to 34 active mobile broadband subscriptions per 100 inhabitants. Nominally, 340m mobile broadband subscriptions have been added on the continent since 2010, compared to an increase of fixed broadband subscriptions of just 4m. Looking ahead, it is estimated that, while around 38% of mobile users in Africa made use of mobile broadband services in 2018, by 2025 this will have increased to 87%.

- **Rising internet connectivity is also being driven by dramatic improvements to Africa's fibre optic network.** Africa's terrestrial network capacity (which is measured by the kilometres of fibre deployed) has expanded at an annual rate of 12.5% over the past decade; and where in 2010 around 260m people in SSA lived within 25km of a functioning fibre-optic network node, by 2019 this had increased to 584m. Ongoing upgrades to these cables, as well as the laying of new ones (such as 2Africa and Google's Equiano), will meaningfully lower costs and improve broadband availability.

- **As a result, Africa's overall internet usage levels are steadily rising.** In 2019 there were 300m active internet users in Africa, up from 100m a decade ago. During this same period, Africa's share of global internet users has almost doubled, to just over 7%. Meanwhile, the share of African households with a computer has also doubled and the share of households with internet access at home has more than tripled since 2010.

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- **Importantly, these developments are supporting Africa's broader tech ecosystem**. By some estimates, over USD2bn was raised in venture capital (VC) equity funding for African tech start-ups in 2019, up by 74% from total funding of USD1.16bn in 2018. Meanwhile, last year there was believed to be 618 active tech hubs in Africa, up notably from 442 in 2018 and 314 in 2016.

- **Of course, key challenges remain**. Despite recent growth, still only around 30% of Africa's population makes regular use of the internet, while Africa accounts for just 2% of total global bandwidth usage. This refers both to problems associated with availability (Africa's ICT infrastructure gap is expected to grow to around USD76bn by 2025); and affordability (internet costs in Africa are still, by some margin, the highest in the world). To this latter point, average data usage per mobile subscriber per month in Africa in 2019 stood at 0.8GB, compared to 8.3GB in Asia Pacific and 9.8GB in China. Other challenges relate to languid regulatory change to support the ICT sector in Africa, as well as issues around government control (specifically internet shutdowns, of which there were 25 in 2019 across the continent).

- **And critical divergences remain, too**. For instance, around 69% of households in Mauritius and 50% of households in Tunisia have direct access to a computer, compared to just 6% of households in Tanzania, Malawi and Niger. Data costs remain prohibitively high across many of the continent's most institutionally vulnerable economies, too.

- **Yet these challenges are insufficient to dilute the enormous potential inherent in the continent's technological embrace**. Already around 9% of SSA's total GDP in 2018 came from mobile technologies and services (with a nominal contribution of USD144bn), while almost 3.5m people were employed in the mobile sector during the year. The contribution of the sector in driving wider growth is well-proven: for instance, a 10% increase in mobile internet penetration increases GDP per capita by 2.5% in Africa, compared with 2% globally. And a 10% increase in digitization increases GDP per capita by 1.9% in Africa, compared with 1% in non-OECD countries. Other social advantages of such progress include rising agricultural productivity; healthcare access and affordability; deeper financial inclusion; and the broadening of public political participation.

- **Looking ahead, the growth of Africa's internet economy (or iGDP) is expected to remain a core driver of the continent's progress in the decades ahead**. Africa's iGDP currently stands at around USD100bn and could reach USD180bn by 2025, and USD700bn by 2050. A relatively small cluster of economies will be at the forefront in driving (and benefiting from) this anticipated growth. Indeed, six economies (Nigeria, SA, Egypt, Algeria, Morocco, and Kenya) account for 75% of Africa's total iGDP, a dominance that is expected to continue, not only in the next five years but the next thirty. Yet, growth is also pronounced in mid-sized iGDP markets, such as Côte d'Ivoire; Senegal and Rwanda (all of which will see notable iGDP growth in the decades ahead).

- **In sum**: Africa's technological deepening since 2010 continues to be profound, offering opportunities for the continent to leapfrog traditional developmental stages and circumvent abundant logistical and regulatory obstacles to wider reform. Further, the importance, resilience, and exponential growth potential of this area continues to be emphasised by the COVID-19 crisis, which has hastened global technological advance. To this point, according to a recent IFC and Google report, Africa's internet economy has shown itself to be "broadly resilient" during the COVID-19 crisis, a trend that is expected to continue given the importance of digital connectivity in supporting business continuity and servicing the continent's growing consumer base in the years ahead. All considered, the developments that are outlined in this report will, in our view, increasingly come to encapsulate the continent's future economic and institutional allure.

(1) Introduction: leapfrogging through technology

In this report we continue to update our review of the five structural trends that we initially outlined, almost a decade ago, to be behind Africa's underlying and lasting economic and institutional appeal

In this report we continue our review of the five structural trends that we initially outlined, almost a decade ago, to be behind Africa's underlying and lasting economic and institutional appeal. Thus far we have reviewed Africa's demographic and income developments (see here), as well as the opportunities and risks that emerge as a result of the continent's rapid urban growth rates (see here). We now look to the ICT sector, considering how technological advancements in Africa continue to drive economic activity; attract investment; enable income and efficiency gains; and, in so doing, allow the potential for institutional and developmental leapfrogging in key economies on the continent.

We structure this report in three parts.

- First, we review major technological trends in Africa over the past decade, focusing our discussion on increases in mobile penetration and internet usage over the past decade. Leading from this, we provide some insight into Africa's burgeoning tech industry.
- Second, we outline the primary challenges still facing deeper technological progress across Africa, as well as the critical divergences across the continent in terms of internet usage; households computer access; and the affordability of mobile data.
- Third, we emphasise the potent economic and institutional advantages of broader technological progress and point to the countries in Africa that are arguably best placed to benefit from them in the years ahead.

Our updated analysis underlines the extraordinary potential that technological deepening, and thus developmental leapfrogging, offers for the continent

Our updated analysis underlines the extraordinary potential that technological deepening, and thus developmental leapfrogging, offers for the continent. Indeed, of the updated trend reports that we have published thus far, it is in this area that the advantages powerfully and comprehensively outweigh the potential risks. In fact, the kinds of technological advancements that we outline in this report – some of which are already beginning to radically reshape the economic terrain in select African economies – can, if harnessed, critically counteract some of the most prominent risks that emerge from the continent's rapidly growing (and profoundly youthful) population, as well as the unbridled and in many cases poorly managed mushrooming of the continent's urban centres.

(2) Reviewing a decade of technological change in Africa

Ongoing progress in deepening mobile access as well as internet penetration are feeding a dramatic elevation in the continent's broader ICT sector

In surveying a decade of change in this area in Africa, it is immediately clear that ongoing progress in deepening mobile access as well as internet penetration are feeding a dramatic elevation in the continent's broader ICT sector. In this regard, we focus in this section not only on the growth in mobile and internet access throughout Africa since our initial series, but also in the rise in Africa's tech industry, and the commensurate global investor interest that this is generating. What is clear in all three of these interrelated areas is the almost limitless scale of growth potential that exists, and that will in many ways come to encapsulate the continent's future economic and institutional allure, rather, as has been the case for much of the continent's modern history, its natural resource and hard commodity abundance.

(i) First, mobile…

As was clear a decade ago, rising mobile penetration remains at the forefront of Africa's technological leapfrogging process. Indeed, growth in mobile usage has remained as robust over the past decade as it was in 2000-2010 period. Indicatively:

Today, there are around 840m mobile subscriptions in Africa, up from around 440m in 2011

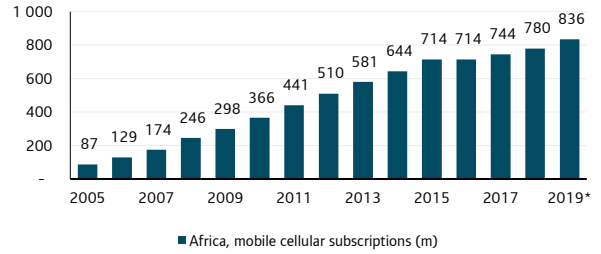
- **Over the past decade an additional 400m mobile subscribers have been added in Africa.** This suggests that total mobile subscriptions have doubled,

from 440m when we wrote our original series, to 840m in 2019. Recall that, in 2000, there were only 15m mobile subscribers in Africa (Figure 1).

For Africa to reach the global average subscription rate, an additional 400-500m subscriptions would still need to be added across the continent

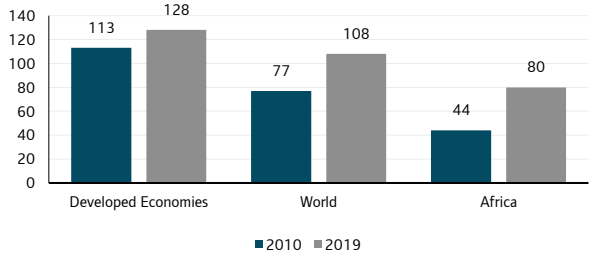
- **Africa's mobile penetration rate has risen to around 80% as a result of this growth, up from 44% a decade ago**. These figures suggest that there is substantial room for further mobile subscription growth in Africa given that the average global subscription rate stands at 108% and the developed world average at 128% (Figure 2). Using these numbers, for Africa to reach the global average subscription rate, an additional 400-500m subscriptions would still need to be added across the continent. The GSM Association (GSMA) estimates that between 2019 and 2025 there will be an additional 610m new mobile subscribers globally, and that 142m (or 23%) of these will be in SSA.
- **The leapfrogging potential of mobile telephony is also emphasised by the fact that fixed line penetration has declined on a per capita basis over the past decade**. In 2010 there were 1.5 fixed line subscriptions per 100 inhabitants in Africa; today there are 0.8 per 100 inhabitants.

Figure 1: 400m new mobile subscribers in a decade



Sources: International Telecommunication Union (ITU); Standard Bank Research

Figure 2: Mobile subscriptions per 100 inhabitants



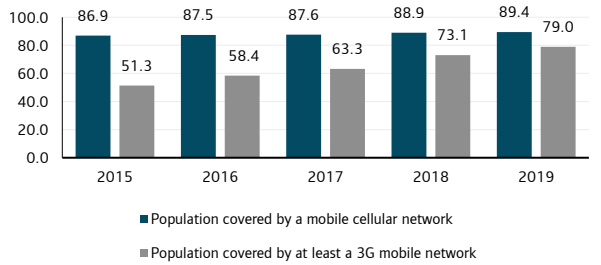
Sources: ITU; Standard Bank Research

The growth in mobile phone usage has also inspired predominantly private telecommunications providers to substantially improve cellular and mobile data coverage across the continent. To this point, around 90% of Africa's population is currently covered by a mobile cellular network, and 80% is covered by at least a 3G mobile network, up from 50% five years ago (Figure 3).

There has been an increase in total mobile broadband subscriptions since 2010 of 340m, compared to an increase of fixed broadband subscriptions of just 4m

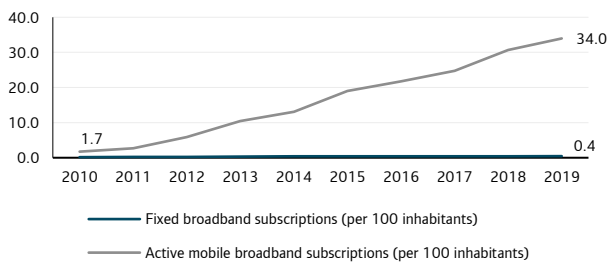
This emphasises the powerful role that mobile telephony is playing in improving internet access across the continent. Indeed, much as mobile operators allowed users to leapfrog traditional fixed line services, a similar process is playing out in terms of the availability and uptake of mobile versus fixed broadband. Fixed broadband connectivity in Africa remains extraordinarily low, at just 0.4 subscriptions per 100 inhabitants, compared to 34 active mobile broadband subscriptions per 100 inhabitants on the continent (Figure 4). Nominally, there has been an increase in total mobile broadband subscriptions since 2010 of 340m, compared to an increase of fixed broadband subscriptions of just 4m.

Figure 3: A profound rise in 3G mobile coverage



Sources: ITU; Standard Bank Research

Figure 4: Mobile vs fixed line broadband – no contest



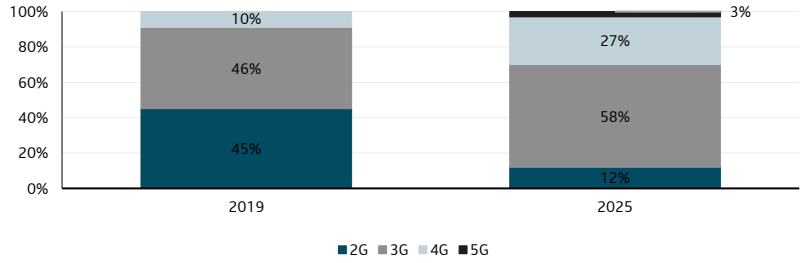
Sources: ITU; Standard Bank Research

Looking ahead, Radcliffe (2018) estimates that, while around 38% of mobile users in Africa made use of mobile broadband services in 2018, by 2025 this will have increased to 87%. This implies an almost exponential rise in mobile broadband usage in the next five years, which will remain the driving force of internet usage more generally on the continent.

Where in 2019 almost half of all mobile internet users were accessing the internet through a 2G connection, this ratio will decline to 12% by 2025, with almost 60% using 3G, and 27% 4G

And, importantly, these new (and existing) mobile internet users will be able to benefit from rapidly improving cellular infrastructure in the years ahead, too. Here the GSMA estimates that, where in 2019 almost half of all mobile internet users were accessing the internet through a 2G connection, this ratio will decline to 12% by 2025, with almost 60% using 3G, and 27% 4G. SSA's 5G market is expected to remain small: by 2025, the GSMA estimates that there will be just over 30m 5G users in Africa, equating to around 3% of total mobile internet access (Figure 5).

Figure 5: Technology mix in SSA*



*Share of mobile connections, excluding licensed cellular IoT. Sources: GSMA; Standard Bank Research

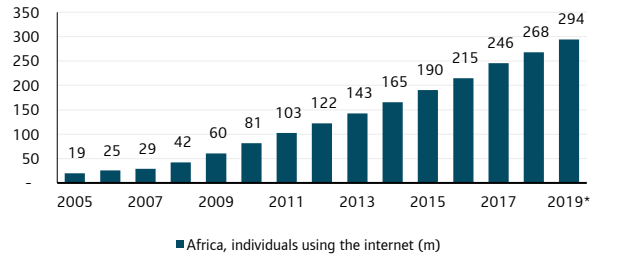
(ii) Internet access…

As we noted in our original series, a decade ago fewer than 100m Africans (less than 10% of the population) were regularly using the internet. This means that just 4% of total global internet users were African. This rate clearly reflected a rift in connectivity between the continent and the rest of the world and presented profound challenges for Africa to participate in – and benefit from – seismic global economic, social and institutional changes that are being driven by technological enhancements. Fortunately, and due in no small part to the increased mobile uptake outlined above, there have been important advances in internet connectivity in Africa over the past decade.

In 2019 there were almost 300m active internet users in Africa, reflecting a 260% increase since 2010

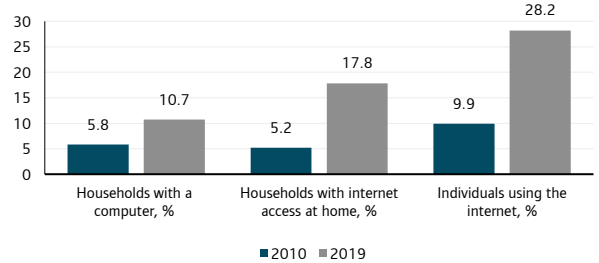
- In 2019 there were almost 300m active internet users in Africa, reflecting a 260% increase since 2010. In nominal terms, over 200m more Africans are regularly using the internet now compared to 2010 (Figure 6).
- During this same period Africa's share of global internet users has almost doubled, to just over 7%.
- And, according to ITU data, the share of African households with a computer has also doubled since 2010, while the share of households with internet access at home has more than tripled during this same period (Figure 7).

Figure 6: A 260% increase in internet users since 2010



Sources: ITU; Standard Bank Research

Figure 7: Internet access is slowly deepening in Africa



Sources: ITU; Standard Bank Research

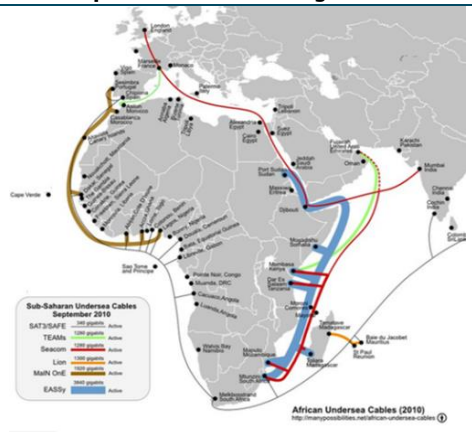
As in the mobile arena, private funding continues to drive increasing broadband connectivity in Africa. A decade ago, we outlined how new the new fibre-optic cables pictured in Figure 8 were likely to substantially improve the continent's connectivity. In hindsight, this already positive assessment proved to be too modest: over the past decade Africa's fibre-optic network has expanded more impressively than we outlined in our original report. Indicatively, according to Africa Bandwidth Maps, there are now more than 1m kilometres of fibre optic networks across the continent, while an additional 300,000km of terrestrial links are proposed, planned, or under construction. Further:

Africa's terrestrial network capacity (which is measured by the kilometres of fibre deployed) has expanded at an annual rate of 12.5% over the past decade

- Africa's terrestrial network capacity (which is measured by the kilometres of fibre deployed) has expanded at an annual rate of 12.5% over the past decade; and
- Where in 2010 around 260m people in SSA lived within 25km of a functioning fibre-optic network node, by 2019 this had increased to 584m (equating to over half of SSA's population).

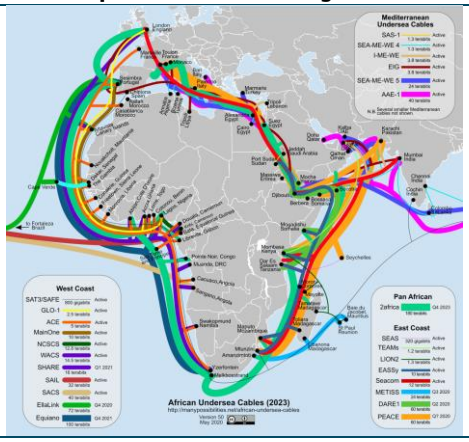
These changes are dramatically altering Africa's fibre-optic portrait (as reflected in Figure 9).

Figure 8: Fibre-optic cables connecting Africa (2010)



Source: manypossibilities.net

Figure 9: Fibre-optic cables connecting Africa (2023 est.)



Source: manypossibilities.net

Several other privately funded developments not included in Figure 9 are also expected to contribute in the years ahead to improved internet availability across Africa. These include (but are not limited to):

Figure 10: A potential game changer

Source: 2Africa

- **2Africa.** In May this year a new subsea cable project, 2Africa, was launched. The project aims build a 37,000km subsea fibre-optic cable between the UK and most of coastal Africa and the Middle East by the end of 2023 (Figure 10). The project is being funded by China Mobile International, Facebook, MTN, GlobalConnect, Orange, stc, Telecom Egypt, Vodafone and the West Indian Ocean Cable Company (WIOCC). It has been reported that this new cable will deliver more than the total combined data capacity of all subsea cables currently serving the continent.
- **Google undersea cable**. Last year, Google introduced its subsea cable – named Equiano – which runs along the west coast of Africa, with primary connections in Cape Town, Lagos and then Lisbon (Portugal). The cable is being fully funded by Google. According to Google, the cable will have approximately 20 times more network capacity than the last cable built to serve the region. The contract to build the cable was signed with Alcatel Subsea Networks in Q4:18, and the first phase of the project, which will connect Portugal to South Africa, is expected to be completed in 2021.

- **Project Taara**. Last month (October 2020) Alphabet's Project Taara (which is an offshoot of its 'X, The Moonshot Factory' initiative) announced that it is working with Econet Group to expand affordable, high-speed internet to communities across their networks in SSA. What differentiates this endeavour is that it seeks to emulate the speed and reliability of traditional fibre, but does so by transmitting data via narrow, invisible beams between Taara terminals. As Krishnaswamy (2020) explains: "by creating a series of links from our partner's fibre optic network over ground to underserved areas, Taara's links can relay high speed, high quality internet to people without the time, cost, and hassle involved in digging trenches or stringing cables along poles". The project will initially be rolled out across Econet's Liquid Telecom subsidiary in Kenya, following which further regions will likely be added if the Kenya pilot proves to be successful.

(iii) A tech revolution…

Improved internet access, coupled with targeted regulatory reforms and a constant flow of private investment are all leading to the development of the tech industry in key economies across Africa

Improved internet access coupled with targeted regulatory reforms and a rising flow of private investment are all supporting the development of the tech industry in key economies across Africa. This shift is being further enabled by Africa's structural economic and institutional appeal, as we emphasised in our recent updated reports on the continent's demographic, income and urbanisation trends. Indeed, Africa's tech industry was so fledgling a decade ago we did not include it in any real detail in our original report on the continent's broadening ICT potential, other than to mention the nascent growth of mobile money systems in East Africa in particular, as well as some of the tech based innovations improving access to markets for rural small-scale farmers. Such has been the growth in this area over the past ten years that it now forms a critical element of any discussion around Africa's structural growth and investment potential.

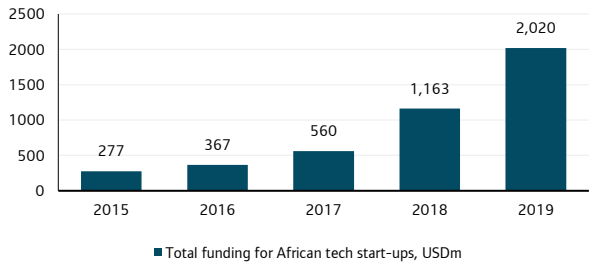
Rising VC funding for tech start-ups

Around USD2.02bn was raised in 2019 in exclusively venture capital equity funding for African tech start-ups

Emphasising the potential in this area, global tech investment firm Partech Partners estimates that USD2.02bn was raised in 2019 in venture capital (VC) equity funding for African tech start-ups. This represented a profound y-o-y increase of 74% from total funding of USD1.16bn in 2018 (Figure 11). Some other findings from the report further underline the scale of positive change in the continent's growing tech sector:

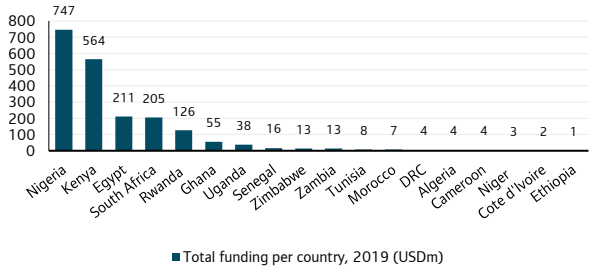
- There were 250 VC funding rounds for African tech start-ups in 2019, up from 168 rounds in 2018, and 55 in 2016.
- From a country perspective, Nigeria attracted over one-third of the total tech start-up funding in 2019, followed by Kenya (28%), Egypt and South Africa (10% each). These four countries accounted for 85% of total tech start-up VC funding for the year (Figure 12). In terms of the number of deals, South Africa was on top, with 66 (+78% y-o-y) in 2019.
- In terms of the sectoral distribution of these funds in 2019, 54% went to financial inclusion (primarily Fintech), with 30% going to online and mobile consumer services and 16% to B2B and Tech adoption.

Figure 11: Consistent growth in VC tech start-up funding



Sources: Standard Bank Research; Partech Partners

Figure 12: Nigeria, Kenya, Egypt and SA at the forefront



Sources: Standard Bank Research; Partech Partners

The importance of these funding lines has also been emphasised this year as the continent (and the world) grapples with the costs of the COVID-19 pandemic. Here, it has been estimated that in the first eight months of 2020, African tech start-ups raised more than USD600m in VC funding, an 8% increase on the same period in 2019[1].

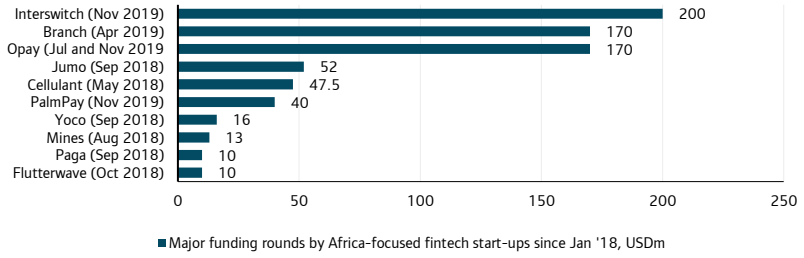
Much of the funding flowing into Africa's tech start-up space is focusing on broadening access to financial products and services (fintech)

As alluded to above, much of the funding flowing into Africa's tech start-up space is focusing on broadening access to financial products and services (fintech). Indeed, rising interest in this area is being driven not only by the trends outlined above and already detailed in this series, but also due to the enormous opportunities that exist to provide financial access to the roughly two-thirds of the continent's population that are still unbanked (nominally, this equates to over 800m people). To this point Kazeem (2019a) argues that fintech in Africa "isn't so much disrupting traditional financial services as building up a historically underdeveloped industry".

Visa's reported investment of USD200m for a 20% share of Nigeria's Interswitch made the company Africa's first fintech 'unicorn'

We will focus in more detail on this critical area in our next report in this series when we consider the trends shaping financial access across the continent. For now, it is worth pointing to some of the largest fintech deals over the past two years that continue to emphasise the rising interest in this sub-sector (Figure 13). The largest of these deals was the USD200m reportedly invested by Visa for a 20% stake in Nigerian payments processor Interswitch (which Partech Partners counted in its tally of VC funding for African start-ups). This investment valued Interswitch at USD1bn, making it Africa's first fintech 'unicorn'. Chinese investors were at the forefront in funding Opay (which was founded in 2018 and is majority owned by the Chinese consumer internet company Opera); as well as in the USD40m raised for PalmPay (which was led by Chinese mobile phone manufacturer Transsion). More recently, this month it was announced that Amazon CEO Jeff Bezos (through his personal VC fund Bezos Expeditions) has invested in the African cross-border fintech start-up Chipper Cash, which raised a USD30m in a Series B funding round. Chipper Cash offers a mobile-based P2P payment services in seven African economies, including Ghana, Nigeria, Kenya, South Africa, and Rwanda.

Figure 13: Rising interest in African fintech start-ups



Sources: Kazeem (2019); Partech Ventures; Sky; TechCrunch; Standard Bank Research

Other areas of significant tech promise in Africa are healthtech (which attracted USD189m across 13 deals in 2019 – an extraordinary 969% y-o-y increase); e-mobility and food delivery (which, according to Disrupt Africa's 2019 report raised USD62.2m over the course of 14 deals in 2019); and B2B e-logistics (such as on-demand FMCG delivery services). Considering the area of e-mobility and food delivery, in South Africa online food delivery revenue is expected to reach USD965m in 2020 (+35.4% y-o-y), while market volume is expected to grow at a CAGR of 9.7% out to 2024, by which stage the market value will potentially have reached USD1.37bn. The growth of ride-hailing apps in markets such as Nigeria, Kenya and Uganda is also supporting growth in this sub-area of the tech industry.

[1] As Bright (2020) points out, there are some discrepancies between Partech's VC funding estimates and those put together by WeeTracker (which has total VC funding for African tech start-ups in 2019 at USD1.3bn and Disrupt Africa (USD496m). These discrepancies relate to differing methodologies used by all three organisations – with Partech, for instance, more broadly defining what constitutes a start-up in the African context and Disrupt Africa using a far more conservative approach.

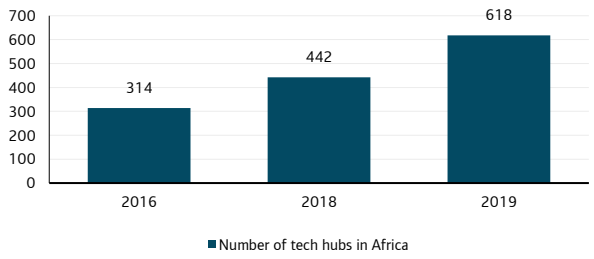
Tech hubs

In 2019 there were 618 "active tech hubs" across Africa, representing a 40% y-o-y lift from the 442 hubs counted in 2018, and 314 in 2016

Understandably, these VC funds, together with development finance, corporate involvement and domestic innovation have boosted technology ecosystems across Africa. To this point, a recent collaboration between Briter Bridges and the GSMA Ecosystem Accelerator programme identified 618 "active tech hubs" across Africa in 2019, representing a 40% y-o-y lift from the 442 hubs counted in 2018, and 314 in 2016 (Figure 14). Some other findings from the study include:

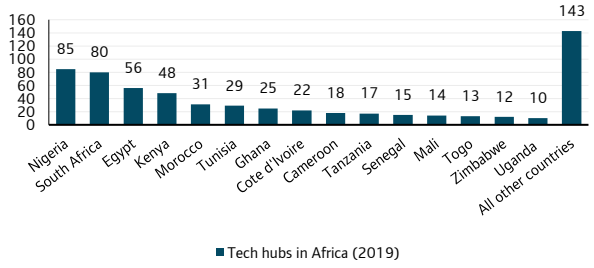
- In terms of their distribution, Nigeria (85); South Africa (80); and Egypt (56) hosted the largest number of these tech hubs. Yet, while these three countries accounted for one-third of all hubs in Africa in 2019, the remaining hubs are well spread across the continent (Figure 15).
- Naturally, and corroborating some of the arguments made around the benefits of urbanisation that we made in our most recent report in this series, most of the hubs are based in the continent's large urban centres. Indeed, the top 10 cities in the study host 40% of the total number of hubs across the continent. Lagos comes out top with more than 40 hubs, followed by Cairo, Cape Town, Nairobi and Johannesburg (all with between 20 and 40 hubs). So-called tier 2 tech hub cities (those with 15+ hubs) include Casablanca, Accra, Abidjan, Tunis and Abuja; and Tier 3 (10+ hubs) cities include Dakar, Bamako, Kampala, Dar es Salaam and Lomé.
- Of the various hubs, 52% are focused on incubator and accelerator programmes; and 24% are tech-focused co-working spaces.

Figure 14: Twice as many tech hubs in 2019 as in 2016



Sources: Standard Bank Research; GSMA; Briter Bridges

Figure 15: Wide dispersion of hubs across Africa



Sources: Standard Bank Research; GSMA; Briter Bridges

Again, these developments are being spearheaded by private capital, both local (particularly banks and telecoms network providers) and from prominent MNCs. To the latter point, Google (via its Google Launchpad Accelerator, which provides start-up assistance in 17 African countries); Facebook (through its Facebook NG Hub in Lagos); and Microsoft (which runs Microsoft Development Centres in Nairobi and Lagos) are all actively involved in supporting the continent's tech innovation potential.

Separately, Africa is reportedly the fastest growing continent (though admittedly from a low base) for software developers

Separately, Africa is reportedly the fastest growing continent (though admittedly from a low base) for software developers (Kazeem, 2019b), with countries such as Morocco, Kenya, Nigeria, Egypt and South Africa leading this growth. Global tech firms are, again, at the forefront in this regard: Microsoft has committed to spending USD100m on a software development centre initiative in Africa, with its first development centres having opened in Nairobi and Lagos. By 2023 the firm hopes to have expanded its local developer pool to 500. And, as outlined in a joint report published by Google and Accenture, there are currently almost 700,000 professional developers across Africa with more than 50% concentrated in five key African markets: Egypt, Kenya, Morocco, Nigeria, and South Africa (Google/Accenture, 2020)

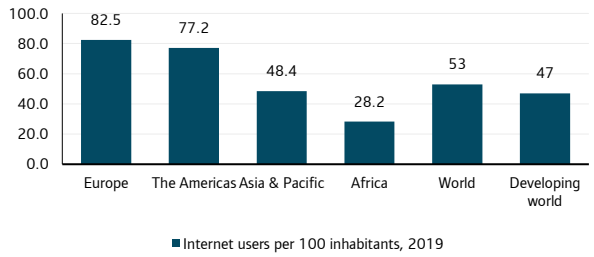
What is perhaps most alluring about Africa's tech potential is that it remains in its infancy – and, powered by supportive structural trends, is likely to become an increasingly defining feature of the continent's economic prospectus in future.

(2) Key challenges: cost; availability; and government control

Of course, there are persistent challenges to Africa's ability to fully grasp the potent advantages offered by the developments outlined above

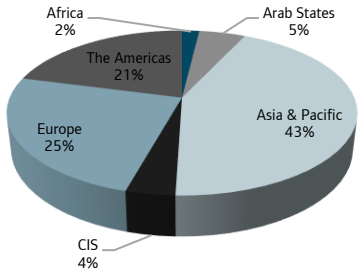
Of course, there are persistent challenges to Africa's ability to fully grasp the potent advantages offered by the developments outlined above. To be sure, despite the various developments outlined in this report thus far, Africa's total internet usage rate stood at 28.2 (users per 100 inhabitants) in 2019, almost half that of the global average, and substantially lower than the developing world average too (Figure 16). A further representation of this lag is in Africa's share of global bandwidth: despite being home to roughly 17% of the world's population, Africa accounts for just 2% of global bandwidth usage (Figure 17).

Figure 16: A long way to go for Africa



Sources: ITU; Standard Bank Research

Figure 17: Share of global internet bandwidth, 2019



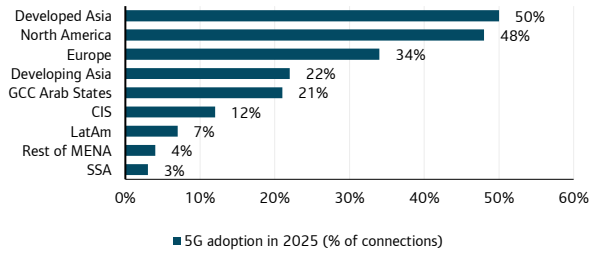
Sources: ITU; Standard Bank Research

Another indication of Africa's technological lag is in the continent's ability to keep up with the rollout of 5G across the world in the years ahead.

There will be 1.8bn 5G connections globally by 2025, but Africa will only have 31m of these (with 3% of total connections on the continent via 5G at the time

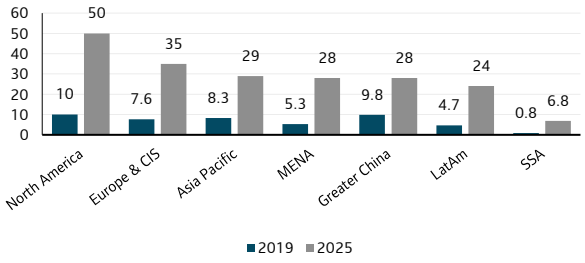
- Here, the GSM Association (GSMA) expects that there will be 1.8bn 5G connections globally by 2025, but Africa will only have 31m of these (with 3% of total connections on the continent via 5G at the time, compared to 50% in Developed Asia) (Figure 18). Part of the lag will be due to capex spend, which in Africa for 5G will be substantially lower than most other regions in the world. Here, the GSMA expects that African operators will allocate 27% of total capex to 5G, compared to 87% in North America and 69% in Asia Pacific.
- The GSMA also expects that average data usage in Africa will remain substantially below the global average in the next five years (Figure 19). With that said, it is important to outline that the pace of expected data usage growth in Africa is nonetheless profound: from average per person usage of 0.8GB per month in 2019, average usage is expected to lift to 6.8GB per person per month by 2025, implying a 750% increase in just five years. This compared to slightly lower (though still impressive) growth in North America over the same period of 400%; 360% in Europe & CIS; and 72% in Asia Pacific.

Figure 18: Africa will lag in 5G adoption



Sources: GSMA; Standard Bank Research

Figure 19: GB per subscriber per month



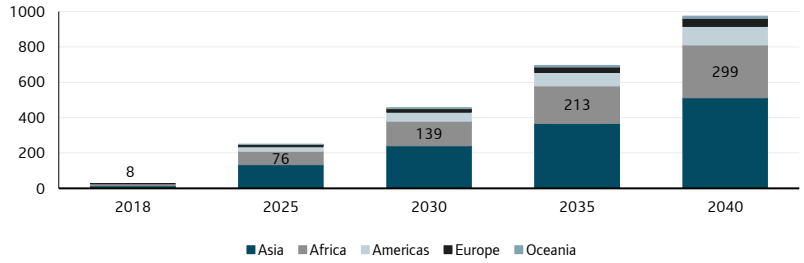
Sources: GSMA; Standard Bank Research

Availability

The World Economic Forum (WEF) calculates that Africa's ICT infrastructure gap totalled around USD8bn in 2018, but that this number will grow to USD76bn within the next five years

Some of the most obvious reasons for Africa's technological lag relative to the rest of the world relates to the dispersion of the continent's population, and the lack of adequate infrastructure across its urban areas, as well as between coastal and landlocked economies. There are, for instance, direct links between internet usage and the availability and reliability of electricity across Africa. Condensing these impediments, the World Economic Forum (WEF) calculates that Africa's ICT infrastructure gap[2] totalled around USD8bn in 2018, but that this number will grow to USD76bn within the next five years, and touch USD300bn by 2040 (Figure 20).

Figure 20: ICT infrastructure gap by region, USDbn



Sources: Global Infrastructure Outlook (G20 Initiative); WEF; Oxford Economics; Standard Bank Research

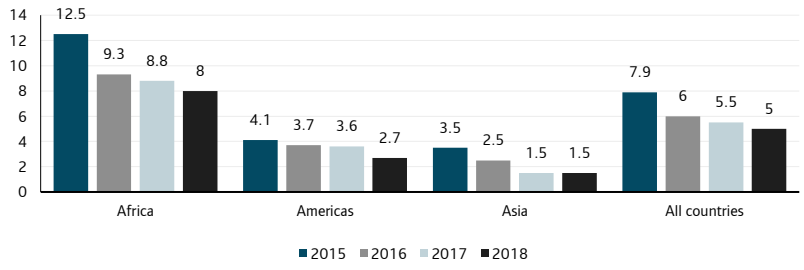
Affordability

Another primary cause of this "usage gap" is affordability, both of mobile (and particularly smart) phones and computers themselves, as well as of mobile data in many economies on the continent.

Africa's overall internet costs are still, by some margin, the highest in the world: according to the Alliance for Affordable Internet, the average cost for just 1GB of data in Africa in 2018 was 8% of the average income (GNI per capita), substantially higher than the global average

Indeed, Africa's overall internet costs are still, by some margin, the highest in the world: according to the Alliance for Affordable Internet, the average cost for just 1GB of data in Africa in 2018 was 8% of the average income (GNI per capita), substantially higher than the global average, and profoundly disconnected from comparatively low internet costs across Asia (Figure 21). In some cases this unaffordability relates to limited disposable income amongst the more than 80% of the continent's population that remain low-income (as we outlined in our first report in this series), though other contributing factors include a lack of competition between mobile operators in several markets across the continent, as well as the logistical and regulatory challenges that often face such operators, and which drive up operational costs.

Figure 21: Cost of 1GB of mobile data as % of ave. income (GNI per capita)



Sources: Alliance for Affordable Internet; Standard Bank Research

[2] This "infrastructure gap" is defined by the WEF as "the difference between projected ICT infrastructure stock and projected ICT infrastructure need. Projected ICT infrastructure stock is developed by first calculating current ICT infrastructure stock at the national level through a perpetual inventory approach using data on gross fixed capital formation (GFCF) in ICT, then projecting future GFCF based on a model that includes economic growth, population growth and stated government commitments. Projected ICT infrastructure need is defined as the level of infrastructure that would bring a country's infrastructure stock equal with its best performing peer. Peer groups are defined by GDP/capita, and "best performing" is defined as 75th percentile of countries in the peer group" (WEFa, 2018).

At least, and as reflected in Figure 21 on the previous page, though costs in Africa remain in many cases prohibitively high, they have clearly declined meaningfully over the course of the past five years. To this point, Alliance for Affordable Internet outlined in a recent report that:

- The average cost of 1GB of data (as a percentage of average income) had declined in Africa to 7.12% in 2019 (from 8% in 2018); and that there had been an average decline of mobile broadband costs across low-and-middle-income countries from 2018 of 17%.

The two most improved countries in the world in terms of data affordability in 2019 were Cameroon and Mali, both of which had adopted new national broadband plans

- And, that the two most improved countries in the world in terms of data affordability in 2019 were Cameroon and Mali, both of which had adopted new national broadband plans. Other notable 'risers' in the year were Tunisia (up two places in the Affordability Drivers Index) and Namibia (also up two places).

Governance

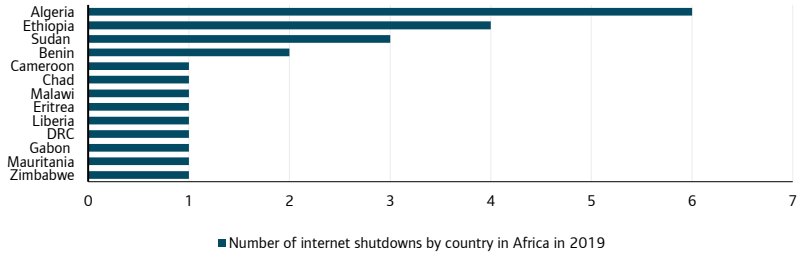
A further challenge regarding internet usage and availability is the rising tendency of governments on the continent to limit or even entirely prohibit use of the internet in order to stifle criticism and/or demobilise protest activity.

- According to internet advocacy group AccessNow, there were 25 internet shutdowns in Africa in 2019, reflecting a notable (47%) elevation from the 17 incidents identified in 2018. Further back, there were only 12 incidents in 2017; and 11 in 2016 (Figure 22).
- In 2019 "at least" 14 countries shut down the internet in Africa, compared to 10 in 2018. And, of the 14 countries that shut down the internet in 2019, at least seven have never done so before or did not do so in 2017 or 2018 (this list includes Benin, Gabon, Eritrea, Liberia, Malawi, Mauritania and Zimbabwe).

The economic cost of these shutdowns is not insignificant: according to the ICT Policy Centre for Eastern and Southern Africa (CIPESA), the cumulative cost of the shutdowns in SSA since 2015 has been around USD237m

According to Reporters Without Borders (RSF), these shutdowns have become more sophisticated, too, with prohibitions of social media use now "widely used in Africa as a censorship tool to gag dissent and prevent coverage of unrest within a sector of the population". And the economic cost of these shutdowns is not insignificant: according to the ICT Policy Centre for Eastern and Southern Africa (CIPESA), the cumulative cost of the shutdowns in SSA since 2015 has been around USD237m.

Figure 22: Rising trend of internet shutdowns in key African economies



Sources: AccessNow; Standard Bank Research

Another internet tracking organisation, Netblocks, has recorded notable social media disruptions throughout this year before elections in several countries in Africa. These include disruptions in Guinea on the eve of elections and again ahead of the announcement of the results of the presidential election in October; in Burundi on election day in May; in Malawi on election day in May; and in Mauritania following the elections in June. Most recently, the organisation outlined "widespread disruption" to social media in Tanzania on the eve of the recent presidential elections, with the most

pronounced influence on Twitter, WhatsApp, Instagram and Google services (NetBlocks, 2020).

Other related challenges centre on the torpid nature of the ICT-supportive regulatory reform in many economies on the continent. Further to this, the disruptive nature of the tech industry has challenged regulators across Africa (and the world), leading occasionally to the reactive imposition of restrictions on new services (particularly ride-hailing ones) in response to their exponential growth in some key markets. Regulatory constraints have also limited the spread of mobile money transfer solutions in some markets, as we will explore in the next chapter in this series.

(3) The economic and institutional advantages of Africa's technological embrace

We now turn to the clearest economic, social and institutional advantages that deeper technological use is creating – and may still create – in the decades ahead. Indeed, and as we outlined in our original report series, mobile and internet usage has an immediate and disproportionately powerful impact on incomes and growth across Africa.

Consider that, according to Katz and Callorda (2018):

A 10% increase in mobile internet penetration increases GDP per capita by 2.5% in Africa, compared with 2% globally

- A 10% increase in mobile internet penetration increases GDP per capita by 2.5% in Africa, compared with 2% globally.
- A 10% increase in digitization (which is the conversion of information into a digital medium) increases GDP per capita by 1.9% in Africa, compared with 1% in non-OECD countries.

The same study also found that increases in mobile broadband penetration had a higher effect on GDP than increases in fixed broadband penetration. Indeed:

- An increase of 1% in fixed broadband penetration was found to yield an increase in 0.08% in GDP on the continent, compared to a 0.15% GDP lift from the same increase in mobile broadband. This, too, indicates the growth potential that is inherent in Africa's ongoing mobile broadband elevation.
- Separately, the WEF has outlined how faster download speeds have the potential to deliver profound improvements in per capita GDP across the world. Here, it has been shown that a doubling of download speeds (which is easy to secure in Africa due to the base effect of relatively limited internet access in many economies) results in a 0.3pps increase in per capita GDP.

According to the GSMA, around 9% of SSA's total GDP in 2018 came from mobile technologies and services (with a nominal contribution of USD144bn)

Already these advantages are becoming abundantly clear across Africa.

- According to the GSMA, for instance, around 9% of SSA's total GDP in 2018 came from mobile technologies and services (with a nominal contribution of USD144bn), while almost 3.5m people were employed in the mobile sector during the year. The industry is also assumed to have contributed around USD15.6bn in tax revenues for governments across the continent in 2018.
- The GSMA also expects that, by 2025, 167m more people from SSA will have subscribed to mobile services, and smartphone connections in the region will more than double.

In the next decade, the number of internet users in Africa will grow by 11%, representing 16% of the total global amount

Separately, it is expected that, in the next decade, the number of internet users in Africa will grow by 11%, representing 16% of the total global amount (Euromonitor, 2018).

Africa's growing iGDP

These and other advantages were recently drawn together by Google and the IFC in a joint report on Africa's 'e-Conomy'. Drawing on a study by Accenture, the IFC/Google report suggests that, "depending on the usage level of digital technologies by

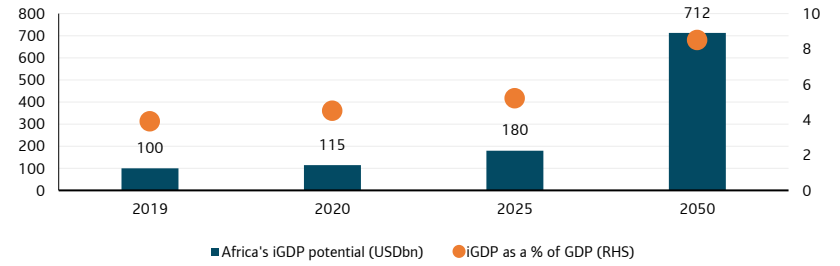
businesses and the right mix of policy actions", Africa's internet economy (or iGDP) could increase from USD100bn in 2019 to USD180bn by 2025 (IFC/Google, 2020).

- Placing this growth in context: in 2012 Africa's iGDP was estimated at around 1.1%, or USD30bn, of its GDP.
- Today, the sector's contribution stands at around 5%, a level that is not widely out of synch with other regions in the world: in the US, for instance, it is estimated that the iGDP contributed around 9% of GDP in 2018.

By 2050 it is expected that Africa's iGDP will be worth over USD700bn and will account for almost 10% of the continent's total economic output

- Looking ahead: by 2050 it is expected that Africa's iGDP will be worth over USD700bn and will account for almost 10% of the continent's total economic output (Figure 23).

Figure 23: Africa's growing iGDP potential



Source: Accenture; Standard Bank Research

The report also outlines how Africa's internet economy shown itself to be "broadly resilient" during the COVID-19 crisis, a trend that is expected to continue given the importance of digital connectivity in supporting business continuity and servicing the continent's growing consumer base next year (IFC/Google, 2020).

Broad social advantages

The social impacts of Africa's growing ICT base continue to be profound

The social impacts of Africa's growing ICT base continue to be profound. Some of the more pronounced opportunities in this regard exist within the informal sector, where ICT leapfrogging enables individuals and business owners to circumvent some of the powerful structural challenges that have limited their ability to meaningfully participate in the economy in the past. Notably, mobile phone penetration rates appear to be almost as high within the informal sector as in the formal sector. Indeed, such is the developmental power of telephony, that access to smart phones and the internet is widely regarded as socio-economic necessities – rather than non-discretionary advantages – across the developing world. To this point, there is a direct correlation between countries' performance in attaining the UN's Sustainable Development Goals (SDGs) and its levels of mobile connectivity. And that, as Richard (2019) argues, the SDGs "reflects the global consensus on the importance of connectivity and universal, affordable access to the internet. Digital inclusion is a key enabler and a critical tool for the achievement of the other SDGs".

Aside from this, Nyalandu, Rabana and Uppink (2016) lay out several other transformative aspects of internet access for Africa. These include:

- **Enhanced agricultural productivity**. Still around two-thirds of Africa's population is employed in the agricultural sector. As we noted in our original series, mobile and internet access can dramatically improve farmers access to markets (and improve transparency around produce pricing); improve farming practices; and widen access to financial services (thus contributing towards individual economic resilience). As the authors note, some tech-based innovations, such as Esoko in Ghana and Manobi in Senegal have aided in boosting farmers incomes, in some cases by as much as 40%.

- **Financial inclusion.** As we will outline in the next chapter in this report, fintech solutions are contributing towards the dramatic improvement in financial access across Africa. This is having meaningful impacts on socio-economic security, as well as widening access to credit for both informal sector workers in particular.
- **Education**. The proliferation of online learning services could bridge critical gaps in the quality and availability of education across Africa.

Opportunities for remote diagnosis and prevention education are clear, with potential savings from these initiatives of USD188bn by 2025 should internet access materially improve across the continent

- **Healthcare.** As outlined earlier in this report, funding for healthtech start-ups has notably increased in recent years in Africa. Opportunities for remote diagnosis and prevention education are clear, with potential savings from these initiatives of USD188bn by 2025 should internet access materially improve across the continent. As the authors point out: "internet technologies help make health systems more efficient by automating processes, allowing for electronic record-keeping, improving accuracy in data collection, and empowering rural communities through better distribution of health information". One example of this is the Portable Eye Examination Kit (PEEK), which uses a smartphone app to screen eyes and detect curable eye problems and has been used extensively over the past five years in countries such as Kenya.
- **E-government services**. There are abundant opportunities for automating revenue collection in Africa, a process that could deliver productivity gains in the region of USD10 billion to USD25 billion on the continent. As the authors content: "moving government services online broadens access to government services at a lower cost. Furthermore, using these digital services as best practice is a powerful way to encourage the improvement of private sector services and opportunities".

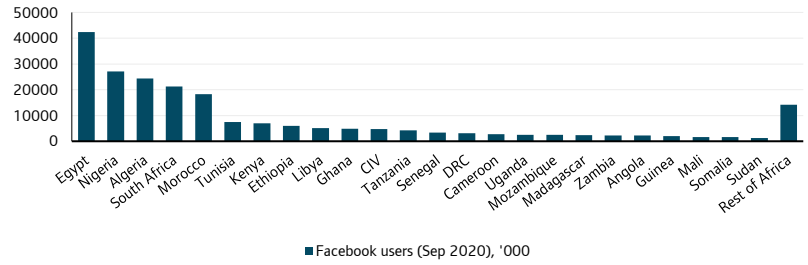
Technological – and specifically social media – access is also supporting the broadening of political and civic participation across the continent

Technological – and specifically social media – access is also supporting the broadening of political and civic participation across the continent. Indeed, social media sites such as Twitter and Facebook and messaging apps such as WhatsApp and Signal are enabling far wider collaboration between individuals and organisations, in so doing deepening opportunities for social mobilisation. To be sure, this relationship between social media use and democracy is far from straightforward and deserved a fuller analysis than we are providing here. As we have seen at the global level, social media can re-enforce political and societal divisions; offer outlets for the spread of 'fake news'; and equally enable the formation and development of anti-democratic organisations. Other challenges, such as the threat that social media can reinforce, rather than dismantle, existing power structures in some African countries have also been outlined by, amongst others, Diepeveen (2019). And, as outlined earlier in this report, the use of social media sites can be blocked by government's concerned with their role in supporting opposition groupings. To this point, in July last year the Chadian government lifted a social media ban that had been in place for 16 months – the longest such blockage in any African country (Dwyer and Molony, 2019a).

Social media can aid in developing space for more active engagement and debate in Africa, enlivening the electoral process

Yet, it has equally been argued that social media aids in developing space for more active engagement and debate in Africa, enlivening the electoral process. For instance, Hitchen et al (2019) considered the important role of WhatsApp in providing an outlet for smaller political parties in Sierra Leone; while Riley (2019) and Orji (2019) show how civil society organisations make use of social media to improve the transparency of electoral processes. There is also extensive literature on the important role played by social media in supporting protest action against authoritarian leaders in North Africa during the Arab Spring in 2010 and 2011, as well, more recently, in Sudan and Burkina Faso. To this point, at present there are roughly 210m Facebook users in Africa, accounting for around 10% of Facebook's total global community. Yet, of these 210m Facebook users, 97m (or around 46%) are in just five North African countries (Egypt, Morocco, Tunisia, Algeria, and Libya) (Figure 24).

Figure 24: North Africa accounts for half of Africa's Facebook user community



Sources: Internetworldstats.com; Standard Bank Research

(4) A look at the countries best positioned to benefit from Africa's ongoing technological deepening

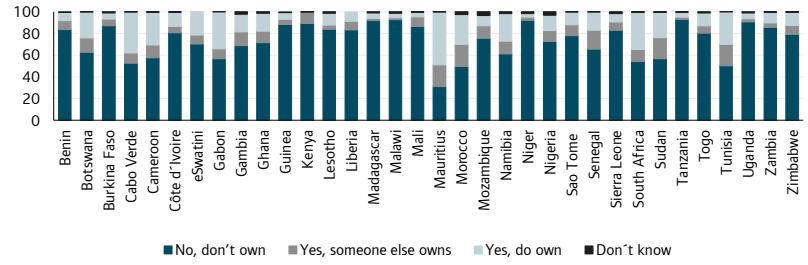
As we know, Africa's 54 economies diverge widely on key economic, political and institutional measures. This is no different in the area of technological progress: indeed, in some ways the primary opportunities thar are emerging in this space are even more selectively focused on a small cohort of countries than when considering some of the broader structural factors that we outlined in the first to chapters in this updated report series. For instance:

- In a recent (2016/2018) Afrobarometer study, an average of 25% of all respondents in the 34 covered economies in Africa stated that they either owned a computer or lived in a household with a computer.

Around 69% of households in Mauritius and 50% of households in Tunisia had direct access to a computer, compared to just 6% in Tanzania, Malawi and Niger

- But this average masked wide variations: at the upper end, 69% of households in Mauritius and 50% of households in Tunisia had direct access to a computer (meaning that both are above the global average), while on the lower end direct computer ownership by households in Tanzania, Malawi and Niger stood at around 6%. In all, in one-third of all surveyed countries more than 80% of respondents stated that they did not have access to a computer (Figure 25).

Figure 25: Wide divergences in internet usage in Africa



Sources: Afrobaromete; Standard Bank Research

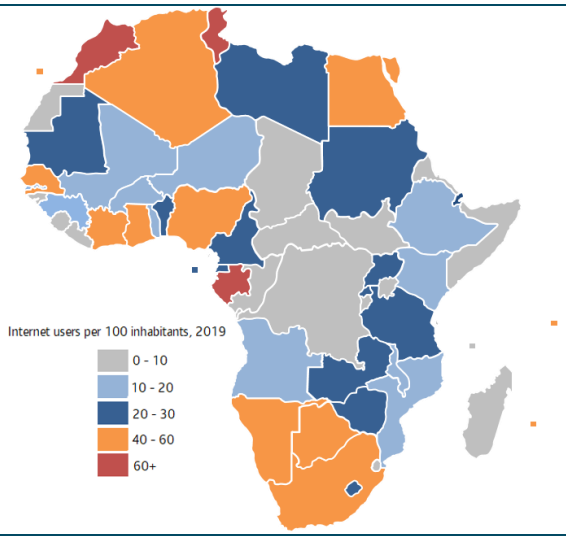
Returning to ITU data, a similar geographical and regional pattern to the one detailed through the Afrobarometer survey emerges (Figure 26).

There are vast discrepancies in internet access in Africa. At the extreme ends, Tunisia has the continent's highest internet usage rate at 64% (of the population), with Eritrea the lowest at 2%

- The most extreme contrast in this regard is between Tunisia, which has an internet usage rate of 64%, and Eritrea, at under 2%.
- Overall penetration rates in East Africa are low considering the region's relative economic prosperity, as well as the prominent role some of its economies (such as Kenya) are playing in the continent's tech and fintech development. In both Kenya and Ethiopia just 18% of the population actively uses the internet.

- Usage in West Africa's largest economies – Nigeria, Ghana, Senegal and Côte d'Ivoire – is higher, with an average rate across these four economies of 43%.

Figure 26: Wide variations in internet usage across the continent



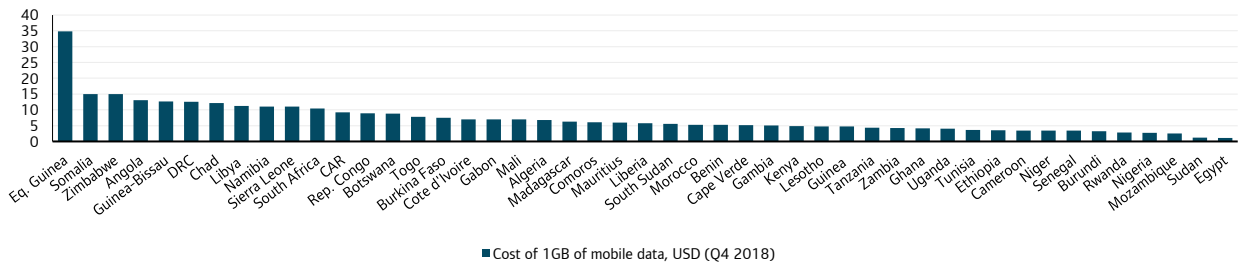
Sources: ITU; Standard Bank Research

Then, in terms of affordability, Africa's average again somewhat masks extraordinarily high data costs in some of the continent's key economies.

As at Q2:19 the DRC had the least affordable mobile broadband costs in the world, with 1GB of data equalling 26.2% of average income

- As at Q2:19 the DRC had the least affordable mobile broadband costs in the world, with 1GB of data equalling 26.2% of average income (GNI per capita).
- In all, the 13 countries with the most expensive mobile broadband data relative to average incomes in the world were African (and 18 of the bottom 20 in the world were African, too).
- Africa's most relatively affordable broadband data markets are Egypt, Sudan, Tunisia, Gabon and Botswana.
- Considering the basic (non-relative) cost of 1GB of mobile data, the wide spread of affordability in Africa becomes equally clear. Indeed, at the extreme ends 1GB of data costs 30-times more in Equatorial Guinea than it does in Egypt. And data costs are almost five-times higher in Angola than they are in Nigeria (Figure 27).

Figure 27: Broad divergences in terms of basic data costs across Africa

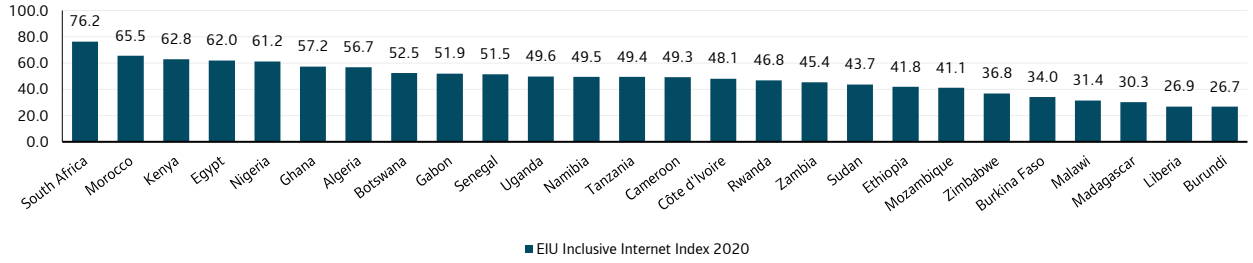


Sources: Alliance for Affordable Internet; Standard Bank Research

These regional discrepancies are well captured by the Economist Intelligence Unit (EIU), which ranks countries globally (and 26 in Africa) according to the availability, affordability, relevance and readiness (which is defined as "the capacity to access the internet, including skills, cultural acceptance, and supporting policy") of ICT services in the country. The composite country scores are then drawn together in an Inclusive Internet Index, with scores provided to each country (0 = least inclusive, and 100 = most inclusive). Of the 26 countries in Africa that are measured in the index, South

Africa is regarded as the most 'inclusive', followed by Morocco, Kenya and Egypt. The least inclusive country in Africa (and indeed of the 100 countries globally covered by the survey) is Burundi, followed by Liberia, Madagascar and Malawi (Figure 28).

Figure 28: SA is Africa's most 'inclusive' internet market; Burundi its least



Sources: EIU; Standard Bank Research

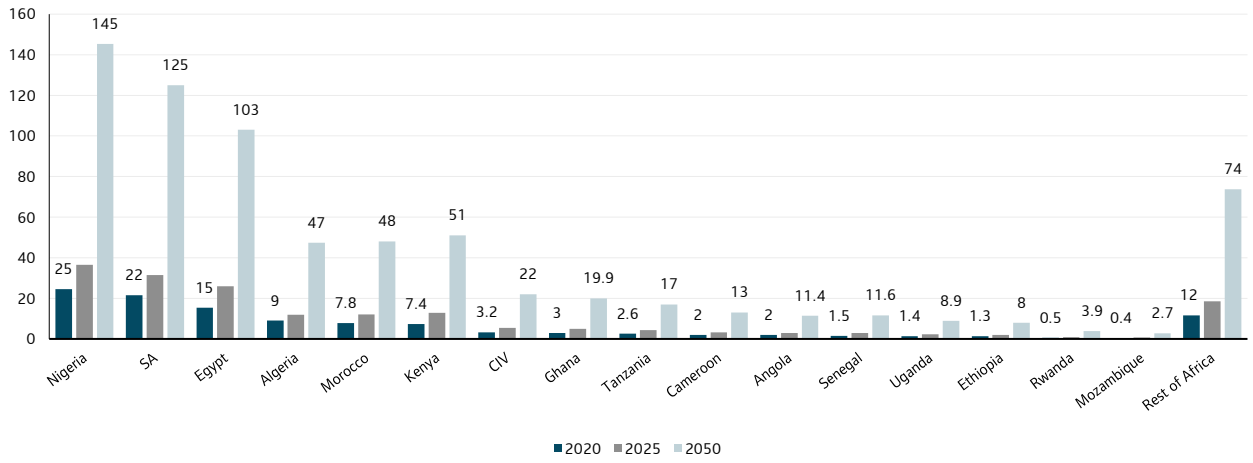
A similar picture emerges when considering the estimated iGDP of various African economies.

Two-thirds of Africa's iGDP is held by just six economies: Nigeria, SA, Egypt, Algeria, Morocco, and Kenya

- Here, Nigeria (USD25bn), SA (USD22bn) and Egypt (USD15bn) are the largest markets on the continent, followed by Algeria, Morocco and Kenya. In all, these six economies account for 75% of the continent's total estimated iGDP.
- Looking ahead, the dominance of these core markets is expected to continue – by 2050 the iGDP in these six economies is expected to stand at around USD520bn, accounting for 73% of Africa's total iGDP at the time.
- Driving this point home, Nigeria's current iGDP is more than eight times larger than Ghana's; 18 times greater than Uganda's; and twice the size of the smallest 38 economies on the continent combined.

However, this dominance should not distract from important and impressive gains in second tier iGDP markets in Africa. For instance: Côte d'Ivoire's iGDP is expected to increase by almost 600% between 2020 and 2050; while both Senegal and Rwanda are expected to see their iGDP's increase by between 670% and 680% (the fastest rate of the countries included in the survey) during the same time period (Figure 29).

Figure 29: Africa's iGDP potential (USDbn)



Sources: Accenture; Google/IFC; Standard Bank Research

In sum, Africa's technological advantages are potent – but poorly spread across the continent, skewing the leapfrogging potential that they offer.

(5) Concluding remarks

Throughout this report three core findings have emerged consistently:

- **First, Africa's technological progress since 2010 has been deep and profound**. This has unambiguously contributed towards the improvement of its economic, institutional and political resilience. Indeed, the leapfrogging potential inherent in these technological changes allows African economies and market participants to circumvent some of the more pressing logistical and institutional challenges that they face, and that we emphasised in our recent reports on the continent's demographic and urbanisation trends.

In the years and decades ahead, we expect that increasing technological uptake across Africa – and particularly in those countries still poorly connected – will be the driving force of overall socio-economic progress on the continent

- **Second, despite this progress, the continent still lags the world in terms of internet usage (for various reasons).** This presents both a challenge and a clear opportunity for the continent given the known and significant economic and per capita income gains that rising internet access will provide. We also know that, in the next five years, the availability and affordability of internet (both mobile and fixed broadband) will improve across Africa, further enabling the continent to catch up to global and developing world connectivity standards. In the years and decades ahead, we expect that increasing technological uptake across Africa – and particularly in those countries still poorly connected – will be the driving force of overall socio-economic progress on the continent.
- **Third, that a relatively small selection of economies is driving – and largely benefiting from – technological change in Africa**. In virtually all measures – from internet access to levels of regulatory support and VC funding, countries such as Nigeria, SA, Egypt and Kenya are the most abundantly prepared to harness the rising global interest in Africa's technological embrace. While a range of other economies are unambiguously benefiting, even if in a more modest way, it remains clear that, for Africa's leapfrogging potential to broaden, and become more inclusive, blockages to ICT access and reform will have to be lifted in some of the continent's least connected – and thus most disadvantaged – economies and regions.

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