Disruptive innovation is transforming Africa's economic potential, creating new target markets and unprecedented consumer choice. Capitalising on these potential opportunities demands a complete rethink of customer engagement and business development strategies. So how can your business ride the wave?

Disrupting Africa: Riding the wave of the digital revolution

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Executive Summary

Joel Segal, Chair of PwC's Africa Business Group, looks at how technology is reshaping economies and societies across the continent and how disruptors, mainstream businesses and policymakers can capitalise on this wave of innovation and change.

Africa is embracing technological disruption in a way that sets it apart from other continents. What marks out the digital revolution in Africa isn't the technology that underpins it, so much as the growing affordability, accessibility and, until recently, largely untapped demand that have made its advances so rapid.

Imagine you're living in the remote mountains of East Africa and one of your children needs medicine. But getting this delivered to your village requires a treacherous two or three day motorbike courier ride.

Then think what life would be like if you could find the medicine you need on your solar-powered TV, pay for it from your mobile, and then a drone drops it to your door.

Such dreams are now becoming a reality. The growing availability of low-cost solar power units means that millions of people across Africa now have access to electricity for the first time; while mobile payment is now accessible for consumers in even the most remote communities.

And, yes, trials of drone deliveries of medical supplies, even blood transfusions, are now underway in the mountains of East Africa.

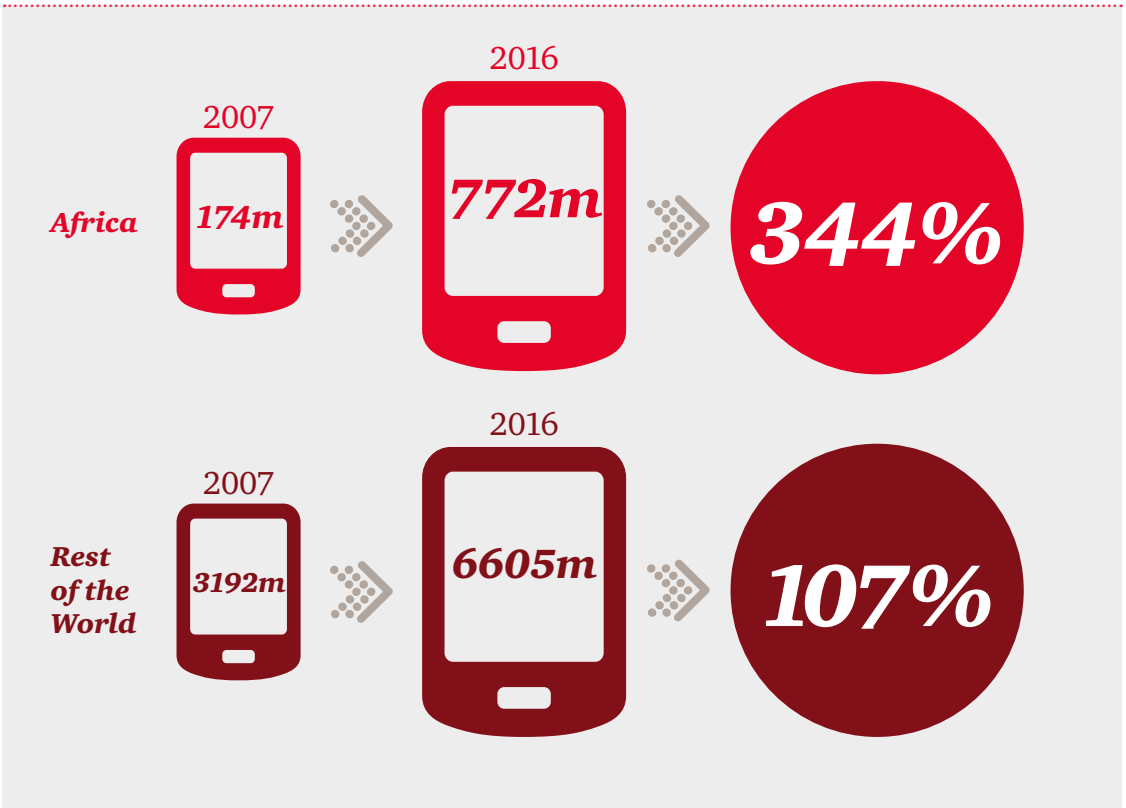
Why Africa?

Africa is an early adopter rather than follower. Instances include the highest mobile growth rate in the world (see Figure 1)[1].

As Figure 2 highlights, business leaders recognise the huge potential to strengthen customer engagement and insight.

1 PwC megatrend analysis.

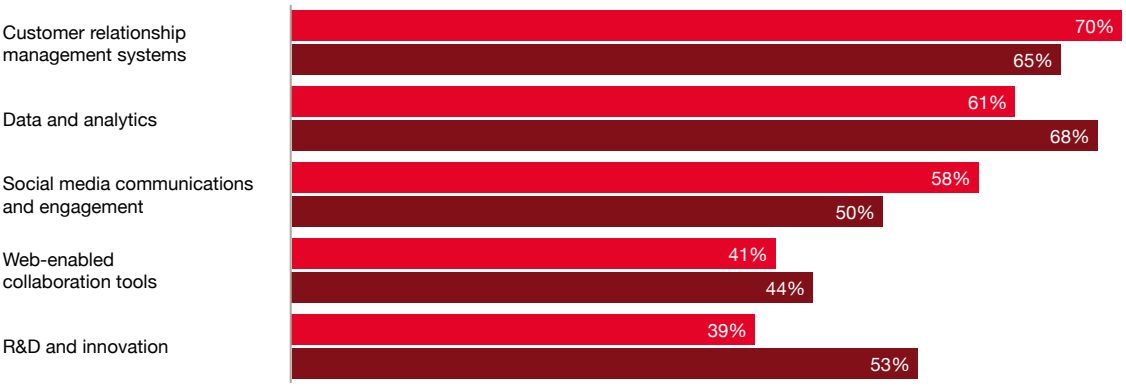
Figure 1: Growth in mobile phone usage



Source: ITU

Figure 2: Impact of connecting technologies

Q. Please select the connecting technologies you think generate the greatest return in terms of engagement with wider stakeholders



Source: PwC 19th Annual Global CEO Survey[2]

2 We explore the findings of our latest CEO survey and their implications in the Africa Business Agenda 2016 (www.pwc.com/theagenda).

One of the great advantages Africa has over other continents in riding the disruptive wave is that there's far less legacy to get in the way than in other regions, creating a clean sheet on which companies can develop their own distinctive business models. We see this in the speed that many markets are expanding. We also see it in the blurring of industry boundaries – the coming together of renewable energy, mobile payment and consumer finance is a clear case in point.

The shared economy model that has propelled companies like Uber and Airbnb to the top of their respective industry standings is also deeply ingrained within Africa. Uber is here, but so are a host of home-grown rivals. The shared model is also evident in the growing number of networks that enable millions of one-person businesses to seek work, acquire market intelligence and trade beyond the previous confines of their locality.

Valuable potential

So where is the future potential? In this report, we explore the current and potential impact of disruptive technologies in six key areas:

1 Driving efficiency in business and public services

Technology has the potential to open up new markets, increase choice and speed up delivery.

Digital connectivity is at the heart of these developments, not only by increasing the availability of goods and services, but also enabling colleagues and innovators to work together in virtual communities. Yet while mobile connectivity is well-advanced, internet availability lags behind. Less than 30% of African people have access to mobile broadband (compared to 43% in Asia) and only 15% have internet at home[3]. The devices they connect through also tend to use relatively old technology, which limits the variety and volume of content that can be accessed and downloaded. Improvements in internet access and the availability of new generation devices could not only boost connectivity but also create platforms for other commercial development in areas such as advertising, e-commerce and entertainment.

More effective collection, analysis and sharing of data could in turn improve the efficiency of public services and ensure investment is targeted where it's needed most. Yet while there is a lot of data available, it can often be fragmented, incomplete or out-of-date, making it difficult to target investment, track progress against objectives or enable citizens to hold public officials to account. Greater readiness to share data and make it transparent are therefore crucial to transforming public services.

2 Strengthening trust and combatting corruption

Accurate and comprehensive records of public expenditure are essential in tackling corruption and waste.

Blockchain technology could hold the key. Blockchain creates a tamper-proof record of every transaction and information exchange. This could help to combat fraud. It could also reduce the huge expense dedicated to the gathering and verification of records.

3 Improving market access and ease of doing business

E-commerce has the potential to revolutionise retail in the same way as it has in Europe, Asia and North America.

But as few people have laptops or smartphones, the sales interfaces need to work on simple devices. This reduces the quality of advertising (less graphics and video), as well as the variety of options on offer. Development is also hampered by poor roads, mail systems and payments infrastructure.

Drone technology could help to bypass some of the road and mail problems. But the foundations of reliable addresses and digital payments would still need to be in place to realise the full potential of e-commerce.

3D printing is bringing customised manufacturing within the reach of remote communities. Examples already include prosthetic limbs. Looking ahead, 3D printing could revolutionise manufacturing by shifting the focus from high investment in machinery and the search for lower labour costs – the model that propelled the 20th century industrial boom in Asia – to a world in which technology is relatively cheap and the real source of value is the creativity of the people who use it. And Africa's lack of legacy would enable it to leapfrog countries with more traditional industrial bases and move to the forefront of this new industrial revolution.

4 Strengthening healthcare and crisis prevention

Technology is helping to overcome the traditional barriers of distance and limited access to healthcare.

3 ITU [insert publication and date]

Examples range from portable eye examination kits to cardio screening, which can be transmitted for diagnosis by a remote specialist. In turn, big data analysis and drone surveillance are helping to detect early signs of a potential epidemic and then track its spread to help target care and contain the outbreak.

Policymakers and businesses can work together to bring these technologies into mainstream use, which would help to improve access, reduce costs and free up personnel within overstretched healthcare systems.

5 Promoting education, innovation and job creation

Innovation hubs create opportunities for established businesses to partner with start-ups and create thriving ecosystems of creativity and enterprises. Yet many of Africa's tech hubs lack the infrastructure (IT, internet, power and roads), technical expertise, investors and regulatory support to realise their potential. Governments can play a key role in providing the regulatory support and development of telecoms, power and other infrastructure needed to bring hubs to full potential.

6 Bringing the informal sector into the mainstream economy

Mobile connectivity enables banks and telecoms providers to reach out to previously unbanked customers with low-cost accessible services. Successful examples include Kenya's M-PESA payments platform, which has provided the foundation for access to credit and other services including power and higher purchase goods.

The blurring of industry boundaries and creation of new commercial ecosystems are at the heart of these developments. Increasing inclusion still further requires a rethink of regulation. It also demands a rethink of how enterprises with very different business models such as banks and mobile networks can work together within successful joint ventures. Our experience suggests that a potentially more compatible model might be an intermediary or spin-off company that operates at arm's length from the two parent groups.

Priorities for action

So how can businesses and policymakers capitalise on the potential? Drawing on our market experience and wide-ranging market analysis conducted for this report, we believe that there are five fundamental priorities for mainstream businesses, disruptors and policymakers:

Mainstream businesses

1 Disruption isn't just a tech opportunity

Connectivity is breaking down barriers between business sectors and opening up new markets for industrial and consumer goods. Further commercial potential comes from developing the physical, financial and telecoms infrastructure along which this commerce flows.

2 Create ecosystems of innovation

Africa has a growing array of tech hubs and 'technopreneurs'. Partnerships provide access to innovation. They in turn can use the market presence to trial products and gain the scale bring innovations into the mainstream.

3 Broaden your outlook

By making products and services cheaper, more accessible and easier to use, disruption is greatly enlarging Africa's consumer class.

While companies have traditionally focused most attention on the 'upper' and 'middle +', what we at PwC call the 'global emerging middle' offers an even bigger prize a US$6 trillion global market by 2021[4].

With more than two billion consumers (including a large proportion of Africa's population), the global emerging middle (annual income US$996-US$3,945) sits just below the conventional middle class in income terms. But its aspirations for the quality and performance of its products are in sync with higher segments. And our research shows that once a company has established itself in the emerging middle, customers will carry their loyalty with them as they continue to increase their income.

4 Be prepared to experiment

Innovations that would have needed years to take hold can now become expectations in a matter of months. As a result, long drawn-out business planning is now too slow – by the time you've got to market, it's already moved on. Success requires a disruptive mindset – quick to market, quick to gain feedback, learn and adapt and, if you fail, fail fast and move on.

5 Think differently about your workforce

A disrupted economy demands people who are creative, collaborative and ready to embrace change. The innovators won't just be tech specialists and data scientists, but also people with the engagement skills to get closer to customers and understand their needs. It's also important to think about how people will work alongside artificial intelligence within new hybrid workforces.

4 Profitable growth strategies for global emerging middle, PwC, 2012 (http://preview.thenewsmarket.com/Previews/PWC/DocumentAssets/228841.pdf).

Disruptors

1 One size fits none

Western models won't work in Africa – the lack of legacy and pace of change mean that Africa is already beginning to leapfrog other continents. Similarly, no model can be transferred intact from one African country to another. Successful disruptors have developed business models that serve specific market needs and recognise the differences in regulation, market structure and consumer preference in different parts of Africa.

2 Look beyond technological innovation

Software solutions and other technological advances won't work on their own. The real key is developing an effective business model and ensuring customer relevance. African consumers are crying out for home-grown content on their digital channels, for example. But content delivery needs to take account of the generally limited availability of wi-fi and use of old style 'brick' devices.

3 Think about where you fit in

Some disruptors have been able to carve out new markets from scratch. But most successful African start-ups have slotted themselves within gaps in existing markets and been able to develop revenues by speeding up delivery or broadening access. A clear case in point is the use of mobile data to verify location and support loan applications. As mobile and Internet of Things connectivity take hold in Africa, this data, rather than the devices and equipment that feed it, could become the real money spinner.

4 Think scale before it's too late

Many successful start-ups have been built on the platforms created by parent companies or joint venture partners. But as businesses expand, they may begin to outgrow the original platform or find that it prevents them from moving into new markets. It's therefore important to look at how to build up growth capacity and market reach further down the line, though new partners, standalone structures or separation and Initial Public Offering (IPO) from the parent business.

5 Expect resistance from vested interests

Large established players can be expected to push back against regulation that enables new entrants to take away market share – or even make their own business model obsolete. Partnership may be the only way to gain market access for now, but once up and running, you can begin to convince policymakers that the innovation and competition you offer is in the long-term interests of the market.

Policymakers

1 Embrace change as an opportunity

Technological disruption is bringing power, telecommunications and financial inclusion to communities that have been missed by mainstream utilities and financial services providers. It's important to regulate businesses that are growing rapidly and operate within systemically critical areas of the economy. But the need to regulate shouldn't be a veil for protecting vested interests.

2 Let the data flow

Government data is a huge and underused resource. Disruptive technologies are helping to map disease and target response. They're also helping to identify infrastructure, healthcare and education needs. It's important for governments to play their part by improving the quality of their own data, being prepared to share it and using the insights to target investment and improve the efficiency of public services.

3 Leapfrogging developments elsewhere

As technology becomes more affordable and easy to use, Africa has an opportunity to take advantage of the latest developments. This might be fibre optic or 4G telecommunications.

4 Putting agriculture at the forefront of development

Agriculture has continued to be at the back of the queue for investment. As our report highlights, it's also one of the areas where innovation is most needed but has been hardest to reach. Smart development would have agriculture at the forefront, bringing unused land into production, using the latest technology to boost yields and moving up the value chain into areas such as seed development.

5 Scrutiny is a fact of life

Digital connectivity will heighten scrutiny of government. But this is also a chance to foster greater transparency and trust. Blockchain technology offers a unique opportunity to combat corruption and fraud in public office.

Once in a generation opportunity

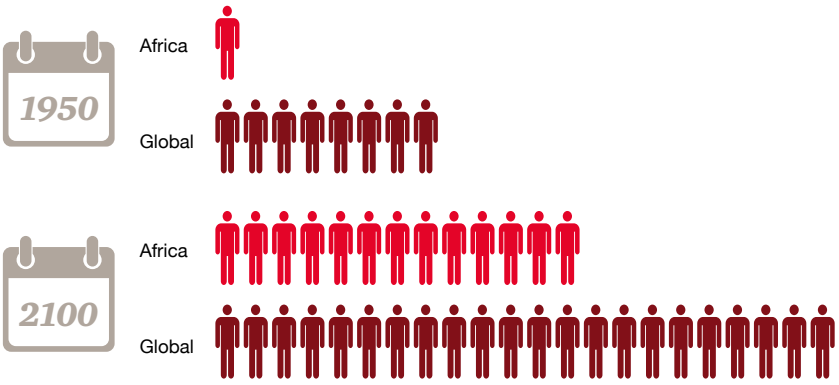
These are exciting times. From mobile banking to renewable energy, Africa is leapfrogging developments in other parts of the world. Businesses and governments have an unprecedented opportunity to harness Africa's digital revolution to deepen and broaden prosperity across the continent. Let's make sure we use it.

Introduction: The power and potential of digital disruption

Technological disruption is transforming markets and societies across Africa in ways that wouldn't have been possible even five years ago. And this opens up huge and still largely untapped commercial potential for domestic and international businesses.

Figure 3: Demographic dividend

Africa's total population versus rest of the world



Source: UN DESA

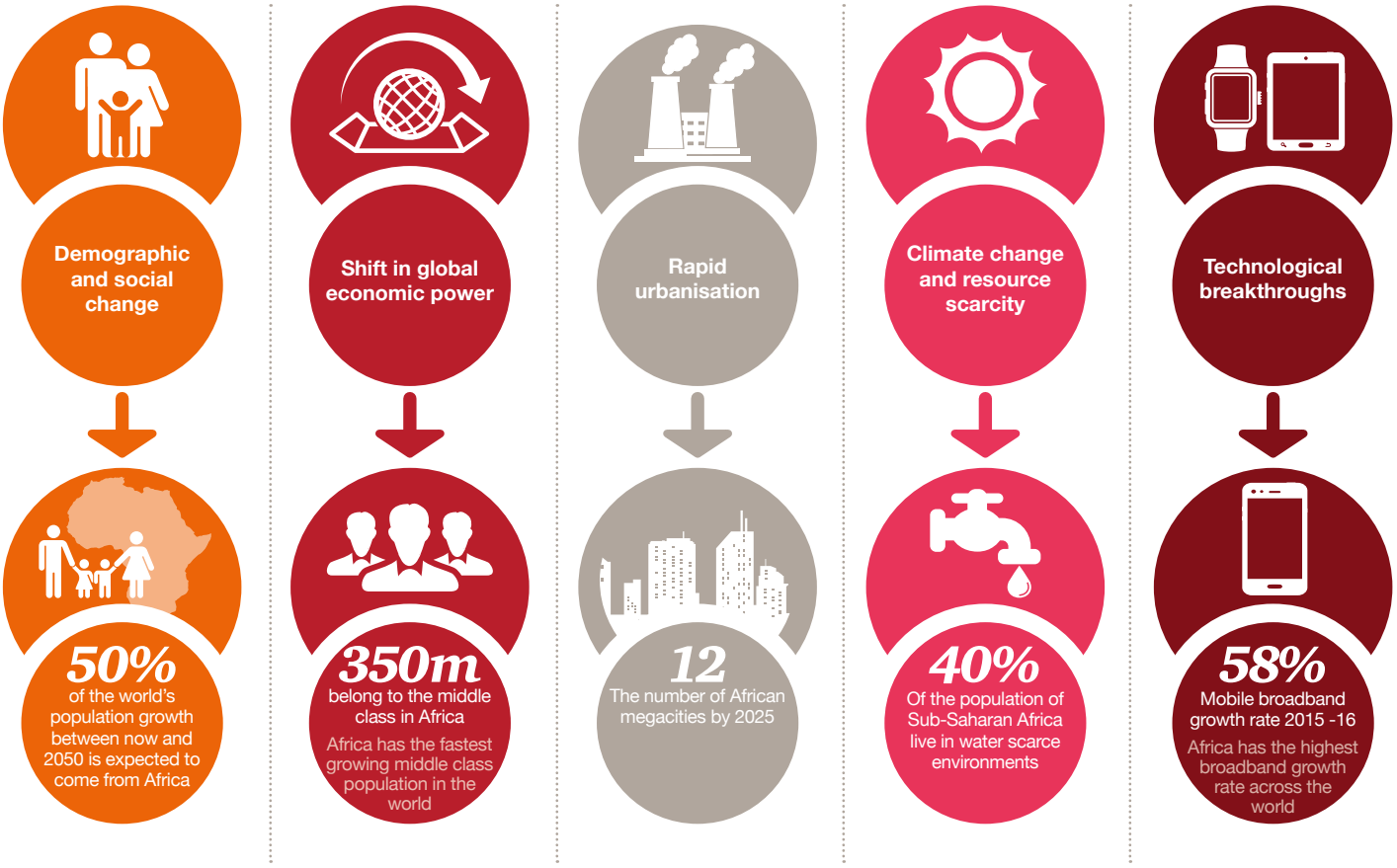
From the demographic dividend of a young and rapidly expanding population (see Figure 3) to an increasingly affluent and aspirational middle class, Africa has the potential to become a new powerhouse of production and consumption in the 21st century, just as Asia was able to do in the late 20th.

As we explore in our five global megatrends (see Figure 4), accelerating consumer demand and urbanisation[5] will create new target markets for domestic and international businesses. The availability of working age labour could also see a large proportion of manufacturing and service output shift from ageing Asia, Europe and North America to Africa by the middle of the century, though only if there are major improvements in education, infrastructure and health.

Cutting across all these transformational trends is technology. Three-quarters of the 153 African business leaders taking part in PwC's latest annual global CEO survey see technology as one of the three trends that will transform customer, employee, government and other key stakeholder expectations over the next five years (see Figure 5).

5 By 2030, half of Africa's population will be living in cities, compared to a third today (Urbanization in Africa: Trends, Promises, and Challenges, World Bank, 1 June 2015 http://www.worldbank.org/en/events/2015/06/01/urbanization-in-africa-trends-promises-and-challenges and UN Populations Division, World Populations Prospects, 2015 Revision http://esa.un.org/unpd/wpp/Download/Standard/Population/).

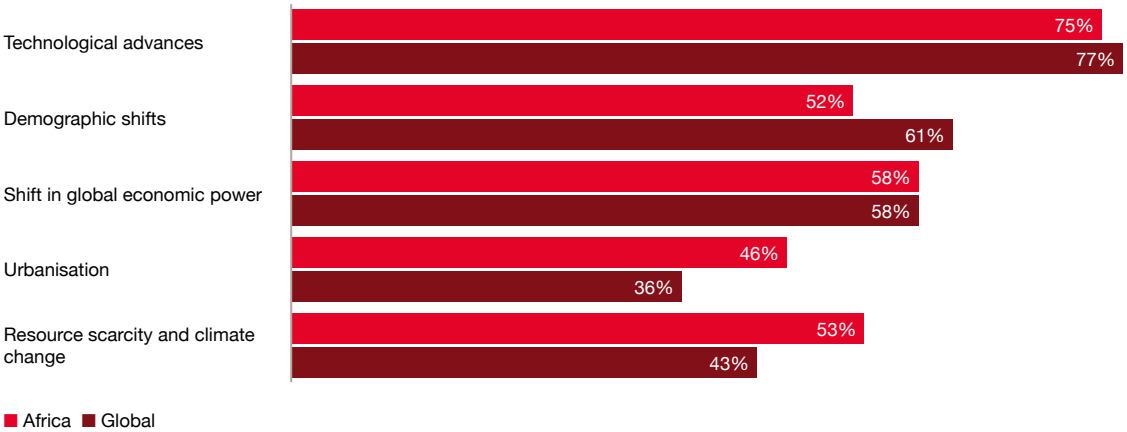
Figure 4: Megatrends



Source: PwC Megatrend analysis

Figure 5: Transformational trends

Q. What are the top three global trends which you believe will be most likely to transform wider stakeholder expectations of businesses within your sector over the next five years?



Source: PwC 19th Annual Global CEO Survey[6]

6 We explore the findings of our latest CEO survey and their implications in the Africa Business Agenda 2016 (www.pwc.com/theagenda).

Figure 6: Change in approach to R&D

Q. To what extent are you making changes in response to changing stakeholder expectations in how you maximise the societal value of your R&D and innovation?

Source: PwC 19th Annual Global CEO Survey

Once digitally connected, people can gain access to products and services that would have been beyond their physical and financial reach before. This already includes the kind of cheap, fast and convenient access to financial services that even the most extensive branch networks can struggle to provide. And disruption is now bringing affordable electrical power, internet access and e-commerce product delivery to homes and businesses that were until recently seen as too remote to be within these orbits.

This connectivity is the essence of disruptive transformation, creating new markets, bringing in new customers, enabling new entrants to seize the initiative and challenging incumbent providers to up their game or slip into obsolescence. These possibilities have also given rise to a new wave of 'technopreneurs', innovators who see new opportunities for technology-based business models in growing markets. As Figure 6 highlights, this surge in innovation is changing how companies in Africa and other parts of the world approach R&D.

In Disrupting Africa: Riding the wave of the digital revolution, we explore how disruptive innovation is transforming markets and societies across Africa. The report is divided into six key themes reflecting the challenges and opportunities opened up by new technology and their implications for businesses and policymakers:

1. Driving efficiency in business and public services
2. Strengthening trust and combatting corruption
3. Improving market access and ease of doing business
4. Strengthening healthcare and crisis prevention
5. Promoting education, innovation and job creation
6. Bringing the informal sector into the mainstream economy

The transformational innovations we feature range from drone delivery services to affordable new solar-powered units, the use of blockchain ledgers to combat fraud to harnessing robotics and big data analytics to map the prevalence of disease and target medical aid. Disruptive technologies can create their own demand dynamics – the smartphone is an enduring example. But in most cases, disruptors probe for gaps and weaknesses in existing value chains and then seek to offer services that are faster, easier and cheaper. Disruption also operates across blurred lines – companies are using repayments on solar systems to create credit histories for their customers and hence provide access to loans, for example.

Seizing the prize

As international investors, you too could be at the forefront of this disruptive revolution. The keys aren't just technology, but customer insight and the ability to apply innovation in Africa's diverse and distinctive markets.

Clearly, obstacles will need to be overcome to realise the full potential. These include promoting financial inclusion, consumer awareness and the development of a reliable digital infrastructure. They also include combatting corruption and vested interests. But by democratising technology and fostering empowerment, disruption can play a key role in clearing away these barriers to progress and prosperity.

Glossary of digital disruption

What are the technologies that are driving innovation and change, how are they being used in Africa and what is the future potential?

Big data analytics

Computer capacity and data availability/flows (both structured in areas such as contracts and government records, and unstructured in areas such as internet search and social media) are increasing exponentially. This enables businesses and public bodies in Africa to not only gain more insights into what's happened, but also predict and respond in real-time.

Big data analytics offers the win-win of better outcomes and more efficient use of resources. It enables businesses to target and tailor products and services with ever greater precision, which is a huge advantage in such a diverse market. Analytics are also being used to map the incidence of disease and target treatment and prevention.

We've always had analytics. The disruptor is that the price of these tools is coming down sharply and they're becoming much easier to use, which is opening them up to local government and a broader range of communities and enterprises

Blockchain

Blockchain creates a permanent and unchangeable record of every transaction and information exchange between different parties.

The most high-profile application of blockchain has been the cryptocurrency, Bitcoin. This model is now being applied to reduce the cost of remittances to and from African countries[7].

Yet in many ways the biggest potential comes from the ability to create trusted tamper-proof records. This could help to improve record-keeping and combat fraud within businesses and governments. It could also reduce the huge expense dedicated to the gathering and verification of records. This could have important applications in banking[8] and trading businesses. It could also lead to greater transparency in government.

Drones

While the primary use of drones (unmanned aircraft) was once combat operations, there are now more in civilian than military use around the world.

Commercial uses include product delivery. Insurers and public bodies can also use drones to survey infrastructure and disaster zones to target vulnerabilities and repairs.

The disruptor is the fall in price, which is bringing longer range and easier to control models into the reach of more and more businesses, public bodies and remote communities across Africa.

7 The average cost to send funds to Africa remains at 9.6%, the highest transaction fee in the world, compared with just 5.6% for South Asia – Remittance Prices Worldwide, World Bank, 18 June 2016.

8 Recent estimates suggest that consistent use of blockchain in anti-money laundering checks could save US$2.5bn of the estimated US$10bn global processing costs in the banking sector ('Profiles in Innovation Blockchain: Putting theories into practice', Goldman Sachs, 24 May 2016, http://www.the-blockchain.com/docs/Goldman-Sachs-report-blockchain-Putting-Theory-into-Practice.pdf).

Sensors/Internet of Things

From fridges to freight trucks, sensors can track how equipment is running, how it's being operated and external factors such as weather.

South African companies have been pioneering the use of sensors to monitor driving as they look to reduce accidents. They're also leading the way in the use of health monitors to detect signs of ill health and remind people to take regular medicines.

The Internet of Things (IOT) takes sensor technology to the next level by connecting up all the sensors and communicating the data for tracking, analysis and response. Uses include enabling companies to detect equipment faults and arrange prompt repairs.

The move to a new generation of 4G and 5G mobile connections will open further IOT possibilities, by turning everything from a TV to a toothbrush into a constantly monitoring and communicating smart device.

FinTech

In a continent in which levels of financial inclusion remain low (only 34% of people have bank accounts and 6% have access to formal borrowing[9]), the transformational potential of mobile finance services is already evident in the rapid growth of the M-Pesa and MTN Money networks. A study by the Pew Research Center found that three out of ten African cell phone owners in the Pew study say they use their phone to make and receive payments[10].

Yet in many ways, mobile payment is just the beginning. FinTech now embraces everything from insurance and remittances to the hugely underserved agricultural and SME lending markets. Many leading mobile phone companies now offer a range of health, life, crop and funeral insurance micro-cover. Some offer insurance as an add-on incentive for people taking out a certain amount of credit, helping to improve loyalty and retention in a market in which people often use multiple operators as they seek out the best deal.

Renewable energy

In a continent in which more than 600 million people aren't connected to their national grids[11], low-cost solar cells bring sustainable power generation to homes in remote communities and informal settlements, as well as to SMEs, in a way that conventional national grids have struggled to do.

This has increased mobile connectivity and, as a result of better and cheaper lighting, improved security and given more study time for children. Many people use mobile payment services to pay off the instalments or charges for their solar panels. This in turn gives them a credit history, which can be used to gain access to finance.

9 World Bank (http://datatopics.worldbank.org/financialinclusion/region/sub-saharan-africa).

10 'Cell Phones in Africa: Communication Lifeline', Pew Research Center, 15 April 2015.

11 International Energy Agency estimate 2015.

Robotics

Robotics is a wide field covering the analysis, customer engagement and automated operations delivered by intelligent machines.

The advantages of artificial intelligence, machine learning, robo-advice, algorithmic-trading and other forms of robotics aren't just increased speed and lower costs, but their ability to constantly learn and refine, opening the way for ever greater precision, customisation and adaptation. Robotics may eventually be the only feasible way to make sense of the torrent of data flowing through your organisation, which could very soon begin to defy human comprehension.

The applications include faster and more informed customer service and the ability to serve multiple markets in multiple languages from one centre. By taking care of routine tasks, robotics can also free up what may be limited numbers of trained personnel to focus on more value-adding activities.

The broader impact will be felt in areas ranging from urban development to telecommunications as robotics change how people are deployed and in what numbers.

Shared economy

Digital connectivity is enabling people in Africa to share resources (e.g. crowdfunding), seek out new sources of finance (e.g. peer-to-peer lending) and do business through a common platform (e.g. Uber model).

The shared economy is a familiar concept in a continent whose economies are based on close personal ties and the pooling of resources. Many thousands of Africans run one-person businesses, driving taxis or repairing machinery and clothing, but their ability to sell their services has depended on their local network and word of mouth. Connectivity allows sole traders and small businesses to share their labour, and capital, with a much larger group of potential consumers.

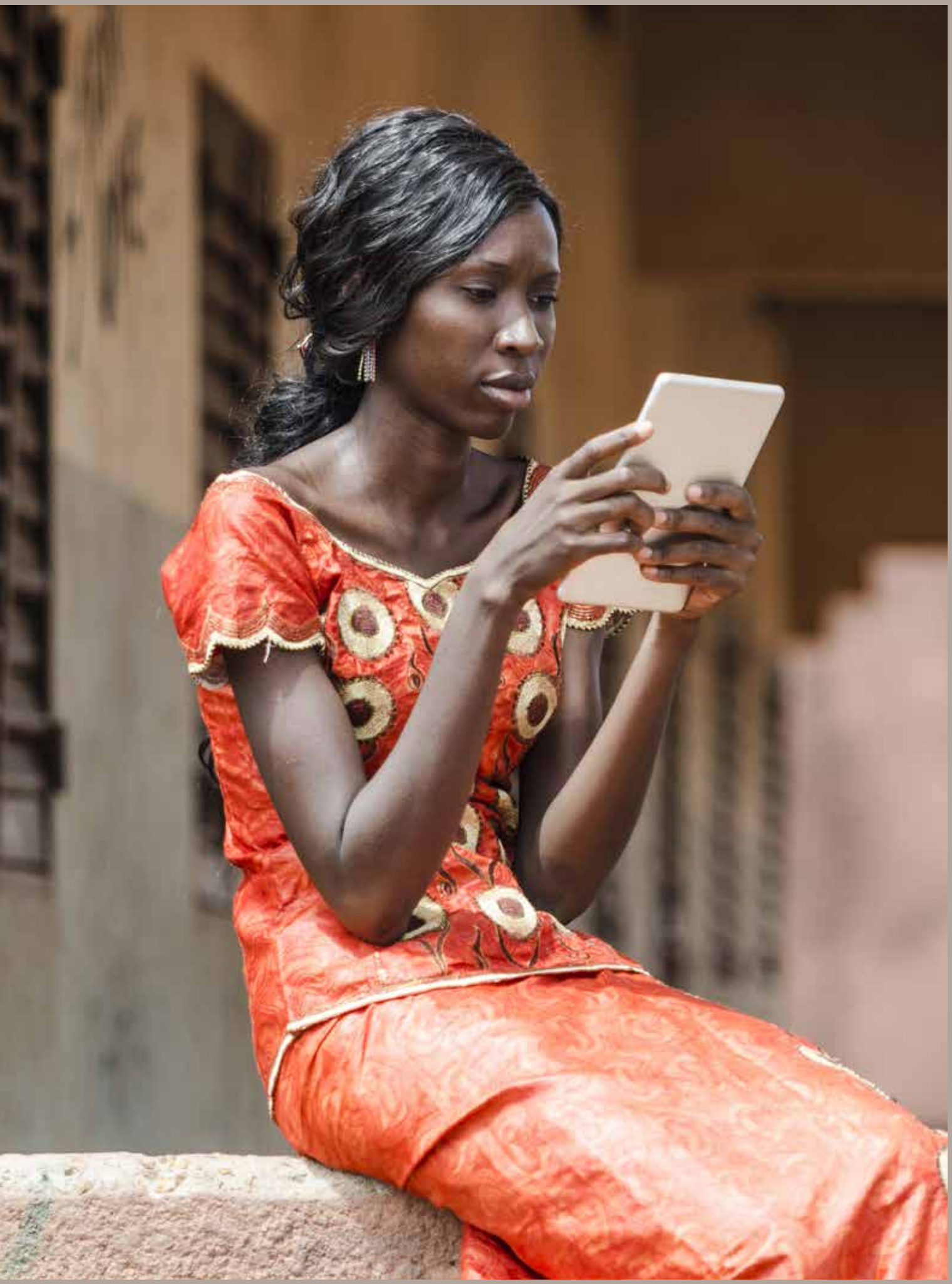
Rather than waiting for government investment, crowdfunding would enable residents and businesses to gather enough investment to build new roads, schools and clinics, while having direct control over the award of contracts and how the funds are spent.

3D printing

3D printing brings customised manufacturing to your doorstep. As it becomes cheaper, 3D is being used to produce everything from spare parts to prosthetic limbs and precision tools in places in Africa that are too remote or difficult to reach.

As the sophistication of 3D printers increases, it could soon be possible to print machinery, vehicles and aircraft, which could be assembled locally.

3D printing changes the value dynamic by making location and labour costs less important in product choice than design skills and innovation.



Capitalising on the potential: Six priorities for transforming societies and economies

Disruptive technologies can help Africa to unleash its full creativity, ingenuity and enterprise. From extending connectivity and inclusion to targeting public investment and strengthening trust in government, our six priorities cover what we believe are the key building blocks for capitalising on disruption and forging a more prosperous future.

While there may be other ways to define the critical issues, we've found that in discussions with businesses and policymakers a strategic grid that looks at:

1 developing capabilities
2 building trust
3 broadening access
4 promoting health
5 fostering innovation and
6 ensuring that everyone benefits

can help people to make sense of the disparate developments, gauge their impact and develop an effective and proactive response.

Within each of the priority sections, we explore the progress to date, the opportunities ahead and the steps governments and businesses should take to realise the potential.

1

Driving efficiency in business and public services

Technology has the potential to open up new markets, increase choice and speed up delivery. But barriers remain. How can they be overcome?

Boosting connectivity

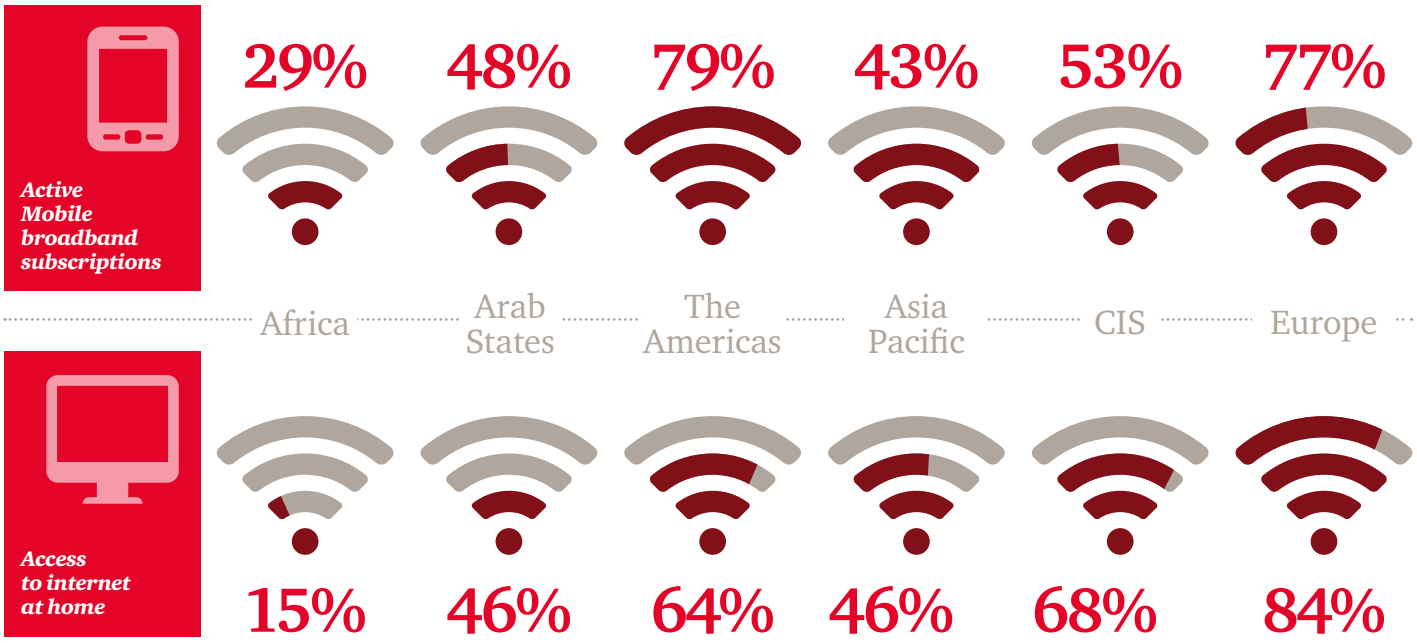
Connectivity is the essential bedrock of disruptive development, not just in linking consumers to businesses, but also enabling innovators to share ideas and seek funding and advice through the shared economy.

Yet while mobile connectivity is well-advanced, internet availability lags behind. Less than 30% of African people have access to mobile broadband (compared to 43% in Asia) and only 15% have internet at home (see Figure 7).

Beyond limited coverage, the barriers include high costs. Most people are on pay-as-you-go plans – downloading a movie can cost several days' pay. Mobile hot spots are available, but they're generally confined to urban areas and beyond the means of most people.

Further obstacles include devices, most of which use old technology and are not set up for smart access. Finally, the preponderance of Western-orientated news and entertainment content deters many African people from using the internet.

Figure 7: Access to the internet



Source: ITU

Opportunities and priorities for business

- Developing affordable devices and data usage plans, along with high quality home-grown content.

Facebook and Google are leading the way through the launch of stripped down services or agreements with mobile providers to waive download charges for accessing their services. Facebook is also looking into drone-delivered wi-fi. Africa represents an important growth market for these global giants. But as China and India have shown, there will also be openings for home-grown companies. One of the companies looking to put an African stamp on mobile content is iROKO, which recently secured funding from Canal+.[12]

Opportunities and priorities for policymakers

- Working with telecoms providers to increase broadband coverage.

Targeting investment in public services

More effective collection, analysis and sharing of data could improve the efficiency of public services.

Yet while there is a lot of data available, it can often be fragmented, incomplete or out-of-date, making it difficult to target investment, track progress against objectives or enable citizens to hold public officials to account.

Affordable access

Blupoint produces small and portable intranet hubs, supported by a cloud-based content management platform, which delivers free and curated content to their users. BluPoint is primarily intended for schools, health centres and local communities, as well as businesses looking to provide digital products and services in a non-digital environment.

Each hub has a memory of up to 1TB, sufficient to hold 8,000 movies. Content can be downloaded using wi-fi or Bluetooth to any phone or device, with a range of 12m for Bluetooth and 140m for wi-fi[13]. Blupoint hubs can operate alone or be linked into networks over a large area.

The company has deployed Blupoint hubs in schools in South Africa and Tanzania as part of its mission to reach 20 million people in 20,000 communities by 2020.

12 iROKO media release, 25 January 2016 (http://iroko.ng/iroko-closes-on-19m-content-capital-deals/)

13 Blupoint hubs also transmit radio, but the signal can only be picked up within 12m of the hub (this is so owners of the hubs do not need to apply for a radio licence).

Drones could offer part of the answer by providing up-to-date monitoring and tracking. We at PwC have been developing a fleet of surveyor drones to help clients monitor infrastructure, manage construction sites and carry out insurance assessments. The drones are also being used to support town planning by mapping buildings and land usage, formal and informal, in urban areas. The drone surveillance in Lagos will help the local government to verify property ownership, improve postal services and collect taxes on unregistered properties.

Key data and analysis could also come from using unstructured mobile data to verify where people live, their income and spending habits. Properly used, this data could help governments to better estimate where populations are concentrated, ind out the areas where deprivation is most severe and hence where to target investment and services.

Further initiatives include new one-stop portals to pay bills and manage services such as passport application. Examples include Kenya's eCitizen portal[14]. South Africa's Yowzit for Government[15] goes further by enabling citizens to post online reviews and ratings of public services. The results help to create a daily updated 'Top 5' rankings for education, health, recreation, municipal services, arts and culture, justice, social services and sport.[16] This is both revealing for users and an aid to government in pinpointing areas in need of improvement.

Opportunities and priorities for business

- Work with government to share data that could support better planning and public services, and provide the basis for joint initiatives in areas such as housing and infrastructure development

Opportunities and priorities for policymakers

- Look at opportunities to augment information gathering using drones, mobile data, payments and other new data sources
- Work with companies to develop protocols for data sharing that provide information for use in planning, while protecting confidentiality

Smart farming

Agriculture is by far the largest employer in Africa. There have been many attempts to modernise techniques, boost yields and improve the livelihoods of farming communities. But progress has been slow and uneven. Plots are small, irrigation is rare and wastage is high.

Mobile connectivity is providing channels to communicate information to farmers about their crops and livestock. They range from advice on animal husbandry (i-cow) to apps that give the latest market prices and as a result hence help remote producers to secure a fair deal from wholesalers.

The focus of innovation also includes crop insurance. Several companies are using mobile platforms to deliver crop insurance, drawing on their ability to aggregate large numbers of farmers and to cheaply collect data about them. A leader in this field is Acre Africa, which uses local solutions to reduce climate-associated risk for farmers [17]. The company is experimenting with the direct monitoring of crops while they are still in the field (using microchips in each plant bag), which can enable more accurate predictions of crop yields in real time.

Opportunities and priorities for business

- The key gap in the market remains finance. After several false starts, mobile lenders are coming to recognise the importance of offering packaged services such as credit advice or lending and insurance
- Seed development also offers significant opportunities. Micro-sensors allow developers to tailor varieties to local conditions more effectively. Using mobile connectivity to improve after-sales advice and support is also crucial in maximising the potential of new 'smart seeds'

Opportunities and priorities for policymakers

- Agriculture has continued to be at the back of the queue for investment. But Africa represents an extraordinary resource, not only capable of supplying domestic needs for multiple African nations, but also of becoming a major source of world food supplies[18]
- Smart development would put agriculture at the forefront, bringing unused land into production, deploying the latest technology to boost yields and moving up the value chain into areas such as seed development

14 https://www.ecitizen.go.ke/.

15 http://govza.yowzit.com/.

16 There are plans to add the home office and post office in the near future.

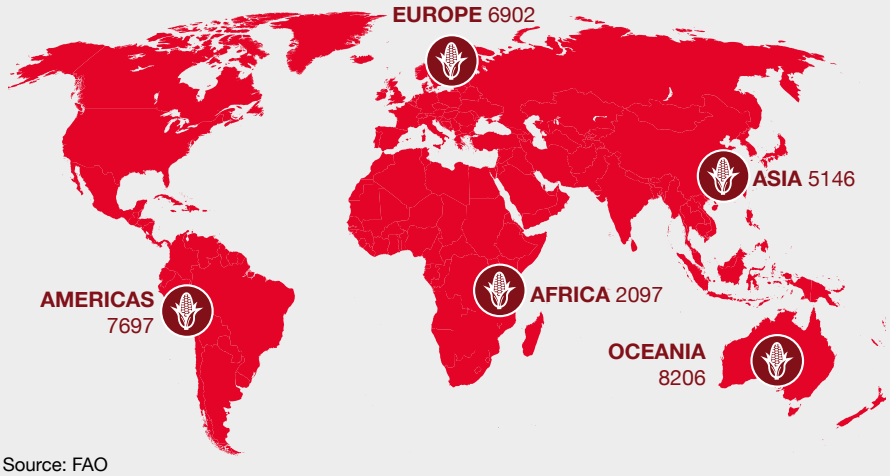
17 http://acreafrica.com/.

18 We explore the future of agriculture further in Food Security in Africa (http://www.pwc.com/gx/en/issues/high-growth-markets/assets/food-security-in-africa.pdf).

The Ethiopia Commodity Exchange (ECX)

Farmers across Africa struggle to optimise yields (the comparison of maize yields in Figure 8 highlights this). It's also difficult to store produce, get their goods to market and secure a fair price.

Figure 8: Average maize yields, Africa versus rest of the world



Source: FAO

The ECX seeks to address these challenges by providing a single platform for producing, grading, storing and trading soft commodities. The ECX brings together farmers, traders and regulators. The backbone of the ECX is its warehousing network, which consists of 65 warehouses spread across Ethiopia and 20 delivery centres. Farmers deposit their soft commodities at one of the centres where is the produce is sampled, graded and bagged, and then it can be traded on the exchange. The trading floor at the ECX headquarters in Addis Ababa trades over 200 different contracts each day ((US$1.2 billion in 2015). The ECX currently handles seven commodities, led by coffee (around 70%), sesame and peas, but there are plans to trade cotton, sugar, teff (Ethiopian wheat), barley and horticultural goods.

Lack of market information has meant that many farmers under-price their produce. A key priority of the ECX is to improve access to market data. The exchange delivers real-time prices to farmers through three channels: SMS messages (800,000 requests per month), interactive voice response (IVR, 1m requests per month) and 160 price tickers located at ECX hubs across the agricultural zone. By getting farmers to deposit their crops in its warehouses, the ECX not only helps cut post-harvest losses, but it also gives farmers the option to self-finance through the warehouse receipt system. The impact on their livelihoods has been palpable, with coffee farmers now receiving an average of 60% more for their coffee than before.

Figure 9: ECX's warehouse and price ticker network

Source: ECX

The next wave of innovation at the ECX includes the digital tracking of commodities through to end use to help guarantee quality, an e-trading platform that can handle up to 100,000 contracts per hour (many times the volumes of the trading pits) and an app that allows farmers to trade their own commodities. These innovations will help farmers to secure better prices for specialist coffees and allow them to develop their own brands. The ultimate aim of the exchange is to trade futures contracts.

Smart Cities

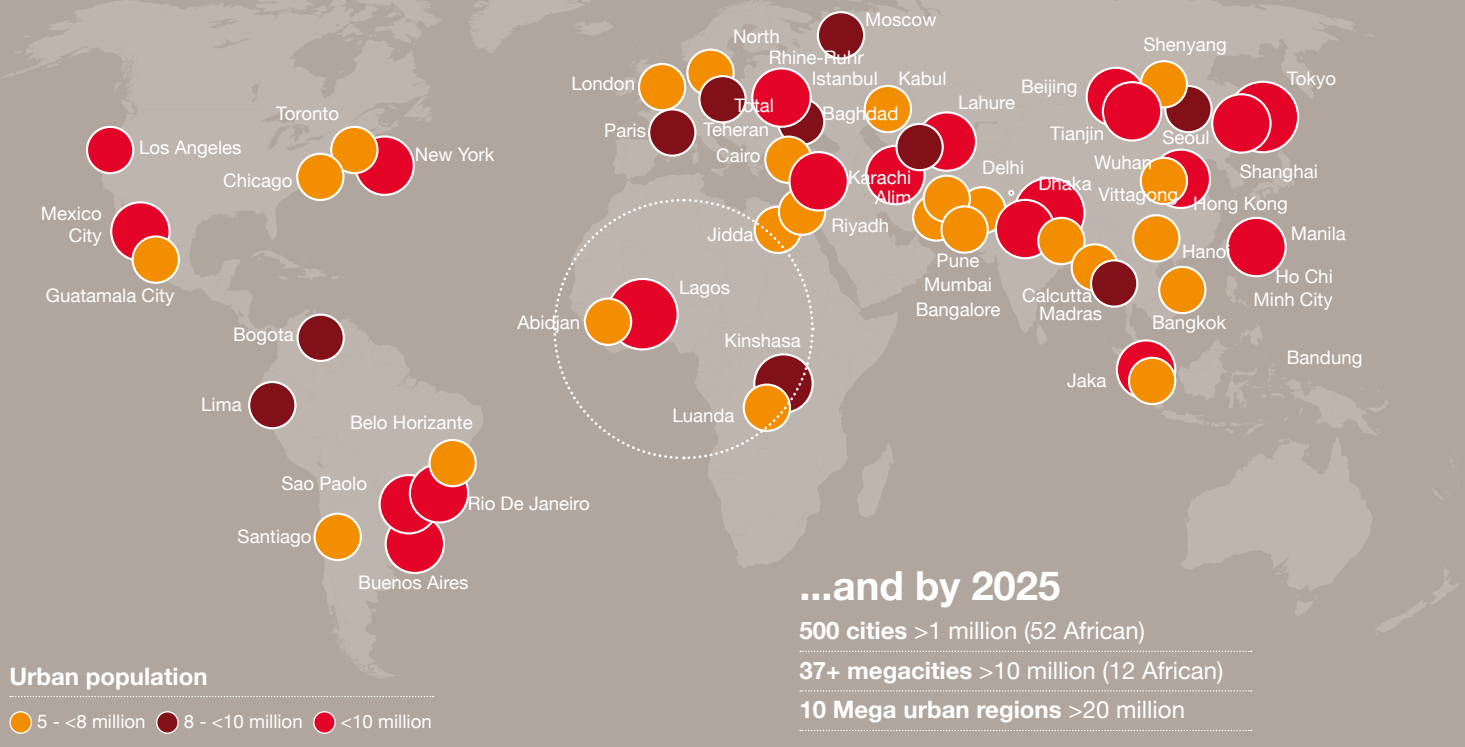
'Smart Cities' use technology to improve the efficiency of the city's infrastructure and the quality and reach of social services. In a Smart City the information and communications technology (ICT) network is fully integrated into the public infrastructure, managing public records, schools and hospitals, transport systems, power plants, water and waste services and law enforcement. This network lets the authorities monitor traffic and growth of the city, respond effectively to emergencies and engage directly with the citizens living there.

Cities of opportunity – a holistic ecosystem

Source: PwC

Africa will house some of the largest cities in the world, including Lagos, Kinshasa and Abidjan

Biggest urban population concentrations in 2015



Urban population

5 - <8 million 8 - <10 million <10 million

...and by 2025

500 cities >1 million (52 African)

37+ megacities >10 million (12 African)

10 Mega urban regions >20 million

Source: UN Department of Economic and Social Affairs

The city of Lagos is bidding to become Africa's first Smart City. The city will have a network of 13,000 surveillance cameras to co-ordinate traffic and fight crime, a metro and high-speed wireless using 4G LTE (Long Term Evolution) technology. The Lagos government hopes that the project will boost the city's economy by over $10 billion[19].

However, there are major obstacles to overcome. These range from the lack of reliable power to the need to train up a new generation of technical experts to run the smart city's complex IT infrastructure. After being put on hold for a while, the initiative has gained new life following the signing an agreement between Lagos State and the UAE, which has pledged to support the project, drawing on its experience in Dubai.

The way forward

Technology is opening up opportunities to boost digital connectivity, revolutionise agriculture and improve public services. But use of these technologies is still limited. To realise the potential requires better understanding of what is available and what it can do on the one side and the partnership between government and business needed to make the technology accessible and affordable on the other. There is in particular a huge commercial opportunity for companies that can bring broadband and functional smart devices within the financial reach of mass market consumers.

19 The Guardian (Nigeria), 'Smart City Project: Connecting Lagos to global knowledge economy', 17 July 2016, http://guardian.ng/news/smart-city-project-connecting-lagos-to-global-knowledge-economy/

2

Strengthening trust and combatting corruption

Digital technology is opening governments up to greater scrutiny and could eventually make it harder to perpetrate or conceal corruption.

Blockchain as a truth engine

Accurate and comprehensive records of public expenditure are essential in stamping out corruption and waste.

Blockchain could hold the key. Groups of transactions are locked into 'blocks' of data, forming a chain stretching back to the originator. Unlike other payment and record-keeping systems, the blockchain ledger is distributed around a network of computers, each of which can see if the original has been altered. This makes it very difficult to tamper with or falsify these records.

Opportunities and priorities for business

- Businesses have opportunities to develop blockchain solutions that bring together all the stakeholders involved in record-keeping and record-usage. This already includes verification and tracing of diamonds

Opportunities and priorities for policymakers

Potential uses of blockchain and their benefits include:

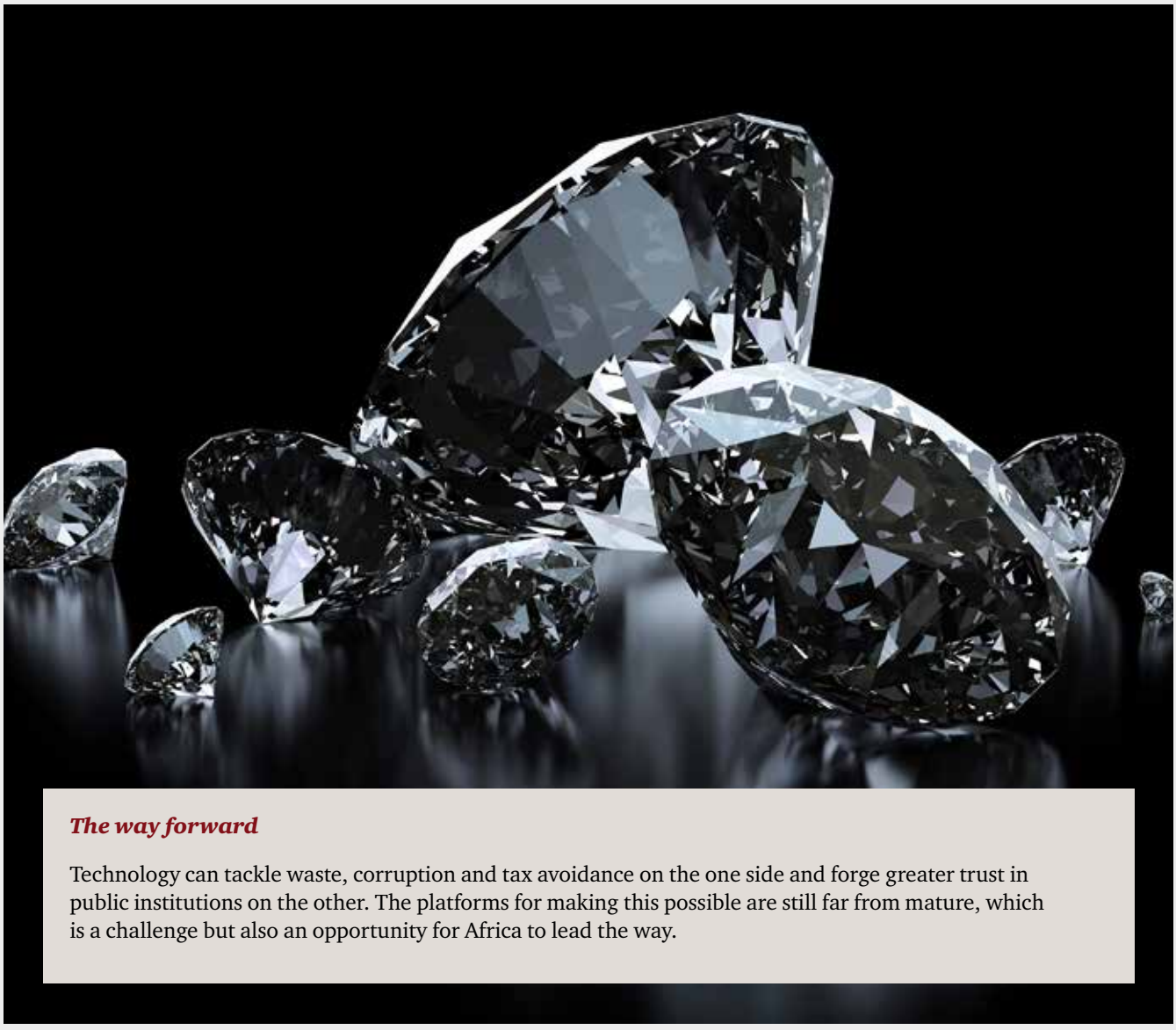
- Public funds: Providing transparent and tamper-proof records of all public spending, down to the local authority level. Could also be used to provide greater transparency in public tenders
- Public sector workforce: Registry of public sector works to combat against ghost jobs
- Public records: Storing information on all citizens from birth and marriage, through to tax and medical records. Would improve voting and medical access. Would also help to combat tax avoidance. People would in turn have full access to all data held on them, helping to tackle falsification and identify fraud
- Land registers: Would help to prove ownership, raise finance against it and avoid disputes.
- ID verification: Records to validate passports and driving licences, and to manage biometric identity card systems

Tracing the diamond back to the mine

Blockchain is being used in Africa to improve the traceability in the diamond trade. Multiple local bodies certify the grade and quality of each mined diamond. But fraudulent certificates can slip into the system, making it difficult to provide insurance cover for diamond traders, and almost impossible for police if they seize stolen or lost diamonds and have no idea where they came from.

The blockchain solution, which has been developed by UK company, Everledger, combines data from insurance companies, law enforcement agencies and certification houses into a single, unfalsifiable ledger containing all data about each diamond.

By bringing together data from multiple sources, insurers can be confident of the value and provenance of the insured diamonds. Police can use the blockchain to discover the origin of diamonds that come into their possession, as well as to identify suspicious cross-border transactions and money laundering. And by having a global ledger, open to all insurers and law enforcement agencies, it can reveal links in international criminal networks and their sources of funding.



The way forward

Technology can tackle waste, corruption and tax avoidance on the one side and forge greater trust in public institutions on the other. The platforms for making this possible are still far from mature, which is a challenge but also an opportunity for Africa to lead the way.

3

Improving market access and ease of doing business

Technology is bringing products and services to new customers, many of who had no access before. But significant investment in physical, digital and payments infrastructure is needed to make the most of the opportunities.

Figure 10: E-commerce potential

■ Total population (180m) ■ Potential e-consumers (60m)

Source: Study conducted in Nigeria by Ipsos on behalf of PayPal

E-commerce: waiting to take off?

Nigeria's experience highlights the opportunities and challenges facing companies in Africa's e-commerce sector.

The Nigerian government expects the e-commerce sector to grow to US$10 billion over the next ten years, reaching 300,000 online orders per day[20]. The country has one of Africa's highest rates of internet usage (47% in 2015).[21] And with an estimated two thirds of Nigeria's internet users having shopped online at least once, there is an e-customer base of almost 60 million Nigerians (see Figure 10)[22].

Nigeria has had many home-grown e-commerce start-ups, but challenges remain. The most significant is the prevalence of internet scams and fraud, which makes many people reluctant to enter card details online. Many others have no credit or debit card, or even a bank account, making cash or mobile payment the only option. Younger Africans are more receptive to e-payment and PayPal is making significant inroads into the Nigerian market, but it's likely to be some years before online payments are universally accepted [23].

As a result, most e-commerce involves cash-on-delivery, which raises the risk of theft, fraud or inability to pay on the day of delivery. There are therefore opportunities for third party payment service providers, who can sit between buyers and sellers, mediating the payment process.

The development of e-commerce is also hampered by digital infrastructure challenges. As few people have laptops or smartphones, the sales interfaces need to work on simple devices. This reduces the quality of advertising (less graphics and video),

20 'Nigeria's e-commerce industry shows growth potential', Oxford Business Group, 27 May 2016, http://www.oxfordbusinessgroup.com/news/nigeria%E2%80%99s-e-commerce-industry-shows-growth-potential.

21 Website of the International Telecommunications Union (ITU).

22 Study conducted in Nigeria by Ipsos on behalf of PayPal.

23 Nigeria has developed its own PayPal equivalent, CashEnvoy, which processes payments for online vendors and auction sites.

as well as the variety of options on offer. It also makes it difficult to sell online TV or movie streaming services, as the cost of downloads is prohibitive. The impending upgrade to 4G services should improve the situation, but until the cost of downloading data falls substantially, these kind of services will remain an option only for the richest Nigerians.

Further problems stem from the limited postal system, clogged roads, inadequate rail connections and customs' hold-ups, which create delays and extra costs in delivery. One solution is using local couriers, but even they can struggle to find addresses, given the prevalence of informal settlements and lack of a national address system for most of the country. Another solution is crowd shipping, using social networks to aggregate deliveries of goods to the same pick-up point. This is a model already used by some retailers, who distribute their goods at strategically located hubs in population centres.

A final challenge is the level of competition, both formal and informal. Nigeria's retail sector is well developed, with many multinational and local giants operating across the country. Together they have huge market dominance, a physical branch network that took years to establish, and pockets deep enough to see off challengers. There is also a vast informal sector, providing a variety of cut-price goods and services. Few informal traders pay sales tax or import duties, and they can undercut the market by sourcing the cheapest goods. Taken together this makes for a highly competitive market, in which the balance of power is stacked against online retailers.

Opportunities and priorities for business

- Secure and trusted payment systems, mobile and online
- Payment and delivery intermediation between retailers and customers
- Closer integration between high street and online retail, using stores to market and collect payment for a broader range of goods available online

Opportunities for policymakers

- Step up development of address system and registration of informal settlements

Drone drop-off

Schemes using drones to deliver small parcels in remote areas are being trialled in a number of countries.

Rwanda is home to one of these trials. The country suffers from an exceptionally high rate of fatalities from post-natal hemorrhage. Many of these deaths could be prevented with a simple blood transfusion. To solve this problem, a robotics company has been working in Rwanda to deliver blood, on demand, anywhere and for a low cost. When a transfusion is required, a healthcare worker sends a text to the central hub, requesting blood. A drone then travels on a set flight plan to its designated co-ordinates. As long as there is a clearing of around three or four car park spaces, the drone can drop the package to parachute down to its destination.

Beyond medical supplies, there is significant e-commerce potential. Several African companies are planning to build drone networks for deliveries in cities and fixed-wing drones for longer distances. Payment could be by cash-on-delivery using a solution built into the drone. If successfully implemented, this new technology could be a breakthrough for the retail sector, enabling the rapid and efficient despatch of high-value or urgent items. But drones will not address the underlying problem, which is the need for better roads and transport networks.

Uber in Africa

The Uber taxi service launched in South Africa in late 2013, and has since expanded to Nigeria (Lagos and Abuja), Nairobi, Accra, Kampala and Dar-es-Salaam, with further cities planned.

Uber has introduced a number of innovations for the local market. In South Africa three bespoke services are offered: UberPOOL, cab-sharing for commuters who regularly use the same routes and times, UberEATS, home delivery of meals from restaurants within a ten minute drive, and UberRUSH, a courier service for urgent packages.

However, there has been strong pushback against Uber from incumbent rivals, with protests in Cape Town, Lagos and Nairobi. Uber also faces home-grown competitors offering a similar model, including Little Cab in Nairobi and Afro in Nigeria. Safemotos, a start-up in Rwanda's capital, Kigali, uses an app that tracks the city's motorbike taxi drivers around the clock, only selecting the safest drivers to operate under its service.

The shared economy model has strong roots in a continent where many people work as sole traders and are keen to find new markets beyond their immediate community. Sometimes it can be as simple as owning a smart phone. In December 2015 Bloomberg reported on a Kenyan who was using his device as a mobile internet café, helping local businesses fill out tax forms online, as well as letting clients send emails[24].

24 'The Solar Company Making a Profit on Poor Africans', Stephan Faris, Bloomberg, 2 December 2015.

Seeing the world in 3D

3D printing is helping to tackle a variety of issues in sectors ranging from agriculture to healthcare. Innovative solutions opened up by this new technology include creating malaria diagnostic toolkits, producing labour-saving agricultural tools and designing prosthetics for amputees.

3D also allows items to be rapidly prototyped, printed on-site to custom specifications, and takes advantage of open-sourcing and user-led design.

While there are numerous possibilities for 3D printing in Africa, a brief look at how the technology is revolutionising the world of prosthetics demonstrates how this technology can reach previously isolated groups and give them the tools to create sustainable solutions.

Over a lifetime, an amputee will typically need upwards of 15 different prosthetics, costing thousands of dollars for replacements and maintenance. At present, there aren't enough trained personnel to produce these in many countries across Africa and importing components isn't only costly, but produces unsuitable hardware for the harsh environments and lifestyles in which they will be used.

3D printing addresses many of the challenges by overcoming a lack of resource, insufficient funds and poor infrastructure. For example, a traditional prosthetic leg in Gambia, a country where the average annual wage is US$380, can cost around US$530[25]. Even in its infancy, 3D printing can cut those costs by more than 90%. A number of African designers have also come up with low-cost 3D printers – one Togolese entrepreneur has even designed one out of e-waste that will set you back a mere US$100[26].

Opportunities and priorities for business

- 3D printing is a technology to watch. Our recent publication, 'Tech breakthroughs megatrend: how to prepare for its impact' lists 3D printing as one of the eight emerging technologies that businesses absolutely need to consider[27]. It opens exciting opportunities to leapfrog existing technologies and offer vital services to many marginalised communities in Africa at a fraction of the cost.

Opportunities and priorities for policymakers

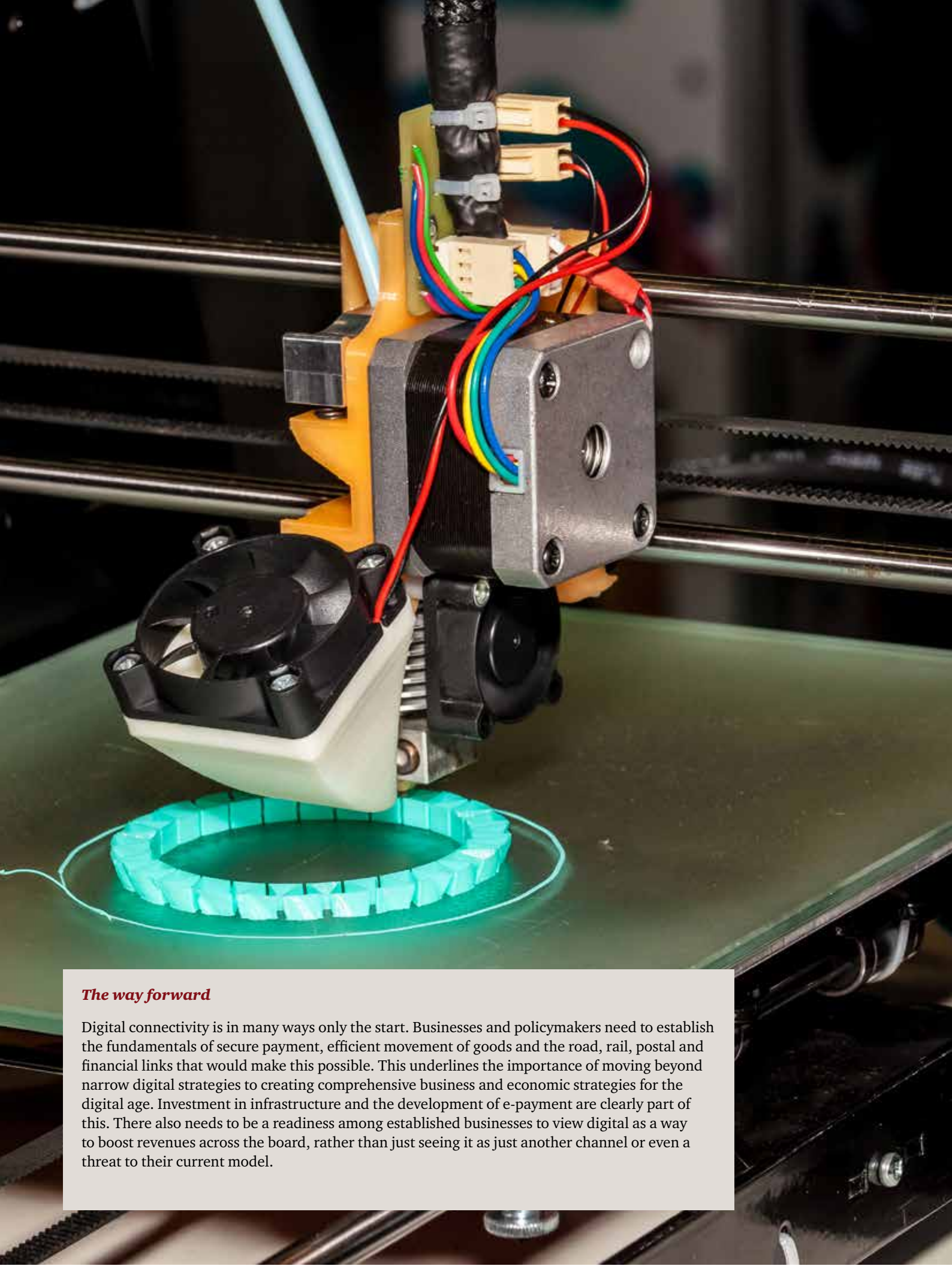
- Access to energy is vital. Even though some printers have been designed to cope with interrupted supplies of energy, there still needs to be an adequate supply to run the printer. The opportunities for extending access to reliable power are explored in Electricity beyond the grid.[28]
- Connectivity is important if users want to take advantage of open-source designs or require assistance from others in modifying their blueprint.

25 https://givenlimb.org/legs-4-africa-provide-1000-prosthetic-limbs-amputees-west-africa/

26 http://www.thisisafricaonline.com/News/A-3D-revolution-in-Africa?ct=true

27 http://www.pwc.com/gx/en/issues/technology/tech-breakthroughs-megatrend.pdf

28 Electricity beyond the grid: accelerating access to sustainable power for all, http://www.pwc.co.za/en/publications/electricity-beyond-the-grid.html"



The way forward

Digital connectivity is in many ways only the start. Businesses and policymakers need to establish the fundamentals of secure payment, efficient movement of goods and the road, rail, postal and financial links that would make this possible. This underlines the importance of moving beyond narrow digital strategies to creating comprehensive business and economic strategies for the digital age. Investment in infrastructure and the development of e-payment are clearly part of this. There also needs to be a readiness among established businesses to view digital as a way to boost revenues across the board, rather than just seeing it as just another channel or even a threat to their current model.

4

Strengthening healthcare and crisis prevention

Disruptive technology is helping to overcome the traditional barriers of distance and limited access to healthcare.

Remote screening

The long trek to remote health centres is still a reality for most people in remote communities. But technology is now beginning to take healthcare to them.

Examples include Peek, a portable eye examination kit. Peek lets users carry out eye exams by taking high-quality retinal images with their mobile phone. Images are clear enough to view cataracts and to detect signs of glaucoma, macular degeneration, diabetic retinopathy and nerve disease. Similarly CardioPad captures data on potential heart complaints, which can be transmitted for diagnosis by a remote cardiologist.

Opportunities and priorities for business

- Development of remote diagnosis and virtual treatment

Opportunities and priorities for policymakers

- Using technology to improve access, reduce costs and free up overstretched personnel

Surveillance and connectivity halt Ebola in its tracks

The recent Ebola epidemic in West Africa has provided the testing ground for new technology to track the disease and help prevent its spread.

Leading the response was RapidPro, a free open-source software platform hosting apps (IHRIS, mHero and U-Report) developed by UNICEF and the Rwandan software company, Nyaruka. The apps helped central authorities and health workers to communicate quickly and easily with each other, as well as alert health workers on the ground about how to detect signs and avoid the spread of the disease. They can also be used for real-time monitoring.

Use of dedicated apps is credited with containing Ebola in Nigeria (the outbreak was limited to a small number of cases) by cutting reporting times and enabling authorities to quickly trace people who may have come into contact with infected patients.

Big data solutions in healthcare

Anonymised mobile call-data records (CDRs) are being used to track the movement of people, map the spread of disease in an epidemic and target where treatment centres should be built. And new breakthroughs mean that the tracking can be carried out in real-time. The US Center for Disease Control and Prevention (CDC) is analysing mobile phone mast activity data in Liberia in order to map where calls to helplines are coming from, which indicates where there could be a fresh outbreak of disease. Using real-time data is useful in low income countries where census records are patchy or out-of-date, enabling intervention to be more effective[29].

The way forward

Comprehensive access and prompt attention are the foundations of effective healthcare. Technology is helping to bring these a step closer. But it can only play dividends if it forms part of a wider drive to improve the affordability and accessibility of basic prevention and care. And this includes water, sanitation and education as well as primary health care, underlining the importance of data and analysis in targeting public investment more effectively.

29 The University of Southampton and the National Vector-borne Diseases Control Programme (NVDCP) have used this technology to help combat the spread of malaria in Namibia.

5

Promoting education, innovation and job creation

New ecosystems of innovation are springing up across Africa.

Innovation hubs

From Cape Town up to the 'Silicon Savannah' of East Africa, more than a 100 tech hubs have been set up across Africa over the past decade to help foster home-grown innovation.

The function of tech hubs varies, depending on which stage of the business development cycle they are targeted at. The simplest hubs are shared work spaces, designed to pool costs and foster the exchange of ideas while start-ups are in the pre-incubator phase – The Office in Kigali, Hive Colab in Kampala and jokkolabs in Dakar are three examples. Larger hubs are designed to connect technical experts, programmers, entrepreneurs and investors, and also offer training, mentoring and business development support with the goal of incubating new start-ups and supporting SMEs. Successful examples include iHub and NaiLab in Nairobi, Orange Fab in Abidjan, the Meltwater Entrepreneurial School of Technology (MEST) in Accra and SmartXchange in Durban.

Many hubs focus on supporting social enterprises that are developing solutions to social problems, notably the Co-Creation Hub (CcHUB) in Lagos, RLabs in Cape Town and ICEADDIS in Addis Ababa. Some are government-led, such as the Botswana Innovation Hub, while others started life in universities, for example @iLabAfrica in Kenya's Strathmore University.

Opportunities and priorities for business

- Use these hubs as an opportunity to partner with start-ups and create thriving ecosystems of innovation
- Use your market access to help trial innovations and develop them for broader launch

Opportunities and priorities and policymakers

- Some hubs exist only on paper, lacking the infrastructure (IT, internet, power and roads), technical expertise, investors and regulatory support to become a reality. Government can play a key role in providing the regulatory support and development of telecoms, power and other infrastructure needed to bring hubs to full potential
- Encourage greater co-operation between universities, start-ups and local government

Edtech set to transform teaching and training in Africa

The use of technology to deliver education – edtech – has a long history in Africa, notably through the use of 'edutainment' to deliver public information campaigns on TV and radio. The content is now moving to mobile and online channels. Udacity is an online university, which uses short, punchy videos to deliver content, mixed in with tests and challenges to keep students engaged. Udacity also offers nano-degrees, which focus on the skills and knowledge needed to work in specific professions, enabling students to qualify in a shorter timeframe[30].The means of delivering educational content are also being disrupted by new technology. Examples include the intranet hubs developed by Blupoint (profiled earlier in this report).

The way forward

Innovation is welling up in Africa. But the continent still lacks the investment to develop ideas and bring them to market. Government has an important facilitating role in areas ranging from education to energy and connectivity. Equally important is the creation of commercial ecosystems that bring together innovators, start-ups and established businesses.

30 https://www.udacity.com/nanodegree

6

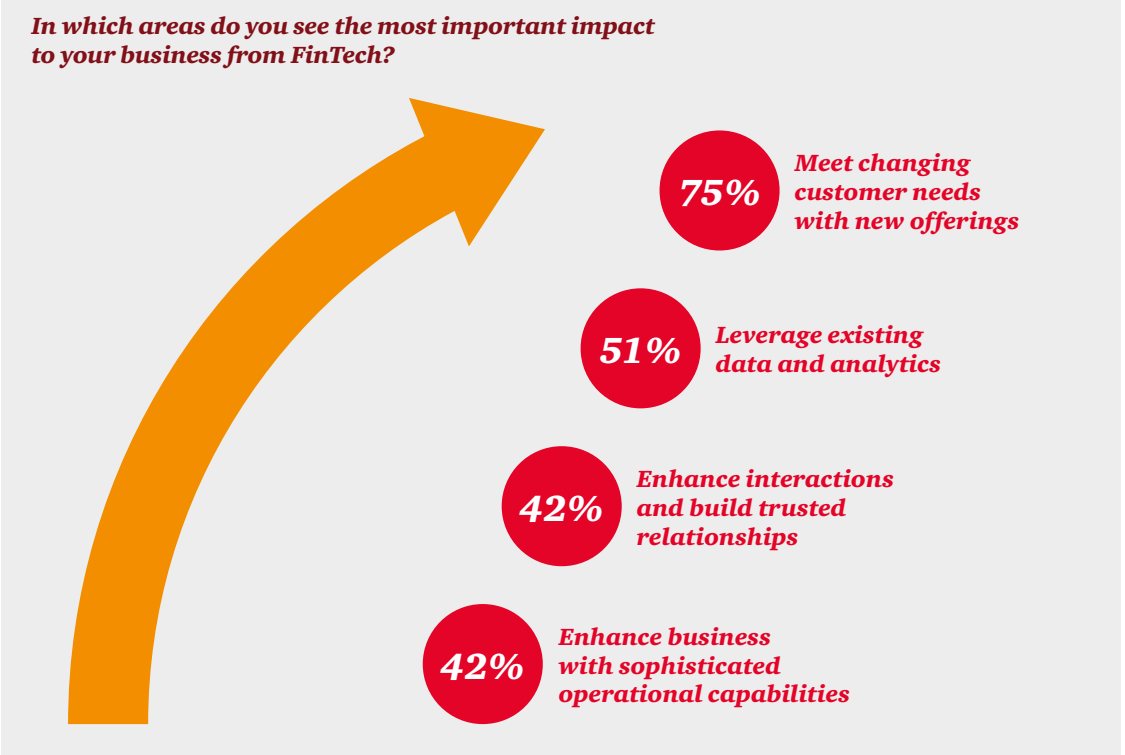
Bringing the informal sector into the mainstream economy

Digital connectivity has brought millions of unbanked people into the financial system. The key to future success is developing compatible partnerships between banks and mobile networks.

Financial inclusion

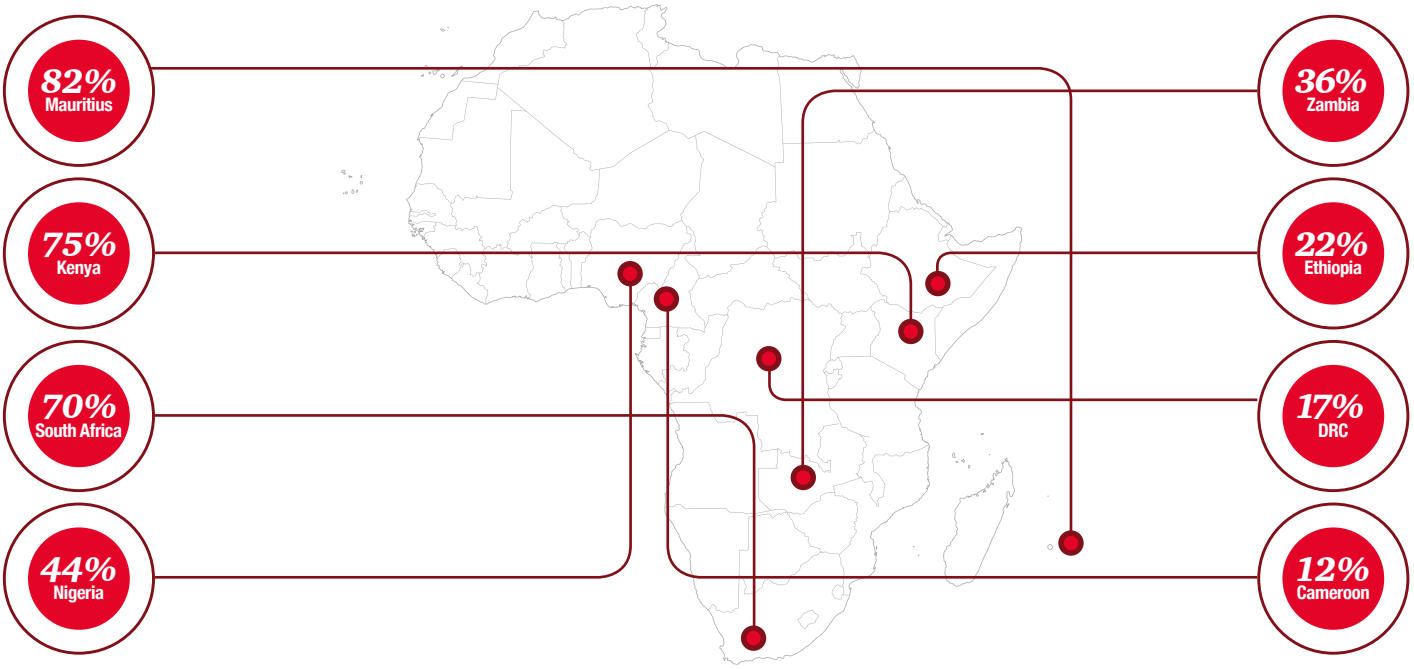
Mobile connectivity enables banks and telecoms providers to reach out to previously unbanked customers with low-cost accessible services. Figure 11 highlights what Boards from around the wold see as the biggest impact of FinTech.

Figure 11: FinTech potential



Source: 544 senior financial services executives interviewed for 'Blurred Lines: How FinTech is shaping financial services', PwC, March 2016 (www.pwc.com/fintechreport).

Figure 12: Population with access to financial services, 2015 (%)



Source: World Bank

Through the success of the M-PESA payments platform, Kenya has one of the highest rates of inclusion in Africa (see Figure 12). Building on these foundations, M-PESA partnered with CBA to launch the M-Shwari mobile savings and borrowing service. M-Shwari gets round most clients' lack of credit history or scoring by using the reliability of mobile payments to judge whether to offer a loan and how much. Lending is paid off every month.

Yet, comparable platforms in other countries have found the going harder. In part, this stems from many regulators' reluctance to allow mobile networks to operate payments in their own right, preferring partnerships with established banks. The challenge is that banks and mobile networks are regulated separately and have different business models. Mobile networks may also be using payments to tie in customers, which encourages them to look at payments and other financial services as loss leaders. TagPay, a PwC-supported start-up in the DRC, offers an innovative alternative by enabling partner banks to supply a full range of mobile financial services, which are operable on any phone. This avoids the need for banks to create a direct partnership with a mobile network provider.

Other difficulties stem from capacity. M-PESA's ties with the Kenya's dominant mobile network creates significant inter-operability. By contrast, the mobile markets in many other countries are more fragmented, which makes it more difficult to gain a viable market share.

Ultimately, what works in one country, won't necessarily fare so well in another. The solutions M-PESA developed for Kenyan consumers will not necessarily work in African markets where one size has always fitted one rather than all.

Opportunities and priorities for business

- If working in partnership, establish clear mutually beneficial objectives. Given the potential variations in business model and competition for customer ownership between bank and mobile network partners, such an agreement may require an intermediary or spin-off company that operates at arm's length from the bank or mobile network
- Look beyond payments to areas such as insurance and SME lending to help cement engagement and capitalise on cross-selling opportunities

Opportunities and priorities for policymakers

- What can you as a government do to extend the financial infrastructure and tackle exclusion? In the DRC, the government programme to pay state employees by bank transfer has helped to increase the number of people with banks accounts from 300,000 in 2005 to 3 million today[31]
- Ensure regulation promotes trust in the financial system
- Ensure regulation and public policy reflects the blurred lines within the mobile financial services market

31 'Much hangs on mobile money', The Economist, 16 April 2016 (http://www.economist.com/news/special-report/21696790-much-hangs-mobile-money-move).

Technology will play a big role in transforming the banking sector for the foreseeable future. Banks need to embrace technology and invest in the interface with the customer, which is increasingly digital. Customers want to bank 24/7 and they want to be in more direct control of their banking.

Patrick Mweheire, Managing Director, Stanbic Bank Uganda

Interview for PwC 19th Annual Global CEO Survey (for the full interview see www.pwc.com/theaagenda)

Remittances ripe for disruption

Africa is heavily dependent on remittances, which average over US$60 billion every year from emigrants both within and outside the continent [32]. The positive impact of these transfers is enormous, supporting household spending, as well as providing funds to invest in building homes, set up small businesses or pay for education and healthcare.

Yet despite some of the highest prices in the world (see Figure 13), this is an area where disruptive technologies and start-ups have found it hard to gain a foothold. In part, this stems from the difficulties of competing with the agent networks of the dominant global money transfer giants. New entrants must also adhere to onerous financial regulations and overcome a host of operational challenges, from local exchange controls to licensing issues and anti-money laundering/know your customer requirements[33].

One area where local companies are challenging the established players is in intra-African remittances. Remittance flows across African borders are highly fragmented, relatively small and vary greatly between regions. Services do exist for remitting funds, but they're costly (typically 20% of the value of the remittance), subject to exchange fees and can only be used to remit funds between accounts of the same bank.

Rising demand for cross-border remittances has led to the emergence of corridor specialists, who focus on moving funds along well-established trade corridors.[34] In 2013, Orange launched a service offering mobile-to-mobile transfers between Senegal, Mali and Côte d'Ivoire, the first such service in Africa. In 2015, Orange expanded the service by partnering with Airtel, enabling Orange Money customers to transfer to Airtel Money customers in Burkina Faso, Côte d'Ivoire and Senegal.[35] Other mobile networks have now followed suit in what looks set to be a continent-wide trend.

Further innovations include the emergence of remittance hubs: companies that connect mobile networks, financial institutions and remittance service providers on a single platform. By offering connection via a single platform, these hubs give their clients the opportunity to connect to anywhere on the network, using any device or interface, be it mobile phones, e-wallets or credit cards.

Opportunities and priorities for business

- Money transfer is a multibillion dollar market that is waiting for a disruptor with the scale and inter-operability to challenge an often slow and expensive service

Opportunities and priorities for policymakers

- According to the World Bank, bringing remittance prices down to 5% would put an extra US$4 billion a year in the pockets of African migrants and their relatives[36]. It will therefore be important to consider whether regulation is impeding real price competition within the remittance market and what may need to change (e.g. currency controls) to secure a fairer deal for consumers

Crowdfunding development

New technology offers the opportunity to fully harness local sources of funding and aggregate pools of capital for investment. This could provide the platform for communities to crowdfund local projects. At a national level, the Kenyan government has been experimenting with crowdfunding. This includes the sale of the world's first mobile-only sovereign bond via M-PESA in October 2015. The issue raised $50 million for road, energy and telecoms projects, with investors able to put in as little as $30.

Funding SME expansion

SMEs can often find themselves caught between two stools, too big for micro-lenders and too small for conventional banks.

A new generation of start-ups is bringing technology to bear on the problem. Pioneers include First Access, a New York-based social enterprise specialising in data analytics. First Access partnered with Vodacom Tanzania to develop credit rating scores for each customer by analysing payments, as well as social network data from their mobile records. This can enable SMEs to gain access to the volume of financing they need to build scale and expand their business.

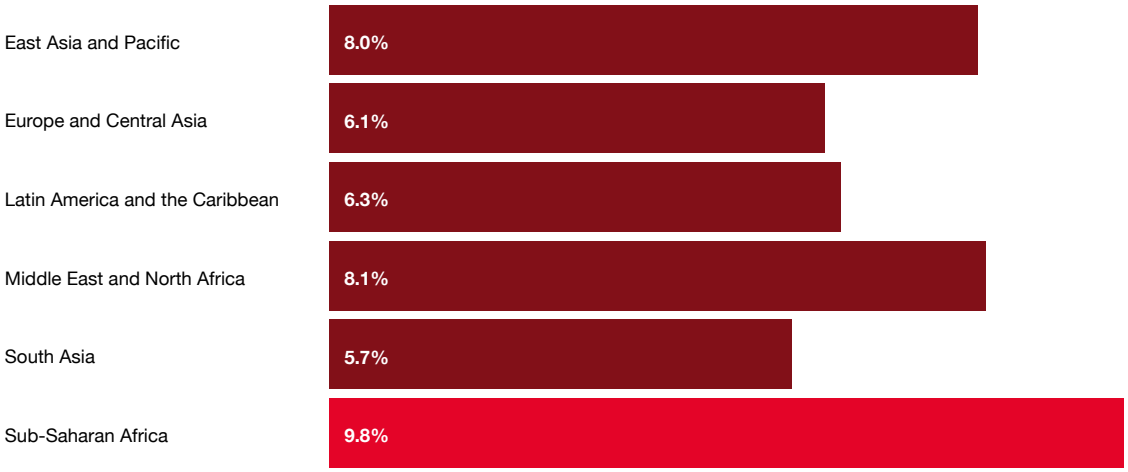
32 One in seven Africans (120m) receives remittances from friends and family abroad, with remittances making up as much as one third of GDP in some African markets (source: GSMA).

33 For example, all remittances to Ethiopia can only be in USD and they are all settled at the exchange rate set by the central bank each day.

34 The largest corridors include Senegal-Mali, Togo-Ghana, Benin-Nigeria, Zambia-DRC, Kenya-Tanzania, Kenya-Uganda, Somalia-Kenya, Mozambique-South Africa and Zambia-Zimbabwe-South Africa.

35 Orange Money has recently launched a service enabling direct remittances from Orange Money accounts in France to the African Orange Money platform, which could herald a new wave of disruption.

Figure 13: Average cost of transfer, 2015 (%)



Source: World Bank Remittance Prices Worldwide, June 2016

BitPesa uses bitcoins to allow SMEs to pay for imported goods and receive payment for exports without the high costs of currency exchange or controls on foreign capital. Provided the payment request is submitted early enough in the day, a payment from Kenya to China could be completed in a single day, versus three to seven days for an international bank transfer. This brings huge advantages for SMEs, especially for traders and retailers who often need to source goods and clear shipments quickly.

Opportunities and priorities for business

- SME lending is a huge growth opportunity in Africa. How can you use disruptive technology to strengthen engagement, credit scoring, verification and payment facilities?

Opportunities and priorities for policymakers

- SMEs are the engine of the economy, yet many are starved of the credit they need to trade and grow. What openings does technological innovation offer to help SMEs gain access to lending facilities and how can you support this with appropriate regulation and government backing?

The way forward

Africa has pioneered models of mobile banking and financial inclusion that are now being copied around the world. At the innovative edge of the marketplace, this is a battle for market supremacy. Several dominant groups are likely to emerge, with mobile offering opportunities to reach customers in new markets without the need for branches. These groups are already positioning themselves. For slower moving competitors, the mounting pressure on service standards and costs will usher in a difficult fight for survival – market share or regulatory restrictions on new entrants offer no long-term safeguards.

Regulators should naturally ensure effective controls over FinTech businesses that are growing rapidly and operate within systemically critical areas of the economy. But the need to regulate shouldn't be a veil for protecting vested interests. This means developing the capabilities to oversee a fast evolving marketplace, drawing on both new skills and the technologies that allow for more informed and timely monitoring.

36 World Bank media release, 28 January 2013 (http://www.worldbank.org/en/news/press-release/2013/01/28/african-migrants-could-save-US4-billion-annually-remittance-fees-finds-world-bank).

Lighting up Africa: How disruption can create its own momentum for change

Standalone renewable electricity encapsulates the power and potential of the disruptive transformation in Africa, and is therefore a good way to set the scene for our exploration of innovation and change. New solar power units are bringing sustainable power generation to homes and businesses with no access to the national grid. And with this comes a huge array of possibilities ranging from increased security, mobile connectivity and study time for children to the chance to acquire a credit history and hence easier access to finance.

"When we commercially launched our products three years ago, our main vision was to mitigate climate change. Fifty thousand installed solar systems later, I am even more thrilled to see our customers' happiness when they turn on their lights, TV and fridge for the first time, or start up a small energy-based business. Access to clean, affordable and reliable energy literally empowers entire nations to live up to their potential – improving economic well-being and uplifting communities' quality of life[37]."

Thomas Gottschalk, CEO Mobisol

Electrification through national grids has struggled to keep pace with Africa's fast rising population (see Figure 14). In 2015, the International Energy Agency (IEA) estimated that 634 million people in Sub-Saharan Africa were without power, compared to 585 million in 2009[38].

Many people rely on kerosene for cooking and lighting (see Figure 15), but it's dirty, hazardous and expensive, forcing poorer households to ration usage, including the lighting children need to do their homework.

Off-grid generation isn't new. But the main source of power has traditionally been diesel generators, which require considerable up-front investment, are costly to run[39] and need a lot of expert maintenance and repair.

No more waiting

This is why the new generation of cheap-to-buy, easy to run and low maintenance renewable power units have such transformational potential.

Mobisol is one of a number of companies that supply solar-powered systems. The down-payment on Mobisol's basic 30 W model is US$26, followed by 36 monthly payments of around US$10. The home systems are designed to provide enough electricity to power LED lights, radios, mobile phones, TVs, DC fridges and a variety of further household and consumer appliances. Larger 100 W and 200 W units are available for small businesses (the 100W option requires a down-payment of US$38 and monthly instalments of US$24)[40].

Azuri operates a similar hire purchase model. Azuri's units come with intelligent software that guarantees power around the clock however much sun is reaching the panels. This increases the range of appliances that can be reliably powered by the units. Azuri offers a range of compatible consumer products including fans and televisions, which are especially designed to run on its smart solar systems.

Domino opportunity

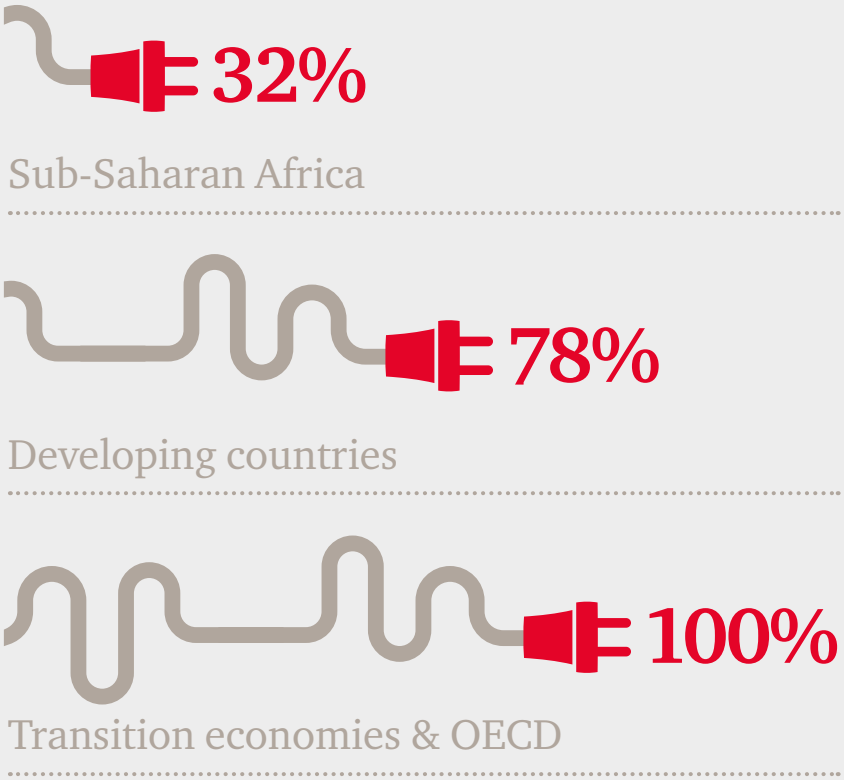
Other leading suppliers include M-KOPA, which has connected 375,000 households to solar power. Customers can save an average of $750 over four years by using solar rather than kerosene[41]. In an increasingly common model,

37 Mobisol media release, 23 June 2016 (http://www.plugintheworld.com/mobisol/2016/06/23/mobisol-provides-reliable-solar-power-for-a-quarter-million-beneficiaries-in-africa/).

38 2009 estimate from IEA, Energy for All: financing access for the poor, 2011; latest estimate (for 2013) from IEA, database on electricity access, 2015.

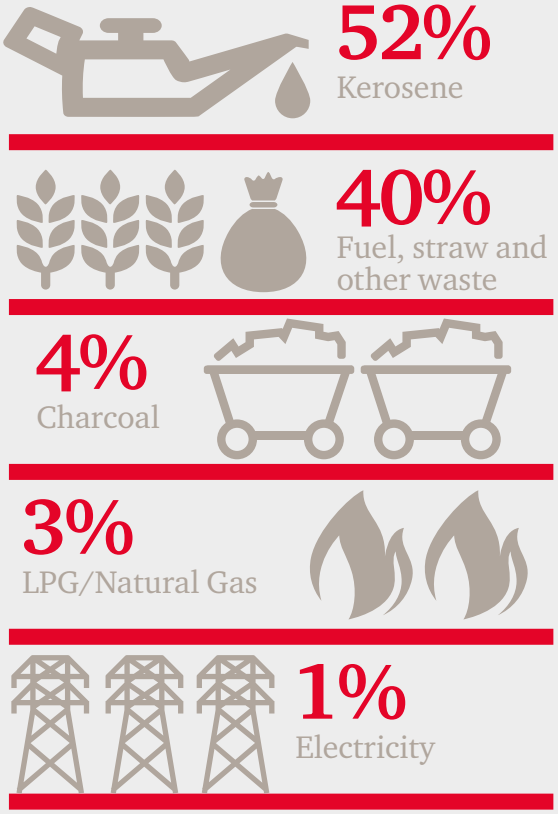
39 Diesel prices vary. In oil-producing countries such as Nigeria and Angola, the price for a litre can be as low as $0.59, but in countries such as Zambia and Zimbabwe it is closer to $1 (August 2015 diesel prices reported by globalpetrolprices.com).

Figure 14: Electrification rate, 2015 (%)



Source: Africa Energy Outlook, International Energy Agency, 2015.

Figure 15: Main fuel used by Nigerian urban households for cooking, %, 2014



Source: Africa Energy Outlook, International Energy Agency, 2014.

M-KOPA's customers make payments through their mobile phones, highlighting how one disruptive innovation (mobile payment) can help foster other key developments (affordable power). Notably, M-KOPA's co-founders, Nick Hughes (Chief Product Officer) and Jesse Moore (CEO), have backgrounds in telecoms and mobile payments[42]. Nick Hughes was formerly Head of Global Payments at Vodafone Group, where he started M-PESA in 2004. Jesse Moore previously worked as Director of the GSMA Development Fund and Managing Director of Signal Point Partners.

M-KOPA's launch of solar powered TVs and Azuri's use of intelligent software demonstrate the spin-off potential of accessible and affordable power. Even more ambitious is M-KOPA's use of its distributed power platform as a means of providing finance, by giving customers collateral and a line of credit (Kopa means borrow in Swahili). Customers with a good payment track record can take out loans, while Azuri's rural customers can use their repayment history to finance inputs at the start of the agricultural season.

With more than 600 million people still in need of electricity, the challenge for all these businesses is scalability, not just in production and distribution, but also the mobile platforms they use for payment.

We explore the impact and potential of new sources of energy supply in our report Electricity beyond the grid.[43]

40 Mobile for development utilities, GSMA January 2015 (http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2016/01/Mobisol-Pay-as-you-go-Solar-for-Entrepreneurs-in-Rwanda.pdf).

41 M-KOPA website (http://solar.m-kopa.com/about/our-impact/).

42 M-KOPA website (http://solar.m-kopa.com/senior-management/).

43 "Electricity beyond the grid: Accelerating access to sustainable power for all (http://www.pwc.co.za/en/publications/electricity-beyond-the-grid.html)."

Conclusion: Are you ready to be disrupted?

Disruptive technology is transforming Africa's economic potential. This includes creating millions of new targetable consumers and giving them unprecedented choice of products and services.

It's also fostering the innovation and connectivity that can create new markets and new business models. Indeed, because Africa is unencumbered by legacy technology, it is able to leapfrog more developed economies. And combined with demographic changes and urbanisation, digital disruption means big opportunities for businesses and investors across the continent. It's vital that you take action now to ride the wave of Africa's digital revolution.

To maximise these opportunities, both businesses and policymakers need to be ready to take on the challenges that still lie ahead. These include creating the skills, telecoms and transport links that will ensure digital disruption has the infrastructure and capacity to be genuinely transformational. It's also vital that the reach and benefits of technology and the growth it fuels are evenly spread.

We believe there are three key questions that disruptors, mainstream businesses and policymakers need to answer to make sure they can turn digital disruption to their advantage:

Mainstream businesses

1. Is your model sufficiently agile and adaptable to work in different African markets?
2. How can you gain access to the talent you need on the ground?
3. Who is your fiercest competitor, disruptor or mainstream, and do you have the business model and customer relevance to prevail?

Disruptors

1. How can you gain access to the further investment and production/distribution you need to move beyond a start-up to being a leading market player?
2. How can you use your data and customer relationships to develop new revenue opportunities?
3. Are your return expectations realistic in markets where getting in early is important, but returns may take time to materialise?

Policymakers

1. How can you create or change regulations to support growth and entrepreneurialism?
2. How can you ensure your education system generates enough people with key technical skills?
3. How can you use digital disruption to improve decision making and deploy resources more efficiently?

Most of these questions don't relate to technology – in many ways this is the easiest part of the challenges ahead as access and affordability are growing all the time. Rather, the keys to leveraging this new technology and riding the wave of disruption lie in rethinking the competitive potential, creating new commercial ecosystems and the readiness to challenge conventional assumptions about Africa's economy that underlie this. Digital disruption has opened Africa for business. Are you ready?

Appendix A: PwC's Digital offering

From helping you to gauge your digital fitness to sharpening analytics and developing cloud-based solutions, we can help you to capitalise on Africa's innovative potential and market opportunities.

Digital Fitness Assessment

In an African market that is evolving so quickly, it's vital to ensure that your digital capabilities are up to speed. Our Digital Fitness Assessment (DFA) is an app-based tool that helps you baseline your digital capability levels and identify areas of strength as well as areas that require improvement.

The assessment uses tailored questions and industry context to establish a digital fitness score, that can be benchmarked against competitors or your previous score.

How does it help you?

Most organisations face three challenges when seeking to develop their digital potential:

1 A lack of understanding on how digital impacts their business

2 Not being equipped and prepared to handle the current speed of digital disruptions

3 Not taking advantage of the spectrum of opportunities offered by digital.

The pace and distinctive path of African disruption heighten these challenges. Our DFA enables you to understand digital better, since it gives an indication of your maturity in the digital transformation journey and provides insight into how to strengthen your organisation through digital.

How does it work?

- The tool has four main components: Assessment, results, engagement and learning. In the assessment component, you will complete a series of questions measuring your digital maturity across a number of key areas.
- The results help you to target areas that need improvement. An ability to benchmark companies by size and industry will also be provided. In the app, you will find a results dashboard, which is an ongoing service where you can follow results, invite additional respondents from your company and learn how you can improve.
- Multiple stakeholders within the organisation can complete the assessment. The more people who complete the assessment, the more powerful the results will be.
- The goal of this tool is to turn the results into actions. The progress of each user will be displayed through game points, illustrated on a company leader board.

We will assess your business against our six digital maturity disciplines

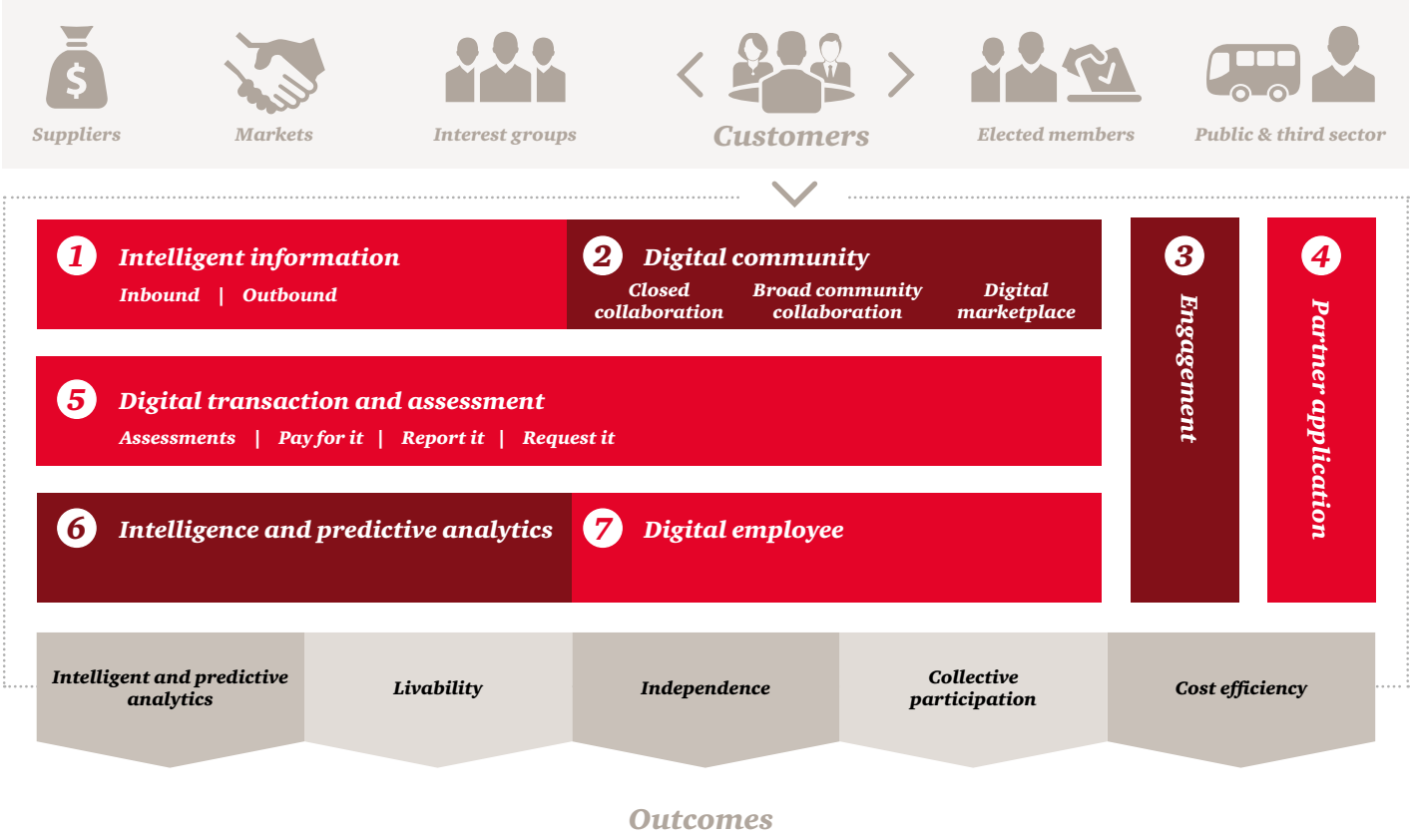
Source: PwC's digital services

Engage

Engage is a cloud-based software as a service (SAAS) platform that can provide tailored solutions across all commercial and public sectors in Africa.

How does it help you?

- Data/systems can be accessed from any device in the network
- Integrated insight tools allow for comprehensive reporting
- Lower operational costs are achieved as the vendor funds and manages maintenance and R&D



How does it work?

Tailored to your unique needs, Engage delivers against five key outcomes:

1

Economic growth

Engage is a platform with in-built triggers that offers time-bound opportunities to everyone from students through to small businesses. It creates a thriving digital marketplace which is underpinned by analytical insight to target people with relevant opportunities.

2

Livability

Through a series of smart interventions enabled across a range of channels, including social media, Engage encourages a new generation to meet their potential and become a part of their community.

3

Independence

A series of automated, smart interventions, enabled by personalised content, predictive analytics, intelligent search and other tools that trigger a web of outcomes that create independence.

4

Collective participation

A digital community that provides a suite of engagement tools designed to create conversations; from community volunteering and real-time polls and surveys, through to collaborative applications and case management.

5

Cost efficiency

Real-time information and reporting capabilities help visualise key organisational data. Powered with intelligence and predictive analytics, information can easily be shared across the organisation.

Engage delivers unrivalled functionality and significant cost savings by digitising routine tasks and services and can be up and running within months.

Engage is based on seven core components that together, facilitate positive interactions with the clients and communities you serve:

1. Intelligent information – including intelligent search inputs and results and targeted, personalised content
2. Digital community – bringing people together to share insight and collaborate
3. Partner applications – platforms to allow better integration with key partners
4. Digital transaction and assessment – enables reporting, service requests, payments and assessments
5. Digital marketplace – for skills and interests
6. Intelligence and predictive analytics – customisable dashboards and predictive analytics
7. Digital employee – offering self-service tools, collaboration and knowledge management and sharing

Data analytics

Our data and analytics support allows you to collect, organise and examine large volumes of data with the aim of discovering useful insights, suggesting conclusions, and supporting decision making.

How does it help you?

- Boosting top-line growth
- Increasing operational efficiency by eliminating inefficient practices
- Reducing risk and achieving regulatory compliance
- Improving the quality and integrity of data to enable better decision making

How does it work?

With 150 data analytics professionals, we help and advise through:

- Innovation Lab – we can help you to accelerate your data analytics innovation
- Business solutions – we can help you solve business problems with data analytics apps and solutions
- Strategy through execution – we can help you develop and implement the right data analytics strategy

Digital Workplace

As the way people work and interact evolves, our digital workplace solutions help you to develop the right access devices, an appropriate communications infrastructure, the necessary business applications, a team-oriented workplace environment, and an overarching digital security umbrella. Key opportunities in Africa include more virtual collaboration and an improved ability to attract and retain people with tech skills.

How does it help you?

A well-designed Digital Workplace employee portal should be:

- Personalised
- Customisable
- Collaborative
- Reliable
- Secure

All of these workplace traits improve employee productivity, attract the best staff and ultimately provide value for your business.

How does it work?

Our digital workplace portal offers:

- Real-time event information for client-facing staff
- People directories
- Cloud platforms

Other Digital Workplace applications include collaborative reporting and resolution; digitising paper-based processes and real-time customer feedback dashboard cards (including gamification)

Innovation Jumpstart

Innovation Jumpstart is a catalyst to help challenge traditional marketplace thinking and approaches.

How does it help you?

Innovation Jumpstart helps to transform your business and accelerate innovation by harnessing the power of digital capabilities, agile analytics and new ways of working.

How does it work?

PwC assesses your digital maturity and runs workshops to rapidly generate new ways to solve problems. You will be connected to our 'innovation network' - start-ups, peer communities, industry forums, and high-tech partners (e.g. Google, HP, Salesforce and Microsoft).

The overall goal is to help introduce, develop and foster a digital mindset and new ways of working.

The Innovation Jumpstart Approach

An expert team to catalyse change

Achieving real business outcomes

Digital

Insight

New ways of working

A holistic approach to innovation

Discover	Enable
Inspire	Accelerate
Create	Sustain

Cyber Security

We offer a comprehensive range of integrated cyber security services. We can help your organisation assess, build and manage your cyber security capabilities, and respond to incidents and crises. Our services are designed to help you build confidence, understand your threats and vulnerabilities, and secure your environment in way that allows you to pursue digital opportunities with confidence. Our services include risk assurance, consulting, legal and regulatory advice and forensic, and forensic support to help you protect against, prepare for and respond to breaches.

How does it help you?

Digitisation and innovation in Africa provide your organisation with a wealth of opportunities to grow and serve your customers more effectively. However, as reliance on digital technologies rises, vulnerability to cyber security threats also increase. Therefore cyber security is a key commercial and regulatory priority.

Our Cyber security is about protecting your organisation's digital processes and data. It is much more than a fix to technological problems – it is about protecting what matters most and using technology as an enabler.

How does it work?

Our cyber security services are divided into four components: Assess; build; respond and manage. We assess your organisation to understand your capabilities and maturity in order to help you prioritise your investment. Based on this, we will design and deliver cyber security improvement programmes to your organisation that allow you pursue opportunities with confidence. Following this, you will gain access to our cyber incident containment, investigation and crisis management.

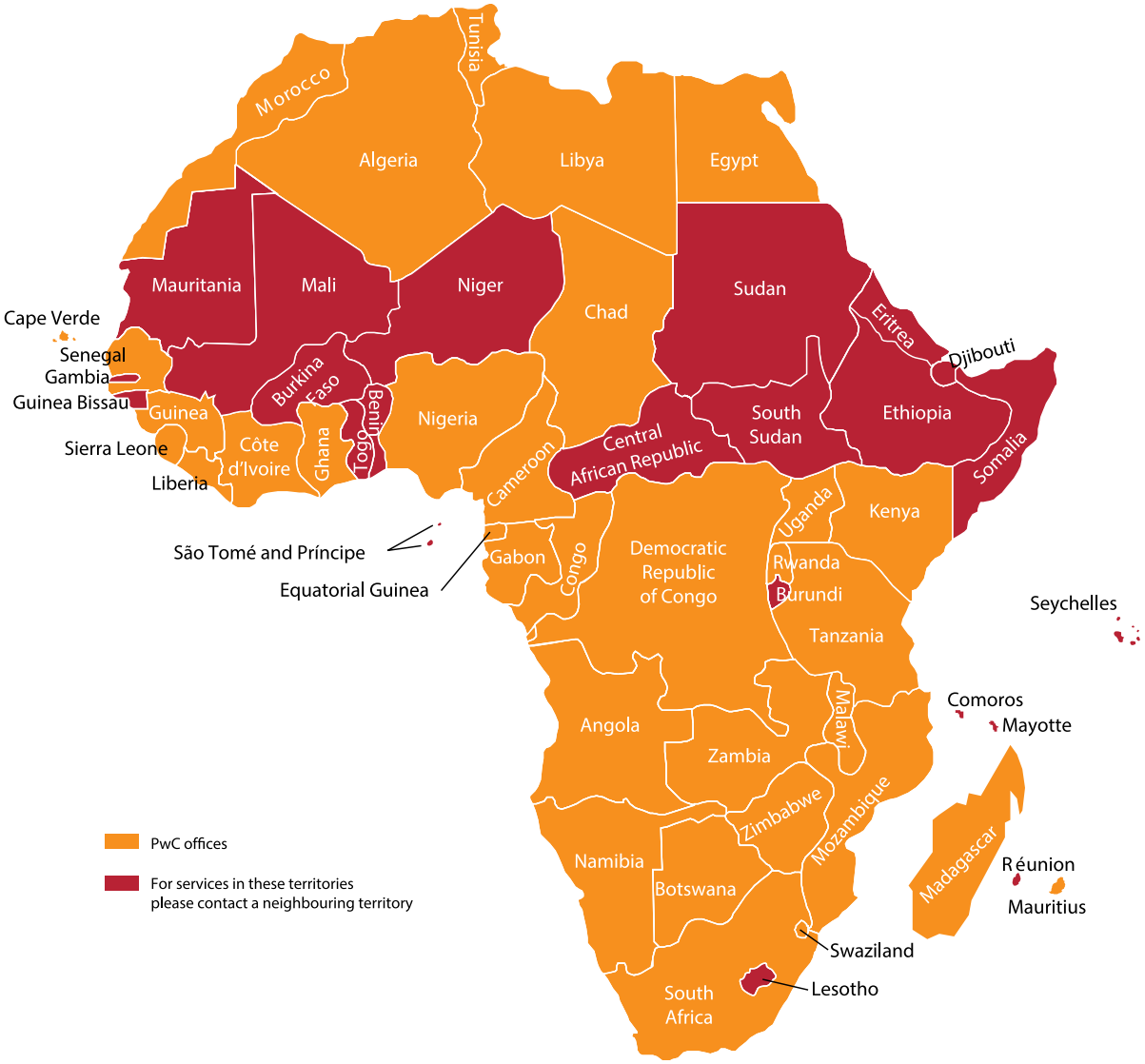
Appendix B:
PwC's extensive African footprint means we're there for you, wherever you do business.

We know that value goes beyond a single engagement or a single result. Value is defined by a relationship – one that is born of an intelligent, engaged, collaborative process.

With our African network, our people and experience, we're ready to help you realise that value wherever you do business.

PwC is the largest provider of professional services in Africa, with more than 400 partners and over 9 000 staff on the ground in 34 countries. This means that we're able to provide our clients with seamless and consistent service, wherever they do business.

Our in-depth knowledge and understanding of African operating environments enables us to offer tailored tax, assurance and advisory solutions for every business challenge.


Tunisia
Morocco
Algeria
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Egypt
Mauritania
Mali
Niger
Chad
Sudan
Eritrea
Djibouti
Cape Verde
Senegal
Gambia
Guinea Bissau
Guinea
Burkina Faso
Benin
Togo
Nigeria
South Sudan
Ethiopia
Sierra Leone
Liberia
Côte d'Ivoire
Ghana
Cameroon
Central African Republic
Somalia
Uganda
Kenya
São Tomé and Príncipe
Equatorial Guinea
Gabon
Congo
Democratic Republic of Congo
Rwanda
Burundi
Tanzania
Seychelles
Comoros
Mayotte
Angola
Zambia
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For services in these territories please contact a neighbouring territory

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