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With anything electronic with so broad a reach, the “Internet of Things” or “IoT” as it is commonly known, is becoming bedrock on which our communication world is being built. The IoT is a revolution.

Indeed, from the days of carrier pigeons to videoconferencing a few years ago, today, thanks to the power of the internet that is linking the whole world, you can video call someone anywhere in the world for free. You can instantly transfer files and photos, chat by text and voice and buy anything from anywhere in the world all from the comfort of your home, thanks to the internet.

For example, soon, German automaker, BMW, will connect cars with other IoT devices, such as the owner’s house and heating system.

That is why this second edition of Forbes Africa ICT Outlook is dedicated to the digital revolution of IoT, one of the most significant and positive disruptive innovations in recent times.

Our main story focuses on why, Cumii, a pan-African IoT company, believes that what we need in Africa are things that impact our pattern of life, improve the quality of our lives and enhance public health and productivity. At the moment, the company focuses on three major verticals: connected cars, connected homes and connected health. There are stories on IoT in agriculture and mining.

In this edition, we look at how IoT is turning the world into an always-connected, always-on information ecosystem. How it IoT slowly empowering the new healthcare consumers to make informed decisions based on tracking and rewarding their activity levels, and, those with chronic conditions can now receive real-time feedback on how their lifestyle decisions impact their health.

We also look at whether from digital divide, we now have digital inequality. There are also stories on cryptocurrency and advancing the adoption of cloud computing services in Africa.

Enjoy this second edition of Forbes Africa ICT Outlook, a magazine which looks at the information, communications and technology industry’s activities and operations across the continent and its contribution to the economic development of the continent.

Happy reading!

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For many years we have been juggling work and home, wishing we could be in two places at one time. Now something very exciting is happening. We can be at work, home and many other places at the same time, thanks to the Internet of Things (IoT), the idea of linking devices and appliances to the World Wide Web.

Even if you’re not a technology fanatic or have not fully embraced smart devices, there’s a good chance that within a few years you will be captivated by this smart technology, where devices talk to the Internet and each other and even talk to your body and your and vehicles.

Imagine leaving for work with your smartwatch alerting you to the calories you’re burning along the way. Then you remember to turn on your geyser at
home for an early shower when you arrive home. When you approach your house, you use your mobile to unlock the front door, switch the oven on and turn on your favourite television channel, all at the touch of a single button.

If you are a fleet owner, while watching your favourite soapie you can collect and analyse your vehicles’ telematics and see how you can reduce maintenance costs and vehicle downtime through remote monitoring coverage.

IoT is the “interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure”. Basically this means a number of connected devices, including sensors, sprinkled around in everything from the milk carton in your refrigerator to the thermostat in your home or office.

But it is more than just a number of sensors. IoT includes information regarding the transportation of goods, traffic patterns, environmental conditions and many other details not even developed yet. It includes data gathering through wearable electronics activities, medical conditions and even people’s sleep habits.

That is why at Cumii, a pan-African IoT company, we believe that what we need in Africa are things that impact our pattern of life, improve the quality of our lives and enhance public health and productivity. At the moment, the company focuses on three major verticals: connected cars, connected homes and connected health.

Why did we choose those three verticals? It is because they are very relevant to the continent and they would create much value for Africa. I believe our connected car, connected home and connected health can meet all of these requirements.

CONNECTED HOMES
Customers are becoming savvier about smart home devices. When it comes to home security, many look for dealers who can offer the total package.

Homeowners want an app that can arm their security system, turn off the lights, lock the door, adjust the temperature and even let them monitor how the nanny is with the children while they are at work with a Wi-Fi camera. They want remote services that give them the same level of control out of the house as they have in the house.

This means the IoT technology has and is adding layers of security to our lives. Take smart lighting for example. Automating a home’s lights offers more
than just convenience. A lighting system that is triggered by motion or sound can automatically turn on when an intruder is in the area (or rings the doorbell), and thereby act as a deterrent to prevent crime, while a traditional home monitoring system only responds after the fact.

These days, smart metres are already offering home and office owners the potential to take control of their energy use and make savings on their energy bills. At home and at the office, connecting to a private, secure wireless network, these metres come with a handheld display which reveals at a glance the amount of energy, in pounds and pence, consumers are using in near-real time.

Unlike other paid for, innovative offerings, smart meters are currently being fitted by gas and electricity companies at no extra cost.

IoT helps save money on home and office maintenance when lights, air conditioning and other appliances which reduce energy costs when they triggered by motion or sound to come on and off.

This means smart security, combined with smart home devices, allows for a more personalised system experience and a more engaged customer.

These days we can work with the homeowner to craft the system that fits the family's individual needs, and thus make the customer more invested in the system and its services.

FLEET MANAGEMENT

The car is the second largest investment after the house, and it is the place where we spend most of our time, apart from the house and the office. Vehicles are evolving into mobile computing centres, which include connectivity to the Internet and other vehicles.

Today's connected vehicles generate enormous amounts of data, track and perform logistics management for companies aiming to enhance productivity and tackle road safety issues and even making maintenance predictive, not reactive.

For example, trucks and buses can be maintained when they need service, not on a fixed schedule or when they break down. That's a huge benefit for fleet operators with hundreds or thousands of vehicles.

We are confident that our global expertise in IoT solutions and in delivering fleet management services coupled locally engineered innovations and knowledge eliminate challenges companies and even African governments face in managing their fleet of vehicles. Ultimately this service will
improve productivity, improve safety and significantly reduce costs.

For example, our fleet management of government buses in Tanzania is delivering faster response times through improved job efficacy and allocation, reducing fuel costs owing to shorter journeys and higher revenues, as drivers can complete more jobs.

**IOT AND HEALTHCARE**

IoT as it relates to healthcare serves one primary purpose: harnessing data from multiple devices and sensors that reveal what’s really going with the individual’s health.

These days it is clear that while health, wellness and fitness wearables have become a fashionable way of supporting healthy lifestyles among consumers, healthcare payers and providers are striving to benefit from the possible cost savings arising from their potential preventive value.

Of course, health authorities across Africa are increasingly promoting their use as a method of encouraging healthy lifestyles.

Now think about how much effort is currently put into securing health information and picture efforts to aggregate greatly multiplied volumes of health data from virtually unlimited locations.

Imagine a world, where every human is connected to a device which is connected to a daily health monitoring device through the Internet. In case of a natural/unnatural mishap, an alarm is raised for healthcare units to rush immediately for aid. No phone calls are required, no delay in aid due to lack of alert and hence, lives are saved. That is the kind of world the IoT is capable of creating.

Indeed, imagine a patient with a pacemaker has a heart attack at midnight. What if the pacemaker were in constant communication with a system that summons an ambulance when a heart attack is about to happen, and wakes the patient up in advance of the episode?

That’s a realistic example of the medical advances we can and should realise with healthcare through the IoT. Success in
building the new security measures required for such applications will be key to reducing the cost of reactive care, eliminating avoidable hospitalisations and readmissions and realising the overall improvement in outcomes that healthcare organisations all want.

CHALLENGES
Of course not all is smooth sailing. Privacy concerns abound and may limit data collection, transmission and storage. Some fear that some connected devices may have serious vulnerabilities, including encryption, password, cross-site scripting, user access, and permission. Some analysts assert that there is a concern about IoT devices that share information and create alerts. This includes patient data involving medical conditions or home thermostats that could indicate when a homeowner is away.

However, I believe that as long as privacy issues can be addressed, the increased connectivity of many products has the potential to provide useful analysis for individuals, businesses and governments.

BACKBONE OF OUR GENERATION
IoT in our homes, in our cars and fleets and when it comes to healthcare is becoming the backbone of our generation. Technology is seeping into every bit of our daily life.

It has now become imperative for us to innovate and use gadgets and devices that enable us to do things efficiently, irrespective of our geographical location or other demographics.

According to estimates by the McKinsey Global Institute, IoT will have a total economic impact of up to $11 trillion by 2025.

The IoT is expected to be entirely automation-ready, energy efficient, secure and enable an advanced way of living.

So pick up that smartphone and tablet, jump online, and prepare to get smart. It’s about to be the new normal.

EVEN IF YOU’RE NOT A TECHNOLOGY FANATIC OR HAVE NOT FULLY EMBRACED SMART DEVICES, THERE’S A GOOD CHANCE THAT WITHIN A FEW YEARS YOU WILL BE CAPTIVATED BY THIS SMART TECHNOLOGY

Norman Moyo is CEO of Cumii, a pan-African IoT company that focuses on disruptive technology.
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Even people who aren’t in technology have heard of the Internet of Things (IoT). From smart homes to smart cars – and smart everything in between – IoT is promising to change every element of our lives.

We are entering a world where our alarm clock triggers the coffee pot to start brewing and tells the tiles in the bathroom to heat up; a world where our water meters can tell the municipality when there is a leak; a world where the IoT allows us (and our doctors) to monitor our health all day, every day.

“The IoT is radically changing how we do things, from manufacturing and retail to healthcare and transportation. However, we are still in the early stages of what will become a highly connected world. Just as millennials can’t conceive of a world without video calls and instant messaging, the future is one in which it will be hard to explain to the next generation how we got anything done without the connected ecosystems of IoT,” says Mariana Kruger, GM of ICT Converged Solutions at MTN Business.

She adds that today’s IoT solutions are a great example of how technology is advancing. “IoT solutions are created to solve a very specific, known problem. Think about replacing old power meters – smart meters simplified meter reading, but newer smart meters enable micro billing for time-of-day billing, monitor for leaks, and completely eliminate meter reading trips. In every sector, we are pushing the limits of what is possible with IoT.”

Kruger says that it’s easy to see IoT as one of those technologies that is only relevant in certain applications, like enabling a connected, smart home; or allowing utilities to monitor power usage; or facilitating more efficient manufacturing. But in the same way the Internet started out as a more efficient means to send messages than faxes (at a very simple level) and evolved into the
enabler of almost everything we do in our personal and business lives, IoT is evolving into the connectivity that will link us to everything we use, and to each other.

**SCI-FI BECOMES A REALITY**

IoT is the future of how businesses, governments, and consumers interact with the physical world. A recent PWC study found that people are cautiously “dipping their toes in the IoT pool”, but that there will be exponential growth of the use of smart ecosystems as people get more comfortable with the technology, as the costs lower, and as the technology itself become better.

“All IoT solutions start with basic sensing, expand to control, and then culminate in an applied business solution. This will result in an explosion of possibilities with our biggest inhibitor our own imagination,” Kruger says. “We may have become used to the idea of smart meters, but that the connected human is still seen to be the stuff of sci-fi. Every day, investment and innovation in IoT is taking us further into the possibilities of the technology.”

The connected human isn’t a new concept. IoT-enabled pacemakers have been in use since 2009, and popular devices like FitBits allow people to monitor basic health information. But thanks to miniaturised sensors and chips, there are now pills that could alert you when you’re at risk for a heart attack.

A US-based company has developed an ingestible sensor the size of a grain of sand that can monitor whether a person has taken his or her medication – and at the correct dosage. Once swallowed, the body’s electrolytes activate the pill, which transmits a signal to a small battery-powered patch worn by the patient. The information is transmitted via Bluetooth to the cloud. Doctors are already using smart pills to take photos of intestinal tracts as an alternative to more invasive colonoscopies.

The IoT could even help the blind to see through the use of cameras and microscopic chips that relay sensory information to their visual cortex. In a recent study, five people were connected to a brain-stimulating device that, in turn, was connected to a computer. By receiving signals to their visual cortex, the participants successfully navigated a virtual maze world — without sight — 92% of the time.

**CREATING A BETTER WORLD**

Kruger points out that the IoT not only holds great potential for improving human health and productivity, but that it is already helping us improve the natural world. For example, MTN Business has partnered with Prodapt, Wageningen University (WU) in the Netherlands and IBM to stop Rhino poaching using the IoT.

Using smart collars containing custom sensors on animals such as zebra, wildebeest, eland and impala, which graze close to rhinos, the project is tapping into information about their behaviour to provide an early warning system if poachers are nearby. “These animals react in different ways to different threats, and we are using this project to collect location information, movement, direction and average speed of travel, along with rule-based patterns based on the animals’ response to threats. As a result, their response patterns become an early warning system to protect the rhino, allowing game rangers to take pre-emptive action before any threat happens,” Kruger says.

She adds that it is hard to imagine all of the benefits and capabilities of IoT because projects like this keep pushing the boundaries of what’s possible – and what it can achieve. “As is so often the case, we don’t realise what we are building until our eyes are opened to what is possible. As we start to connect and collect, previously unfathomable opportunities open up in front of us.”

The current ecosystems of intelligent devices are only one step in an evolving ecosystem, Kruger says. “We forget that IoT is an aggregator of solutions rather than an individual solution. It allows us to integrate disparate devices into a cohesive whole, providing a way to pool resources and connect things and people to create even better ways of doing things. When Bill Gates famously said we always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten, he may as well have been talking about IoT. Even though it has been creeping up on us for years, we are yet to realise its true influence. The IoT future will be limited only by our imagination.”
Farming is not what it used to be. From what seemed to be an extraordinary feat of mechanisation in the second half of the 20th century, the farming industry has evolved with farmers now using satellites and industrial robots to increase productivity. This evolution took place within one generation, and by the early 2000s, had helped to drive down the share of the chronically undernourished population to around 15%, half the number of 1970s.

While the developed world’s agricultural sector is surging ahead, the less developed, more vulnerable areas, such as sub-Saharan Africa have been progressing much slower. However, the pace of modernisation of this critical sector is not fast enough. According to the Food and Agriculture Organisation (FAO) of the United Nations, in the next 30 years the rate of food production needs to increase by 75% to meet the needs of a population of more than nine billion people. Further, the global industry is faced with the additional pressures of limited, new arable land available and flat lining acreage of genetically modified crops worldwide.

However, with technology there is an opportunity to improve agricultural output through the utilisation of The Internet of Things (IoT), Big Data and other technologies.

**Using Precision Agriculture to Maximise Output**

The data-centered approach to farming, which is widely referred to as precision agriculture, rests upon a combination of technologies, machinery and tools. It all started with satellite-aided measurement of
A series of smart farming implementations in Africa have reaffirmed the potential of IoT for relieving water supply and drought problems.

**FROM ARCAN TECHNOLOGY TO READY-TO-GO SOLUTIONS AND DIY INNOVATIONS**

As the IoT hits the mainstream, smart farming solutions have been largely demystified and adapted for almost anyone to freely use or develop. An entire marketplace has arisen, where agriculture companies can find all kinds of smart tools, sensors or purpose-fitted drones for improving agricultural outcomes.

Most importantly, key IoT enablement technologies, such as an IoT platform, IoT middleware, or cloud application enablement platforms, have been segregated from the hardware- or vendor-dependent technology stacks into full-scale development tools. As a result, smart farming, just like IoT innovations in other industries, has been broken free from big vendors’ fenced labs and has become available for any engineer willing to try the market with its own smart idea.

This has also benefited equipment manufacturers, allowing them to upgrade their offerings with sensor data collection and basic equipment messaging functions. As the IoT platforms improve and become more available, the cost of IoT modernisation runs lower and can be undertaken by software developers with just a general grasp of the subject.

Another two factors also energise the entire innovation process: open-source technologies and broadening connectivity conventions. For example, in many cases, sensor data collection requires very little development effort so the basic prototype can be functional in days. Using an open-source IoT platform there is no added cost to projects. Such DIY innovations may not look grandiose at first, but as new capabilities are introduced into a smart product, not only does it accrue into something greater but also the user’s expertise grows.

**INTERNET OF THINGS ALREADY DELIVERING AFRICAN AGRICULTURAL OUTCOMES**

A series of smart farming implementations in Africa have reaffirmed the potential of IoT for relieving water supply and drought problems.

**AS IOT HIT THE MAINSTREAM, SMART FARMING SOLUTIONS HAVE BEEN LARGELY DEMYSTIFIED AND ADAPTED FOR ALMOST ANYONE TO FREELY USE OR DEVELOP.**

which handicap the region’s agricultural potential. A staggering 95% of arable land in sub-Saharan Africa relies on rainfall-fed agriculture and therefore efficient water supply is crucial. Establishing a sensor-retrofitted ecosystem, where soil moisture, on-farm water storage levels and weather forecasts are being constantly monitored, allows farmers to refill their farms’ water tanks just enough and on time to keep crops well-nourished.

Remote access to their farms’ activity and operations also provides more flexibility to those who manage multiple farming locations, and open new opportunities to scale their agricultural business. Farming thus becomes less of a low-margin chore and attracts more professionals and tech-savvy enthusiasts.

Companies that deal in farming insurances also use the IoT to deliver better services. For example, an insurance initiative called SUM Africa based in Mali and Uganda uses satellite data and historical patterns to predict yields and insure farmers against yields falling below a certain level. An index-based livestock insurance programme in Northern Kenya also takes advantage of satellite images to protect farmers against rapidly dwindling green pastures for their cattle.

Finally, there is a growing number of application providers that help farmers connect with potential buyers, understand market pricing and forecasts, or get educated on effective soil cultivation or proper livestock treatment. Positively so, the data-centered farming lifecycle spawns a variety of business opportunities far beyond the field.

**THOSE THAT INVEST IN TECHNOLOGY, REAP THE REWARDS**

While up to 80% of farmers in the USA are estimated to already make use of smart farming technologies, fewer than 30% in Europe do so. Currently in Asia and Africa even fewer do. Yet, early adopters in all these markets make a strong case for IoT-empowered agriculture, showing that it boosts yields while reducing cost and risk.

Most importantly, technology complexity – which previously was a barrier to uptake – is no longer such an issue as IoT goes mainstream. A growing range of purpose-built smart farming solutions, and a number of strong open-source and commercial IoT platforms available for custom IoT implementation is enabling this.

Andrew Kokhanovskiy is Chief Technology Officer of KaaIoT Technologies.
Agriculture is the only sector in which one can actually grow something. All the other industries are related to transferring of services, which underscores the importance of the agricultural sector in the economy. Agriculture as an industry is dealt in different ways in different type of economy. The developing economy is still trying to implement the technology in its agricultural process. And the developed economy is already using a lot of automation. The trend of automation in the agriculture sector started from the British Agricultural Revolution between 17th to 18th centuries and it has seen an upswing from then onwards.

With the advent of a modern set of data stats, agriculture is changing its form and formats and globally, the income dependency of the gross domestic product has reduced on the agricultural sector. According to the United Nations, the world population will reach more than nine billion by 2050. And as we know land is a very limited resource and we have to use it wisely. This compels us to produce better yields with the ever reducing space for agriculture.

Today, with Internet of Things every industry has been benefiting from the automation that has been brought into the agriculture industry. The agriculture industry is just not limited to the growing of crops but also the delivery and supply chain, cattle management, water conservation and power utility and many others.

CATTLE: THE WAY TO HEALTH
In a dairy farm, nothing is more important than the cattle and its health. IoT Sense has helped and made it possible for the dairy owners to manage their cattle in the best possible way. IoT Sense has deployed some unique solution for its client. Sensor Collars was one of the features to locate the cattle at any given point of time across their farm. This enabled the client to keep the track of their cattle and a safeguard against theft. Step Tracker was the other important feature as this has enabled our client to understand the health of the respective cows.

IoT And The Health Of Cattle

BY KETAN LOHAR, CEO OF WINJIT
As the cows feel warmer, they walk longer and faster. Through the data obtained the farmers were able to predict and identify the perfect insemination window. This has increased impregnation chances which lead to better herd management. This also acted as an early warning system that would alert farmers of increased activity that often means an animal is warm or decreased rumination, which can indicate a health problem.

With years of research we have come up with a smart, secure and scalable IoT platform – IoT Sense. Our IoT Sense is an edge level software gateway solution with an intelligent hardware agnostic platform, which is built on an open API architecture. IoT Sense helps you connect legacy and new sensors with ease of customization and rapid deployment. It is the platform on which agri IoT is built on.

**CONNECTIVITY** – Provides multi-sensor node to connect wired analogue and digital sensors and actuators as well as BLE sensors. Upstream communication is supported through BLE, WiFi and LoRa. Communication medium plays important role in IoT implementation in Agri space due to large open Area and number of limitation factors (power, range, connectivity etc).

**GATEWAY** – IoT Sense is the most preferred smart, secure and scalable IoT Platform which provides a connection between Sensor Hub to upstream Ethernet or 3G. At every Gateway Agri application running, which normalizes the data locally and policies when defined, will be executed locally.

**CLOUD** – Provides agri management and data services through cloud. The most popular cloud services are AWS IoT, ThingWorx, Azure IoT, Xively etc. Many of these platforms share common features and architectural patterns. The cloud will enable access to advanced analytics and monitoring. Data generated from the sensors is in large size and variety of machine-learning algorithms and cognitive services running on the cloud to provide valuable insights to the Farmers and every stakeholder in the agri chain.

**EDGE ANALYTICS AND EDGE COMPUTING** – Where most of the IoT platform pushes the data in to cloud, agri IoT will analyse and determine the action at the edge level which means in the gateway itself. The advantage of this would be quick and real-time actionable triggers. This will enable agriculturists to respond quicker to any verticals that are monitored through agri IoT.

**UNIFIED DATA** – If the agriculturist already have some sensors in place, and with new sensors in place there may be chances that the data collected from various sensors will in different Agri IoT will enable changing the data definition after it’s received to receive unified/formatted data for easier and standard data access/processing and visualization.

With all this adaption in the field of agriculture with bigger co-operation and business taking and initiative of giving it back to the community this is just a start to an enormous infusion of technology in the agriculture sector.
The Internet of Things (IoT) is like making movies in modern times; all you need to do is to imagine what you want and software and hardware can make it possible.

In reality, the IoT is a network of physical devices embedded with electronics such as sensors, actuators and network connectivity to enable different objects to collect and exchange data. It brings together solutions from hardware manufacturers, software developers, platform providers and network providers to enable objects to be remotely sensed or controlled across existing network infrastructure.

Until recently, most industries have typically developed and managed operational technology (OT) and information technology (IT) as two different domains, maintaining separate technology stacks, protocols, standards and governance models, and organisational units for each. Previously IT and OT played different roles, sometimes even within the same organisation. However, with the emergence of the IoT, and the integration of complex physical machinery with networked sensors and software, the line between these two different technologies is blurring.

In the mining sector for instance, mining IT is merging with OT to become IoT. OT is made up of hardware and software that directly monitors and/or controls physical devices, processes and events in the enterprise, enabling it to detect and respond to change. In this sector, technology is playing a greater role to achieve economies of scale by streamlining and generalising mining processes.

Typically, mining operations combine tools, methods and knowledge to locate, extract, and process mineral and metal deposits in the earth. The methods used to locate ore bodies range from on-the-ground reconnaissance by prospectors to remote sensing techniques such as satellite imagery. Mine excavations take place either on the surface or underground. Mining is a massive undertaking and each mine is practically unique.

Mining systems that process OT (including electronic, telecommunications, computer systems and technical components) are included under the term operational technology. OT systems control valves, engines, conveyors and other machines to regulate various process values, such as temperature, pressure and flow, and monitor them to prevent hazardous conditions. OT systems use various technologies for hardware design and communications protocols that are unknown in traditional IT. Systems availability is paramount in the mining industry, and real time or near-real time processing is required to ensure high rates of reliability and availability. The OT systems administer industrial processes to ensure smooth operations are maintained.

The IoT plays an important role in mining and other major industries, with multinational organisations like Cisco Systems offering robust mining solutions that harness the IoT. However, what is interesting is that we are now seeing increasingly innovative IoT solutions coming from smaller niche companies, such as IoT nxt, Mezzanine Ware, NybSys, Vula Telematix, Fastnet and XLink.

THERE ARE NUMEROUS EXAMPLES OF THE IoT IN ACTION IN THE MINING SECTOR TODAY, HELPING REDUCE OPERATIONAL COSTS, INCREASING EFFICIENCIES AND SAVING LIVES.
that are providing solutions that cover a range of different aspects of the IoT.

**REVOLUTIONISING MINING THROUGH THE IOT**

There are numerous examples of the IoT in action in the mining sector today, helping reduce operational costs, increasing efficiencies and saving lives. For example, Essar the steel mining company, is tracking all their vehicle locations, as well as positions of workers and equipment, which is producing cost savings of 5% on maintenance costs and 10% on fuel costs.

Mining environments contain specialised and specific industrial control systems (ICS). Examples of ICS are supervisory control and data acquisition (SCADA) systems, distributed control systems (DCS), remote terminal unit (RTU) and programmable logic controllers (PLC) as well as dedicated networks and organisation units. These are all examples of OT. An OT device could be as small as the engine control unit of a car or as large as the distributed control network for a national electricity grid.

Over the last few years, OT started to progressively adopt IT-like technologies. Internet protocol (IP) has been gaining acceptance as an all-purpose networking protocol and Linux has been increasing its presence in a wide range of everyday devices. The convergence of IT and OT has resulted in cost and risk reductions as well as enhanced performance and gains in flexibility.

The convergence of IT and OT into the IoT is beneficial to companies in almost all industries, from mining to manufacturing to telecommunication and utilities. The benefits are different for each sector in type and also volume. Usually, the expected benefits will be more significant in businesses where there have already been large investments in OT, for example manufacturing and transportation. Nevertheless, there will be common benefits found across all industries that strive to converge IT and OT, such as cost reduction, increased efficiency, risk reduction and flexibility.

**IN THE MINING SECTOR IT IS EXPECTED THAT THE IOT WILL HAVE ITS BIGGEST IMPACT ON:**

**IMPROVED SAFETY:** Mining is a hazardous operation with harsh working conditions. Today, Mining companies are using different sensors to detect threats. For example, gas sensors are used for detecting presence of harmful gases like CO2 or lack of essential element like oxygen. Traditionally, these sensors are physically connected to an alarm system. The sensors send a signal to buzz the alarm when a present event occurs. IoT enabled sensors can do much more like alert through SMS, email, sound and light all at the same time to make sure the warning does not go undetected. Also, the data collected by sensors can be stored for further processing which can provide valuable insight. A rapid change in working condition can indicate problems ahead of time. For example, if the level of oxygen is decreasing, it gives an indication of possible problem before the disaster strikes.

**PREDICTIVE MAINTENANCE:** Predictive maintenance is a big term in aviation, however it is equally as important in mining. Sensors and IoT technologies can help the mining industry move beyond reactive maintenance. Through the use of sensors attached to assets, feeding real-time condition data into system; enabling early warnings to be made before maintenance issues arise.

**INCREASED EFFICIENCY:** What gets measured gets managed properly. Object detection through ultrasonic, infrared or other ways, means you can track the movement of goods and people. This not only helps to detect problems but helps to plan for increasing efficiency. Using the data, it is possible to track every aspect of mining operations, from pit to port.

**TIME SAVING:** The IoT saves valuable time in developing and maintaining mine sites. Data collected before breaking ground ensures the process is managed correctly and with reduced risk. Further, some mining companies are already using autonomous drilling systems that can operate without human intervention. Operating around the clock, this allows products to be extracted and processed in shorter timeframes.

Ikhtiar Sobhan is Chief Marketing Officer of Nybsys.
A GAME CHANGER FOR AFRICAN CONTENT CONSUMPTION

BY JASON NJOKU
Five years ago, when we started out on our online Nollywood journey, people laughed. They sneered. They were bemused. They were not excited. They chose not to invest. They said we were crazy. They said we were too early.

On the latter point, they were right. In fact, they are still right. Irokotv is close to five years old now, and I would say that even today, we have been over-adventurous with what we want to achieve, which is making Nollywood accessible online to an audience of almost 1 billion in sub-Saharan Africa.

For the vast majority of our lifetime at irokotv, we wanted our customers in Africa to love the experience. But they didn’t, not one bit. Due to poor Internet connectivity across many African countries, streaming long format content was cumbersome, jittery and not enjoyable. Then, on top of this, our potential customer base on the continent were hit with an additional tax – super expensive data – in order to watch their favourite movies.

Our early day adopters, where we built the majority of our momentum, were in the Diaspora, where data runs free, like water. However Africa is another story and, for us, VOD/SVOD (voice on demand) in Africa is dormant – for now.

In 2015, having accepted the fact that VOD was never going to scale at the pace we would’ve wanted, we took the drastic measure of de-emphasising the streaming aspect of our platform, shifting instead towards a mobile-first, Android-first, download-only model, a model that was tailored to our customer base.

We had to build a product that was 100% rooted and defined by our customers in Africa. We took the ownership of content delivery and user experience away from the telcos and into the hands of our own engineers.

Yet, product development will only take VOD so far – much of the power and success for any over-the-top content (OTT) service is in the hands of the telcos – they have the opportunity to unlock hundreds of millions of potential customers if they are able package data bundles that are priced for the base of the pyramid.

VOD in Africa puts the most incredible platform infrastructure, quite literally, in the palm of people’s hands. More than half a billion Africans subscribe to a mobile service. This number is set to increase to 725 million by 2020.

Data usage is predicted to grow from 0.3GB per unique user per month to 4.3GB between 2015-2020, although this will be highly dependent on the pricing structures of the telcos. People have the apparatus to consume, but there exists two main stumbling blocks; data and education.

As has been previously mentioned, data across so many countries in Africa, continues to be too costly for the base of the pyramid – the people. In the West where data is now an everyday commodity, for the majority of Nigerians, and those in other African countries, data remains a luxury.

In Nigeria, between 2014-2016, the cost of data actually dropped by around 56%. However, once you take into the account the Naira devaluation, which has significantly damaged consumer purchasing power, we see that the falling prices won’t have had any real impact on the end users, who are suffering in the current financial climate.

I do not want to lead any readers into thinking that the telcos have turned their back completely on OTT pricing, as this is not so. There has been an aggressive pricing and marketing drive – again I reference Nigeria – in the last year, for social media usage. On some networks, you can get access to your ‘favourite social media apps’ for N50/week [approx US$0.15]. For users of WhatsApp and Facebook, the Internet just became an affordable commodity. However, such pricing structures do not yet exist for VOD – when they do, the market will explode. We wait in anticipation.

Anyone who has stepped foot on African soil will regale you with the ‘mobile is leap-frogging all other platforms’ narrative, and they are correct. Mobile is first, second and third in our OTT strategy. Yet, whilst the likes of mobile money, the mPesas and Pagas of the continent, can thrive on feature
phones due to the SMS nature of the transactions, OTT video content delivery requires more sophisticated equipment.

This is being facilitated thanks to the tumbling cost of hardware, i.e. smartphones, many of which are built specifically for the African market and cost less than $100 to buy. I read recently that a South African-based manufacturer called Onyx is starting to produce a $30 smartphone for Africa. Smartphones, a key component for the uptake of VOD, are set to become an affordable luxury for the continent.

Some have suggested that content has played a part in slowing down the rise of VOD in Africa. I disagree. There’s a lot of content being consumed across Africa – be it on PayTV, free-to-air or on VOD platforms. Nollywood, to which I always refer, is a prolific content producer – some estimates reveal that the industry makes over 1,200 films a year. TV series, as a genre, have seen a new lease of life, thanks to Rok Studios bringing Nollywood-esque budgets and production values to the format.

Short films are being made across the continent by young creatives every day, and international content, especially Bollywood and Telenovelas, as well as US content, are wildly popular on the continent. So content isn’t holding back VOD and there is enough to fill airtime.

I touched previously on the issue of education. By this, I mean digital literacy – understanding how the internet works, how you can interact with it and what it can do for you, which has been a significant barrier to VOD growth for Africa. The base of the pyramid, the vast majority of Nigerians, aren’t that tech savvy – yet.

And VOD does require tech savviness – being able to use a smartphone, purchasing [affordable] data, downloading an app – and so forth.

There are a number of steps one must take in order to actually watch content on your phone. Again, looking at the needs of our customer, towards the end of 2016, we deployed an offline marketing and education strategy across Lagos that saw irokotv ‘pods’ pop up across the city, where customers could come and learn about our product, download the app, buy subscriptions and even download movies directly onto their phone.

Imagine trying to ‘win’ VOD in Africa with this one-on-one approach? It is labour and investment-intensive. It’s essentially a hand-holding exercise, but one that is critical to our survival and growth, particularly if we are to bring on board an entire generation of Nollywood-loving, VOD/SVOD movie fans.

VOD in Africa is in a nascent stage and will remain so until data prices are adjusted for the majority of African consumers.

Whilst much of what I have talked about sounds somewhat downbeat, overall I am excited about the VOD market in Africa and believe that it will prove to be a game changer in African content consumption, in much the same way as it has been in the West. The route may be a little slower, and a little more circuitous, however there is little to no chance that the world’s most mobilised continent, with the largest youth population and the second biggest movie sector in the world, won’t all meet at a sweet spot. Of that, I am sure – however we wait, patiently, for the telcos to bring us data packages for the many, not for the few.

“Yet, product development will only take VOD so far – much of the power and success for any over-the-top content (OTT) service is in the hands of the telcos – they have the opportunity to unlock hundreds of millions of potential customers if they are able package data bundles that are priced for the base of the pyramid.”

Jason Njoku is Founder and CEO of Iroko, the home of Nollywood content.
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REWRITING AFRICA’S LOCAL CONTENT NARRATIVE

BY FUNKE OPEKE, CHIEF EXECUTIVE OFFICER, MAINONE
A RISING CONTINENT
For a continent described as fast growing, such data delays are starting to add up. In less than two decades, the African narrative has flipped on its head. From the “hopeless” plotline embraced in 2000, the African continent has undergone an incredible transformation in several key indicators. While large portions of the continent’s 1.2 billion people live in poverty, many of Africa’s 54 nations have made significant progress in health, education and standard of living. Over the past 10 years, real income per person has increased by more than 30%, whereas in the previous 20 years it shrank by nearly 10%. Over the next decade its GDP is expected to rise by an average of 6% a year, not least thanks to foreign direct investment. FDI flows continue to grow, with the biggest boost coming to countries like Kenya and South Africa, while West Africa outpaced other regions as the leading recipient on the continent, according to an EY report.

This changing narrative is more than a resource boom. Africa may have benefited from the surge in commodity prices over the last decade but economic growth is starting to come from other places. The most resource-intensive economies are working hard to diversify. Prior to the oil price crash in 2015 and the resulting recession in Nigeria, the economy had achieved a steady growth of 5% for about 3 years. This growth was not enabled by the usual suspect; oil exports. With the stagnation of the Nigerian oil industry, growth has surprisingly come from technology, construction and financial services. The Services sector now represents 60% of Nigeria’s GDP.

According to the McKinsey Global Institute’s 2016 Report, Africa’s overall GDP growth averaged just 3.3%, between 2010 and 2015, considerably weaker than 4.9% a year between 2000 and 2008. But this growth hid a marked divergence; oil exporters hit by the decline in oil prices and the political turmoil of the Arab Spring (Egypt, Libya and Tunisia) experienced a slowed growth rate, from 7.3% to 4.0%. For the rest of Africa, growth actually accelerated to 4.4% in 2010 to 2015 from 4.1% in 2000 to 2010.

TECHNOLOGY AND REGIONAL TRADE
There is one way of boosting intra-regional trade, economic growth and development: domestic technology. Unlike other continents, Africa has lost on this opportunity for growth, with intra-regional trade quoted at just 18% in 2014; Europe, for example had 69% of exports to other countries on the continent, Asia had 52% and North America had 50%.

Smartphone adoption is starting to drive the digital revolution in Africa, leveraging the power of mobile and metro infrastructure networks and the influx of submarine cables to transform services in commerce, health, education, agriculture and energy. With an effective enabling environment, this digital revolution can be pervasive across African countries, connecting more people on the continent and boosting more effective trade. Apps such as M-Farm, which connects buyers with farmers and enable farmers to sell goods at the correct market value, can allow sellers of natural commodities in Jos to connect with buyers in Kinshasa. Applications like mPesa, which transformed the entire trading and economic landscape of Kenya; payment gateways like Interswitch, eTranzact and Paga and eCommerce platforms like Konga are examples of how the internet is fueling trade across the continent.

THE SILVER BULLET
In order for the continent to continue to reap the benefits of the enormous investment in telecoms over the last ten years, especially in terms of intercontinental connectivity and terrestrial...
fibre networks (submarine cable investment is over $3.8 billion and terrestrial networks have seen over $8 billion of investment), the Internet experience of end users must be improved. How can we improve the internet experience for users? How can we maximize the connectedness of the internet while improving quality of service and reducing transmission costs? How can we stimulate interconnections and encourage local traffic exchange between content providers, networks and users within the continent?

An effective way is the domiciliation of locally-relevant content on the continent. Across the continent, accessing Google platforms have become faster recently as a result of its local hosting strategies. With a click, you can access the most updated traffic map, search results and even play videos without buffering. This is only possible because Google has placed hundreds of thousands of “cache servers”; servers strategically hosted with ISPs around the world to improve end user performance. These servers provide users in these countries with the best experience as popular and relevant content from one of the world’s largest content providers is now available to them at previously unfathomable speeds. This localization and interconnection has seen local traffic by a few telcos jump from less than 3MBs to over 50MBPS in less than two weeks!

**LOCAL CONTENT IS KEY**

While caching may seem revolutionary to many, it pales in comparison to the effect that fully local data centers and locally-hosted content will have on the internet experience of end users. The data center that will power the digital economy in a region must be as close to endpoints as possible to ensure reduced latency. Local data centers (called edge data centers) guarantee lower bandwidth costs, quicker access to more content providers and carriers, local peering and lower latency for local markets. For a continent on the rise, local data centers provide access to resources that would otherwise not be accessible. To make good decisions, Africans need access to the best content.

The success of the mobile payment and eCommerce platforms in Africa which enabled significant growth in trade was maintained by fast connectivity. For online shoppers; speed is critical. A web traffic study in 2012 discovered that 47% of consumers expect a web page to load in two seconds or less; 40% abandon a website that takes more than three seconds to load. Online speed and latency continues to be the engine that will make or mar continental commerce.

Local data centers and internet exchange points will enable online efficiency to overcome these latency problems. Without IXPs, the internet will not function efficiently, as the different networks need a ‘meet-me’ point to directly interconnect with every other network and exchange traffic. As vital enablers of the internet ecosystem, IXPs have increasingly been adopted by nations across the world, with about 350 globally. Africa has significantly less IXPs than other countries; 21 of its 51 countries have IXPs. The increased influx of global content providers and international blue chip organizations with local data hosting requirements to the continent also makes a strong case for an interconnection service, to provide reliable high speed connectivity platform for users to access locally hosted content without the impact to user experience characterized by content round tripping.

**CONNECTING THE DOTS**

Giving the importance of traffic growth as a useful indicator of the health of the entire Internet ecosystem, MainOne has dedicated itself to building the first Internet hub in West Africa, with a new interconnection solution by its data center subsidiary MDXi dubbed “Open-Connect”. Open-Connect facilitates increased interconnection, collaboration and peering for customers within its data center.

MainOne has aggressively created an enabling ecosystem for domestic internet via infrastructure investments, partnerships and enabling most of the bandwidth-hungry tech start-ups in Nigeria and Ghana with bandwidth sponsorships. In partnership with the Lagos State Government and the Co-Creation Hub, MainOne also laid fibre infrastructure in what has been dubbed Silicon Yaba, Africa’s leading technology cluster. This physical infrastructure has enabled technology companies including startups like Andela, Konga, Co-Creation Hub, BudgIT, Paga, and OLX among others to quickly scale up their operations.

With connections to some of the world’s largest internet exchanges in Amsterdam and London, local exchanges in Lagos and Ghana and 50+ Points of Presence locations across West Africa, MainOne is West Africa’s most connected telco, enabling carriers, ISPs, content providers, multiple cloud platforms and enterprises of all sizes to quickly and easily increase their network footprint and peer without investing heavily in additional infrastructure or resources. MainOne has invested in its private submarine cable, from Europe down to Africa and growing regional and metro terrestrial fibre optic networks across nine countries in West Africa. The company also owns the region’s premier Tier III data center, with 600 racks in Lagos and has started developing its second facility in Sagamu, Ogun State. These approaches are a boon for business because they provide higher capacity, lower costs, and promote the digital economy of West Africa, which in turn increases the number of consumers who use the Internet. 🌍
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Until recently Africa had been considered a laggard when it comes to the adoption of technologies. However the rapid deployment and adoption of mobile telephony has downplayed this perception, giving rise to the belief that Africa is now of age to participate in the global technological development including cloud computing.

Cloud computing is providing a new dimension to the Internet in terms of revolutionising the way that data is stored, processed, retrieved and utilised. It provides value-added services to firms by enabling them to leverage their IT needs to third party organisations to manage and make available when needed. Cloud services basically provide networked storage space and computer resources on a subscription-basis.

It is a global industry with a huge market potential. For example, the global cloud services market in 2014 was valued as US$209.9 billion and is estimated to grow to $555 billion by 2020. The leading global cloud service providers include Google, Microsoft Azure, CA Technologies and Hewlett-Packard Development Company among others. Most of these global companies are operating in Africa.

Another growing phenomenon about cloud service is its rapid growth in traffic. The Cisco Global Computing Index 2015-2020 report estimates that by 2020 cloud traffic will constitute about 92% of data centres’ traffic. Cisco attributes this to an increasing presence of data centres, which are providing services that are
Flexible, fast-to-deploy, and efficient.

**THE CLOUD SERVICES OPPORTUNITY FOR AFRICA**

Cloud services is an emerging industry in Africa, yet studies show that it is only few countries which have established the enabling environment to bolster its growth. South Africa, Kenya and Nigeria have emerged as the African leading markets. From the analysis of Frost & Sullivan, the combined cloud service market in Kenya and South Africa in 2013 was $114.6 million and estimated to rise to $288.0 million in 2018. In the case of Nigeria, the market is expected to grow by $100 million per year from 2015 and hit $1 billion by 2025.

Cisco Global Index shows that Africa has the highest compound average growth rate in cloud traffic as compared to Central and Eastern Europe, but in absolute terms, these regions might be ahead of Africa since they have relatively better-developed cloud market.

**SOUTH AFRICA IS AFRICA’S CLOUD SERVICE POWERHOUSE**

South Africa is the powerhouse of African cloud services and the market is still growing. Kenya and Nigeria's cloud services markets are growing and countries such as Egypt, Ghana, Rwanda and Senegal still have embryonic markets. However, because the market is not well developed, data from other African countries is limited and therefore this hinders the ability to provide an objective analysis of the overall scale of the African cloud services market.

As the region's biggest provider of cloud services, South Africa is not only a subscriber but also a key provider. A number of cloud service providers such as MTN Cloud Service, Dimension Data South Africa and Accenture have emerged in South Africa, and are now expanding their services to other African countries.

In terms of uptake, studies have provided a positive outlook in the three countries where cloud services have taken off. For example, Cisco in 2013 identified an uptake rate of 50% amongst South African medium and large companies; similarly there was a 48% uptake in Kenya and 36% utilised cloud services in Nigeria. In addition to the existing cloud computing users in these three countries, 24% of companies in Kenya, 44% in Nigeria and 16 per cent in South Africa declared their intention to use cloud services in 2014. This indicated that should this pattern continue, in 2014 South African cloud services usage rate may have reached 66 per with Kenya at 72% and Nigeria at 80%.

**HOW TO INCREASE ACCESS TO CLOUD COMPUTING IN AFRICA**

How can we increase adoption of cloud services in Africa? What are the requirements for increased implementation and adoption of cloud services? The reality is that some measures need to be put in place to bolster widespread adoption of cloud services in Africa. These include policy and regulatory frameworks, robust infrastructure and security among others.

A CLEAR REGULATORY FRAMEWORK IS KEY

One of the essential requirements to boost Africa's share of the global cloud services market is the existence of government policy and regulatory frameworks to provide an enabling environment. The underpinning factor for successful cloud service uptake is the absence of restrictions on the flow of information between subscribers and cloud service providers.

Recognising that most of the cloud service providers are largely international organisations with their data centres either in South Africa or outside Africa, it is important that there are regulatory frameworks to protect data hosted by these companies.

However, so far most African countries have not provided adequate regulatory frameworks at the national and regional levels to support the adoption of cloud services. Yet the existence of robust regulatory frameworks will serve as an impetus for confidence building with the potential for increased subscription.

**ROBUST INFRASTRUCTURE IS A PREREQUISITE FOR CLOUD SERVICES**

The existence of a robust infrastructure, such as submarine and terrestrial fibre and last mile facilities, is a prerequisite for successful deployment and adoption of cloud services. An increasing number of submarine fibre cables in the region should provide high-speed connectivity between Africa and the rest of the world. We have already seen the positive impact of undersea cables on increasing bandwidth; these have provided a pedestal for cloud services uptake in South Africa and Kenya.

However landlocked African countries are disadvantaged in having direct access to the submarine cables network, they instead need to rely on a terrestrial fibre network of a third country or expensive earth orbital satellite, and this may affect the adoption due to the likely high cost of subscription.

In addition, terrestrial infrastructure is equally important for providing cloud services. Many African countries like South Africa, Ghana, Kenya, Senegal, and Cameroon have developed policies to facilitate rapid development of infrastructure (fibre or wireless) to
provide access to broadband Internet and related services, which are pivotal for cloud services.

For example, Ghana has rolled out two national terrestrial fibre networks to facilitate the deployment of broadband Internet service across the country. Further, the mobile telephone companies have also deployed their own fibre infrastructure to provide voice and data services.

In reality though Africa still lags behind the rest of the world in terms of reliable networks. Mauritius is though ranked among the first 50 countries in the world with good network readiness index in 2015. On the whole, only seven African countries are among 100 countries ranked by the network readiness index. This is really a setback since reaping the potential benefits of the numerous submarine fibre cables around Africa depends largely on the existence of a robust terrestrial infrastructure to provide good connectivity.

CONSIDERING AFFORDABILITY AND THE LOCK-IN EFFECT
Affordability is equally important to the growth of cloud services in Africa. Affordability can be viewed from two angles- cost of subscription to broadband Internet facility (means of access) and cost of subscription to cloud services.

Africa’s average price for 1Mbit per second bandwidth is $366. However, this varies across the continent with the landlocked countries paying higher rates. For example, Ghana pays $8 for Mbit per second, while land-locked Chad pays $3,037 for the same bandwidth.

Consequently, this high cost of connection to the submarine cables might translate to high subscription costs, which will negatively impinge on the adoption of cloud services in Africa.

Another critical issue is lock-in effect resulting from subscription to a cloud service. Differences in software, configuration and standards may affect a quick switch from one cloud service provider to another. In effect this does not lend to flexibility and may constrict one from changing cloud service providers if one is not satisfied with its service.

DATA SECURITY ISSUES NEED TO BE ADDRESSED
Security is a critical issue in data management in both developed and developing countries. In the contemporary world, data either personal or corporate has assumed greater economic importance. In business, it is a competitive tool and requires protection.

The susceptibility of the IT systems of third parties has the potential of causing huge financial losses. Juniper Research, for example, estimated the cost of global data breaches to be $2.1 trillion by 2019. Understandably, this should be of great concern to cloud service users in the global market.

African adopters need to be assured of the safety of the data held by third IT systems, especially due to increasing threat of hacking. To increase the confidence in cloud services, African Union and other regional bodies should take a keen interest in cloud services. The EU-U.S. Privacy Shield Framework (2016) serves as a pointer for the region. This framework was developed to ensure that US-based companies adhered to EU data protection protocols when handling European personal data. Apart from avoiding security breaches, the framework provides some level of confidence in large-scale data centres.

CLOUD COMPUTING PRESENTS A SIGNIFICANT OPPORTUNITY FOR THE CONTINENT
There is little doubt about the potential that cloud services offers for Africa. Should all the fundamentals be addressed, the growth potential for cloud services in the region is significant. Already, pockets of global companies have entered key African countries, however the development of the market should not be left only in the hands of the corporate organisations, but national and regional bodies should actively promote the service as the case is in Europe and USA.

Godfred Frempong is Chief Research Scientist at CSIR-Science and Technology Policy Research Institute, Accra.
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WHAT DOES CRYPTOCURRENCY MEAN FOR AFRICA?

BY JUDAH J. LEVINE

The world of cryptocurrencies has been characterised by extreme volatility this year, and, as a result, many are watching closely, and with some trepidation as well as excitement. Meanwhile, experimentation with the underlying innovations, including blockchain and distributed ledgers, is being driven by everybody, from disruptive startups to incumbent banks seeking new applications and to avoid being left behind.

Bitcoin provided the proof-of-concept and a measure of validation that a currency could operate outside of the control of sovereign states or regulators. Now, cryptocurrencies are being sought out by several services in Africa seeking the opportunity to move beyond formal channels in order to reduce the costs of cross-border remittances, among other services.

However, Bitcoin hasn’t been without its critics. During a bank investor conference in September 2017, J.P. Morgan CEO Jamie Dimon called Bitcoin a “fraud” and “not a real thing”, lacking a legitimate long-term play. However, Dimon did admit that there is no way to tell how high the value might go, saying “I’m not saying go short, Bitcoin can go to US$100,000 a bitcoin before it goes down... I refer to it like the tulip bulb crisis.”

It has been quite the rollercoaster ride since the first supposed Bitcoin transaction in 2010 when 10,000 Bitcoins were used to buy two pizzas said to be worth $25, making the effective value of a single Bitcoin just a fraction of a penny ($0.0025). This, compared to almost $1000 at the start of 2017 and then price levels that have reached many multiples of that over the course of 2017. The person selling those two pizzas would now be sitting on Bitcoin of close to $10 million at the start of this year, and approaching $50 million by the end of the third quarter of 2017.

Caution is required, however, as it is not unheard of for Bitcoin (and other cryptocurrencies) to lose 20% or more of their value (sometimes much, much more) in just a matter of weeks. Given that track record, cross-border providers leveraging Bitcoin have been careful to stress their efforts to minimise exposure, especially given the heightened sensitivities around remittances.

Cryptocurrencies are no longer just a means for the storage and transfer of value. Ethereum, another cryptocurrency platform making headlines, incorporates smart contracts for applications that promoters claim run “without any possibility of downtime, censorship, fraud or third-party interference.” This has contributed to its popularity for initial coin offerings (ICOs), basically crowdfunding for a new cryptocurrency venture, though an Achilles heel has turned out to be scams and security vulnerabilities in code to drain wallets of tens of millions of dollars (CoinDesk and Parity being recent examples). This has even led to China outlawing further ICOs.

Despite this noise, cryptocurrencies offer potential alternative “rails” for those looking to disrupt the financial services space. And while the extreme volatility may seem to make it completely unsuitable as the foundation for such innovation, many services take on almost no exposure as
the currency is used simply for quick transfers, rather than the storage of value. Disruptors cherish being able to avoid the financial services core infrastructure and intermediation services provided and associated fees levied by large incumbents.

WHERE TO NEXT?
Yet, we are already seeing some indication of the limits to innovation that come purely from alternative currencies. While these are freer from the formal banking sector, regulation, and whims of state interventions for a large stake below market value of XRP digital currency against a fintech company/alternative consortium (Ripple), which had effectively created this cryptocurrency out of thin air.

An uneasy relationship across many players may be expected, especially as more agile start-ups seek to disrupt a status quo where the incumbents still retain a significant advantage in resources and scale. Decentralised automated organisations (DAO) are one answer being floated to open the playing field more widely for innovative propositions to scale quickly without the traditional bottlenecks of building management structures and capabilities. At a high level, these are complex software code comprising smart contracts, which could potentially be seen almost as automated payment rules bundled as business plans and launched without much of the organisational overhead of traditional entities. Even large traditional players may find these advantageous in launching new propositions that may otherwise end up stalled as a result of navigating internal bureaucracies.

These have not always gone as planned, however, such as the fiasco around the unprecedented Ethereum funding raised for The DAO (in this particular case, a proper noun), and subsequent siphoning of funds by someone able to exploit loopholes in the code. Interestingly, this resulted in a situation where, counter to the underlying blockchain philosophies of disintermediation and permanence, an intervention occurred to effectively make ineffective certain prior transactions to “recover” these funds. Much of those diverted funds still sit in Ethereum Classic, the legacy network from which the community has moved away in starting over their ambitious project, with that currency having crashed to almost nothing. Bitcoin has undergone its own split recently as well, with both examples showing how cryptocurrencies can ultimately be at the mercy of competing visions within their communities.

A FEW BUMPS ALONG THE WAY
Some of these banking collaborations are beginning to bump up against each other, leading to some initial disputes as this highly regulated sector seeks to keep pace with potentially disruptive forces. Some disputes are already seeing the insides of courtrooms in interesting attempts to reassert institutional control. One early example saw a consortium of traditional banks (R3) seeking a court ruling to enforce its option
WHAT DOES THIS MEAN FOR AFRICA?
But what are the practical considerations for Africa? Formal banking channels are cost-prohibitive and often geographically distant for large segments of the population, but it is difficult to see how cryptocurrencies or blockchain may solve distribution issues. Mobile money agents seem like the far better option for that at the moment. Perhaps more relevant might be one-off investments in DAO-type structures that are then left to run in addressing the shortages of highly skilled managers. Also of interest would be opportunities for shared ownership or access to a wide range of asset classes in increasing the addressable markets as demand is aggregated.

Potential cost savings could be attractive to large businesses in Africa for which cash management costs are compounded as a result of many small transactions. Agriculture provides one example, and ongoing pilots using mobile money show a desire to transform this market. In this case, large agri-business stands not only to realise significant savings in transaction costs, but also to mitigate counter-party risk such as side-selling where farmers sell to third parties despite loans or inputs received earlier.

But it is still early days, and many questions remain as to whether or how blockchain transforms financial services and other sectors. Incumbent financial services providers are taking multiple approaches, one being the funding of innovative start-ups through venture capital to hopefully gain a stake in potentially disruptive propositions. Picking winners is not easy, however, but it is an acknowledgment that large corporate structures are not always ideal for such experimentation. Some of the larger African banks are involved in a range of blockchain initiatives from joining industry consortia to launching incubators, or taking another look at start-up ventures.

DEFINING OPPORTUNITIES IN AFRICA
Africa, as has been the case with mobile money, may provide a unique testing environment. Importantly, transaction fees will need to be much lower than some of those seen elsewhere in the past, especially if there is to be any hope of adoption by consumers (merchants may enjoy better rates than major card networks – though there is often a strong preference for cash). Either way, it is less clear that Africa will replicate its global leadership seen in mobile money. And applications will need to be localised to the socio-economic, competitive and regulatory dynamics.

Moreover, one cannot ignore the political context and its influence on the adoption of new technologies, particularly when it comes to a primary expression of state power: national (or transnational) central bank issued money. Cryptocurrencies may struggle to gain scaled traction without at least tacit sanction from African central banks and government leaders, whereas other blockchain applications should have a smoother adoption path by comparison, being less of a perceived threat to financial stability and state control.

Mobile network operators are the cash cows in many African markets, but it is less certain that they will have as strong an interest in blockchain as they did in mobile money remittances. Other sectors may need to take the lead, perhaps through an inverted model where supply chain efficiencies and cash management cost savings drive business cases rather than direct transaction fees from end users. Markets across Africa will need to consider localisation requirements, and not just import out-of-the-box implementations. Use cases and applications could potentially be quite distinct where priorities differ from other regions, or even neighbouring countries.

Judah J. Levine is CEO of Mondato.
The history of money has been evolved significantly from the barter system and only civilization has brought us to where we are today. Digital currencies are fundamentally changing the way we understand money and over the last decade, the world has seen drastic changes in the cryptographic arena. This subject can be difficult to understand as it involves maths and numbers, and can be very technical to some people. Africa is gradually discovering cryptocurrencies.

BACKGROUND HISTORY OF BITCOIN AND BLOCKCHAIN TECHNOLOGY
The idea of cryptocurrency started in 2009, by a man or group of people known by the pseudonym, Satoshi Nakamoto. This followed the 2008 economic meltdown, which saw many people succumbing to severe financial pressure. Bitcoin technology is aimed at bypassing the control of banks that dominate the financial system, and many see them as complicit in the 2008 financial crisis.

According to Don & Alex Tapscott (authors of Blockchain Revolution), Bitcoin is backed by the Blockchain technology, which allows digital information to be distributed but not copied. It is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value. Although, this technology was originally devised for the digital currency, Bitcoin, the tech community is now finding other potential uses for the technology.

The Bitcoin technology provides a peer to peer, faster, cheaper, and borderless transactions globally. Bitcoin is the mother of all the coins that are available. There has since been many other alternative coins created with the aim of improving on the Bitcoin. The Bitcoin protocol allows for only 21 million of them ever to be mined. Right now there is just over 16 million Bitcoins in circulation globally. Therefore, there is still roughly 5 million Bitcoins still to be mined and this will happen until the year 2140. This makes mining Bitcoin a long-term investment. Mining in itself does not necessarily create the Bitcoin. Bitcoin is given to miners as a reward for validating the previous transactions. The miners compete with each other in solving complicated mathematical problems. The beauty about Bitcoin is that it is practically infinitely divisible into small portions, called “Satoshis”, up to eight decimal digits. So you don't need to own the entire Bitcoin, to get started.

Blockchain is a decentralised technology. One that automatically checks in with itself every 10 minutes. It's a self-auditing ecosystem of a digital value; the network reconciles every transaction that happens in 10-minute intervals. Each group of these transactions is regarded as a “block”. Therefore, data is public and to alter any unit of information would mean using a huge amount of computing power to override the entire network. Anything that happens on it is a function of the network as a whole. A global network of computers uses Blockchain technology to jointly manage the database that records Bitcoin transactions.

BENEFITS FOR AFRICA
In many African countries where there is lack of dependable economic systems or governance, digital currencies may offer hope. Several African countries now have exchanges and start-ups in the crypto space, and their businesses are recognising the significance of cryptocurrencies in fostering cross-border trade and payment.
Corruption and mismanagement of foreign aids in Africa has been a longstanding problem. Funds are misappropriated or wasted, leaving ordinary people worse off. Given the transparency that Blockchain provides, all transactions can be publicly traced to the final destination.

There are many people who are marginalised from the mainstream banking system. According to the World Bank, 2 billion adult people still do not have access to a bank account. The cryptocurrency is allowing for the lay person on the street to participate freely in owning the wallet and be able to transact without having to pay exorbitant charges. Being unable to access banking keeps many people trapped in a cycle of poverty. Owning a digital wallet will be empowering and will also provide dignity and financial freedom to an individual.

One of the other uses of the technology behind Bitcoin is regulating elections as votes. Considering that most of countries in Africa experience serious conflict on the legitimacy of elections. This technology will solve problems of forgery or manipulation of votes. Africa should explore this technology and take advantage of these many opportunities to reduce corruption and promote development and good governance.

Bitcoin is here to stay and I believe that it’s just a matter of individual choice whether people want to ignore it or educate themselves about it. Remember how when the Internet started and people were quite sceptical about it? Today, internet access has increased dramatically in many developed and developing countries through the use of data-enabled cellphones. Even phones without internet access could be used. For example, in Kenya they use mPesa system, to access Bitcoin wallets managed by a third party company.

Regulatory hurdles need to be surmounted before digital currency can truly go mainstream. There is hope as many countries are getting around the idea of Bitcoins becoming a part of the system. Many businesses are already accepting Bitcoins as a form of payment globally including some popular online businesses.

**THE ROLE OF BITCLUBNETWORK (BCN)**

Bitclubnetwork, of which I am a member, is one business that has changed many lives since its inception in 2014. It has a very unique business model in that it leverages on the numbers of members to buy mining equipment. We then share the proceeds made on the day, depending on whatever is mined on the pool. We have grown to be in the top five of the 20 mining companies worldwide and we are more than just an investment group. We are a distribution channel and have many other products that we offer in the cryptocurrency space. Our team in Randburg, South Africa, also run a free course on cryptocurrencies for our members because we believe that knowledge is power. A few months ago, we embarked on an African roadtrip, launching in Nigeria, Kenya, Uganda, Ghana, Rwanda, Ethiopia and Tanzania. The aim is to spread the cryptocurrency gospel and empower people to make informed decisions and not just fear the unknown.

In conclusion, the people of Africa need to embrace an alternative to the weak and unreliable local fiat money. Cryptocurrency is a method that allows economically and politically subjugated populations to control their own wealth. It is a fast-evolving and complex phenomenon that will have major impact of power distribution in the global economy and in particular on the African continent.

Forward-looking governments in Africa should try and emulate the developments in Japan and Kazakhstan. Japan was the first country to recognise the need for the development of the cryptocurrency market system at governmental level, followed by Kazakhstan.

The topic on cryptocurrency will continue for years to come and the fact that there is marked interest, is a good sign that it cannot be ignored.

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Dr Lebo Hope Mpshe is a medical doctor and cryptocurrency miner and not a financial advisor. Views shared in this article are based on her personal experience in the cryptocurrency space. Some information is from a wide variety of articles read on the subject. Sources available on request.
EMBRACING DIGITAL MIGRATION OPPORTUNITIES

BY LAURENT PETIT

Living in a digital world, analogue technology has become an inhibitor to growth. By pushing to complete the digital television migration or digital switch over (DSO) across the continent, government and private sector should partner to create significant business opportunities for everyone to benefit from.

However, the process to migrate analogue television signals into digital has been laborious, costly and beset by various process issues across the world. On some continents, Africa being one of them, the switch has only been completed by a limited number of countries. While accurate figures are difficult to come by, analysts say that only 11% of African countries have completed their migration to digital.

Indeed, the DSO has been in the media spotlight for the past several years. Back in June 2006, the International Telecommunications Union (ITU) initiated the DSO process, setting a target date of June 17, 2015 for countries to complete their migrations. The goal was to free up the valuable spectrum used by analogue channels for other applications such as mobile broadband and to leverage the many advantages brought by digital television including more choice, more quality and more flexibility. This has not happened.

EMBARKING ON THE DIGITAL TRANSITION

In the meantime, countries like South Africa are using a dual illumination strategy to help combat some of the migration challenges. This means they are broadcasting both analogue and digital television until the country has completed its digital conversion process.

Why is it so difficult to complete the migration process? There are two main challenges: cost and getting different stakeholders, particularly industry players and politicians, to work together. And as is quite often the case, these two challenges feed into one another.

When the option to go digital via terrestrial technology is considered (as opposed to via satellites or a combination of satellites and terrestrial technology), the DSO migration process can become a very costly one, and because there are difficulties in getting multiple stakeholders to effectively work together, there is no agreement on how these expenses will be shared. Part of this is the financial and logistical issues of rolling out a proper digital network and getting
people to buy set-top boxes capable of converting the digital signal to work on their television sets.

Wrapped around the issue of costs is the fact that governments and private sector broadcasters often have different opinions of how best to approach the DSO and what the ideal way of managing the process is.

Given Africa-specific characteristics, such as its sheer size, varying orthography, and its abundant and widespread populations, for the continent to make digital migration happen, a new way of thinking is required away from just considering pure physical infrastructure and the political control over that network.

So how can the thinking be changed? For one, African leaders need to look at the DSO from an effectiveness perspective in the interest of their countries and citizens. They therefore must consider the most cost-effective and rapidly deployable network technology.

In most, if not all cases, the satellite technology, either alone or in combination with the terrestrial technology is often best placed to serve the urban centres and is providing the most cost-effective and the faster alternative to rolling out the capital-intensive and cumbersome terrestrial-only network of towers and repeaters.

**GOING THE SATELLITE ROUTE**

Satellite technology addresses the most significant concerns around the DSO process – cost, timing of the roll out and quality of the service. Because satellites can serve networks anywhere in the world, there is no need to roll out traditional land-based infrastructure as entire continents can be served by one or two satellite beams.

Suddenly, the cost is greatly reduced and there is no issue of taking months to trench cables or build antennas and towers to connect people to digital technology throughout Africa. It simply becomes a matter of installing a satellite dish that links to the global satellite network and delivering the signal directly into the homes.

Having said this, an effective DSO solution often entails the bringing together of the respective strengths of the satellite and terrestrial technologies. For example, where the urban areas are served by a few terrestrial antennas (ideally fed by the satellites that would already have the channels. This enables the most cost-effective (i.e. limited capital expenditures) and the fastest route to the DSO. Such a concept has already been proven in many countries around the world and must be considered as the genuine benchmark for a successful DSO.

It also means that this transition provides for a massive amount of job creation opportunities. Installers need to be trained, infrastructure needs to be rolled out to compliment what satellite can provide and even content producers need to look at things differently to enhance the broadcasters’ offerings.

Satellite providers and broadcast partners are one of the fundamental driving forces behind the DSO. In Africa, satellite operators offer an affordable and viable alternative to costly (and time-consuming) land-based infrastructure. Broadcasters can stream any piece of content to people living in even the most rural areas without having to worry about whether they have a terrestrial connection linking them to that content.

For broadcasters, it means they can extend their reach, have a wider audience and generate additional revenues. For viewers, it means access to more choices and a better quality picture provided by high definition channels.

**LET’S GO DIGITAL!**

The DSO should become more prominent in public discourse to raise more enthusiasm for the growth opportunities it can bring. Satellites can help achieve the DSO much faster and more efficiently than any other technology can. Satellites can thereby enable terrestrial broadcasters to reach large audiences and extend their services with more free-to-air as well as high definition channels.

In the coming years, the likes of virtual and augmented reality (combining to form “mixed reality”) will be driving more changes in the broadcast environment. For example, being able to watch rugby or football in 360-degree virtual reality will become a vital competitive advantage. Satellite will again be the foundation required to harness this new technology.

But all of this will only become possible by embracing the digital migration and ensuring it gets done sooner rather than later.

Government, broadcasters, and satellite providers can form a valuable partnership to migrate Africa to digital. The time has come to act and embrace a new, more efficient and cost-effective way of doing things. And satellite becomes one of the enablers to do so.

Pullout quote: “Why is it so difficult to complete the migration process? There are two main challenges: cost and getting different stakeholders, particularly industry players and politicians, to work together. And as is quite often the case, these two challenges feed into one another.”

Laurent Petit is Head of Africa Commercial at SES Video.
FROM DIGITAL
Divide TO
DIGITAL
Inequality

BY ALISON GILLWALD
The United Nations’ Sustainable Development Goals (SDGs) and associated targets are intended to stimulate action until 2030 in areas of critical importance for humanity and the planet. Although Information Communication Technologies (ICTs) are not mentioned directly in any of the 17 targets, they are acknowledged as an enabler of many of them. Of the 167 indicators identified, there are seven ICT indicators. These are primarily aimed as closing the ‘digital divide’ by ‘connecting the last billion, to use the mantra of the multilateral agencies, donor organisations, special interest foundations and non-governmental organisation that have rallied to this call.

Globally, Africa lags significantly behind all other regions when it comes to connectivity. The next least connected region is Asia, which has almost double the Internet users than Africa at 25.1% (ITU, 2016). But connectivity alone does not reduce information inequality. Even in countries with 90% 3G mobile coverage and 45% smart device penetration, such as Lesotho, the price of data remain relatively high. In Tanzania, which enjoys a low-cost state backbone network enabling some of the lowest retail prices on the continent, the 20% penetration rate believed to be the critical mass required to enjoy the networks effects associated with economic growth, eludes them.

Africa is characterised by low connectivity

In fact, in 2016 using International Telecommunications Union (ITU) data, only 21 African countries were above 20 per cent - these include Algeria, Botswana, Cameroon, Cape Verde, Cote d’Ivoire, Egypt, Gabon, Ghana, Kenya, Mauritius, Morocco, Namibia, Nigeria, Sao Tome and Principe, Senegal, South Africa, Sudan, Swaziland, Seychelles, Tunisia and Zambia.

Not only have most African countries not yet reached this rate of connectivity, but further, what is becoming evident is that unlike with voice access, network effects are not only linked to access but also to the intensity of use.

While these figures broadly tell the picture of uneven digital development and the potential of countries to harness ICT to realise the SDGs, the truth is that across Africa we do not know where we stand now, nor can we ascertain if, and when, we will have progressed toward the goals and targets of the SDGs.

What we do know with the high-level, supply-side data available from operators is that at the speed at which we are connecting people to the Internet today, we can never meet the 2020 target and that the lag will continue to be from global south, and Africa in particular. The global GSM industry association, GSMA, has indicated that with the current number of new mobile Internet connections of a million a day (and there is some argument for this slowing down as markets become saturated for those who cannot afford to buy service), the 2030 universal access targets for the will not be met until 2042. And these supply side targets still only address issues of access or connectivity, without much consideration of the real demand-side challenges.

High cost of data hinders Internet uptake

The high cost of data in Africa is often cited as the cause of poor Internet uptake. Getting data prices far closer the real cost of delivery, plus a reasonable rate of return, to create the necessary incentives for investments, is certainly part of the regulatory objective of pricing transparency exercises. But, that alone will not solve the problems of take-up. If one looks at prices they are not uniformly high across all African countries. And those with the lowest prices will not necessarily have the highest penetration levels. Penetration levels correlate with GDP per capita far more than with prices with the highest GDP per capita countries having the highest penetration levels – Botswana, Mauritius, South Africa (and beyond sub-Saharan countries – Tunisia, Morocco, Egypt). These countries do not all have competitive prices – though Egypt and Mauritius’ prices are amongst the lowest.

The high cost of data and voice are often equated with affordability in much of the rhetoric around ‘the digital divide’. Overall these high costs are determined by several factors. For instance, there are genuinely higher costs associated with the rolling out of greenfield networks under conditions where enabling infrastructure like roads and access to the grid is not available, and these therefore have to be financed in addition
to telecom infrastructure. There is also a real cost differential between rolling out services to more densely populated countries such as Rwanda in comparison to sparser populated countries such as Namibia or one with large land masses such as South Africa – though both do have urban concentrations that mean a significant proportion of the population can be reached very quickly and relatively cheaply.

Currency volatility and the high cost of capital locally may also counter the global trend of diminishing technology costs associated with the adoption of global standards and the accompanying economies of scale and scope. In many countries, high company taxes, secondary taxes on telecoms companies, high excise duties in equipment or generally high regulatory transaction costs, can make up over 30% of operators cost, as in the case in Uganda and Zambia. Taxes on communications services are particularly retrogressive, pushing up prices and impacting far more negatively on the poor and undermining national policy objectives of affordable access.

UNDERSTANDING DIGITAL INEQUALITY IS MORE COMPLEX THAN WE THINK

High prices clearly inhibit the take up of services by the poor but many affordability claims made are very misleading. Arbitrary targets and measures based on average communications cost or use plans as a percentage of GNI mask the extreme inequalities behind these averages, especially in many of our countries with some of the highest Gini-coefficients in the world. Current measures of affordability that use the cost of an ‘average broadband plan’ as a percentage of ‘average income’ to demonstrate affordability against the current 5 per cent of income target proposed by the United National Broadband Commission, tend to mask inequalities in income and misrepresent the affordability of services for the large numbers of citizens that fall below national averages (potentially the majority in very unequal societies such as South Africa). Disaggregating income into quintiles and using communications expenditure from demand side
survey has shown that the bottom quintile could spend as much as 20% of their income on communications.

Further, as quality becomes a bigger issue with more bandwidth intensive apps and platforms used, the more people are choosing, albeit reluctantly, to pay for high quality services. In South Africa for example although Telkom Mobile has offered 1GB of data for R99, and the other operators have offered for R149 a GB for over two years, Telkom Mobile has not been able to make significant inroads in their markets share, with Vodacom, marketing itself as a premium quality product going from strength to strength.

The actual in-country price of data is nevertheless an excellent barometer of the effectiveness of competition or regulation in retail markets. The price of data determine not only the point at which people may be willing or able to connect, but also their ability to stay on line and harness the internet for their wellbeing. As services and devices become more sophisticated and storage and analytics more pervasive, issues of affordability and the ability to use the Internet optimally and protect oneself from cyber attacks, abuses of privacy or surveillance, the less equitable will access and use of the Internet become. In fact a central policy challenge as we move from voice into data services including Over the Top platforms, Internet of Things and Artificial Intelligence – is that as the connected get more connected, so digital inequality is amplified.

Egypt comes out top of this list of countries on the RIA 1GB pricing index followed by Tunisia and Ghana. All of these countries have relatively high Internet use, but Mozambique at fourth place and Tanzania remain very low despite their low prices. While low prices in these two countries have tapped into the pent-up demand for services, there are still many subscribers who are still not online. For instance, only 9% of Mozambique residents use the Internet even though prices are as low as US$2.27 for a 1GB of data. On the other hand, countries with expensive 1GB data such as Swaziland at US$34.42 for a 1GB records relatively high Internet use. Identification of the factors for these diverse outcomes can again only be understood through demand-side surveying and analysis. It is only from here that the exact points of policy intervention can be identified to rectify the problem in the specific country context.

But strategies that target affordability purely from a consumptive perspective don’t work either. The fact is that even if we had effectively regulated, cost-based prices in Africa the vast majority of Africans would still not afford the use the Internet in any sustained and meaningful way.

Nor can public policy have a narrow sectoral focus any longer. ICTs cut across modern economies and societies. Policy formulation needs to deal with the Internet as a general-purpose technology, a cross-sectoral issue, necessary for effective citizenry and economic engagement. As the backbone of modern economies and societies ICT policy must be formulated within the context of the entire ICT ecosystem where the linkages, policy tensions and competing demands can be identified and managed.

SHIFTING FROM NARROW TECHNOLOGICAL DETERMINISTIC CONCEPTIONS

So, we need to shift from narrow technological deterministic conceptions that characterise the digital divide discourse, which focus on access and consumption alone, to broader notions of digital inequality. Measuring progress in terms of the economic value in growth indicators that mask inequality will also not create the conditions for sustainable development. A demand-side value of infrastructure development recognises the value generated by
information infrastructure as inputs into a wide range of productive processes. The outputs not only produce economic value but public and social goods that benefit society. As we have shifted globally from public utility to private provisioning of communications infrastructure we have increasingly ignored these beneficial outputs in our policy, focusing only on outputs with appropriable returns. We need to shift this consumptive lens to one that includes production, and from technological deterministic policy approaches to a rights-based understanding of the role of Internet if critical resource management is to be transformative.

To redress digital inequality far more attention will need to be paid to demand stimulation measures. Even where enabling environments conducive to investment have been created for the extension of networks, the limited demand-side data available in Africa illustrates how the socially and economically marginalised are unable to harness the Internet to enhance their social and economic wellbeing. The limited demand-side data available on the continent shows that besides affordability, human development – particularly education and therefore income – are the primary determinants of access, intensity of use, and utility of Internet. The development of relevant local content in local languages and applications, the enhancement of citizens’ e-literacy are all important demand stimulants. But until fundamental inequalities off-line are addressed they will be replicated and indeed, amplified on-line.

Although not explicit, these imperatives underlie the SDGs and inform the imperative of SDG9 ICT target of universal Internet access by 2020. The problem is that to measure this at the global level we are forced to deal with the patchy, out-dated, supply-side data that are unable to measure digital inequality in the predominantly prepaid mobile markets in developing countries. Further, from a policy point of view, the optimal points of policy intervention are context specific and to be effective need to be located in the political economy of the country. The truth of the matter is that across the global south we do not know where we stand now, nor can we ascertain if, and when, we will have progressed toward the goals and targets of the SDGs.

What we do know with the high-level supply-side data available is that at the speed with which we are connecting people to the Internet today, we can never meet the 2030 target and the lag will continue to be from global south, and Africa in particular. This reality calls for innovative policy that understands the need for a new interplay between state and market with new access, service delivery, investments and risk models that leverage community know-how and low cost technology innovations. It will require even greater regulatory agility and insight to manage the tensions between the different policy objectives of competitive efficiency, innovation and consumer welfare, and the safeguarding of public and social value of the Internet.

To get Africa connected will require doing things differently from what we are doing now. We need to explore alternative policy and regulatory interventions that do not assume mature, competitive, effectively regulated markets operating within guaranteed human rights frameworks – though of course we may continue to aspire to these. Recognising the constrained institutional endowments and
resources that tend to characterise many African countries, we need to identify multiple strategies across the ICT ecosystem that will enable Africa to reach the critical mass and intensity of use needed for the network effects associated with broadband expansion.

What might these include? Consider just two possible game changers. Build the public statistics that are missing in most African countries to inform an evidence base for policy making. This cannot be based on narrow, unaudited administrative data, extracted under conditions of extreme information asymmetry from operators by regulators as in the past. In this increasing complex and dynamic environment, it requires leveraging all existing and anticipated data, particularly aggregated, anonymised big data for public policy and planning.

Starting with an open data framework, a governance framework for the management of complementary supply-, demand-side and big data in a transparent and accountable way that is available for individual, collective, public and private use – a traditional public good; non-rivalrous, non-exclusionary needs to be developed. This would unleash information flows and enable knowledge building and innovation in many of our countries where national ICT statistics either do not exist – or are held secretly by national statistical offices, regulators and private companies. If governments recognise the high value of data and data analytics in the information age, they could better direct universal access obligations to provisioning of this data in usable formats by operators. This would be far better rather than adding to the cost of communications with secondary taxes that are historically poorly administered, and where expended have supported often extremely profitable companies by extending their businesses into so-called uneconomic areas. Funds, if they exist, though they should not necessarily be created for this purpose with their intractable inefficiencies, could also be better used to support low cost access solutions identified in the second area of intervention proposed – spectrum.

**ENABLING SECONDARY SPECTRUM USAGE IS KEY**

The critical resource for Internet expansion in Africa - spectrum, in most jurisdictions is locked into technologically determined licenses or in ideologically constrained notions of state or national resources rather than public resources. In most of our countries, most of the spectrum is largely unused outside of the main metropolitan areas. In the sharing-economy, we are already seeing voluntary infrastructure sharing by operators. 5G essentially operates within a spectrum-sharing environment with data off loads on to proprietal and open public Wi-Fi. From a critical resources management perspective, governments should embrace this. Enabling secondary spectrum use would enable new dynamic spectrum sharing, which operates at a fraction of the cost of GSM network to be deployed on new business models in the largely unused spectrum in rural areas, which could instantly provide low cost, high quality bandwidth there.

Accepting that large numbers of Africans will not be able to afford to be optimally online even if GSM broadband prices were cost-based, deploying spectrum to create and extend the Commons (unlicensed spectrum) would be a key enabler. Extending commercially available public Wi-Fi from elite urban areas, possibly through deploying poorly utilised universal service funds or other public resources to all public spaces, is a way of increasing the intensity of use in urban areas and enhancing network effects that would contribute to more inclusive digital development.

**DATA PROBLEMS**

The only way to accurately determine Internet users in pre-paid mobile markets (which over 95per cent of the Africa’s mobile market is) is through nationally representative demand-side surveys. Research ICT Africa is currently undertaking research across eight African countries – Ghana, Kenya, Lesotho, Mozambique, Nigeria, Rwanda, South Africa and Tanzania.

The data from the completed country study for Lesotho shows that the ITU Internet penetration figure is 16 per cent; this is based on the administrative data provided by the national operators. However the ICT ‘access and use survey’ undertaken by RIA with the Lesotho Communication Authority in late 2016, found the actual figures to be 28 per cent. This is explained primarily by the fact that all supply side data whether from the GSMA, which places Internet penetration in Lesotho at 19 per cent in 2016, or the ITU, are based on guesstimates as the actual unique users are impossible to distinguish in pre-paid environment.

It is difficult to identify unique users with contracted data plans, which is how subscribers have traditionally been measured. Some users will buy data but many will simply purchase airtime that they can convert into data or use for voice, making it difficult to assess data use from what they purchase. Mobile operators can, through analytics identify whether the airtime is being used for data or voice and this can be linked to a specific SIM card. However, because the mobile phone ownership figures are based number of SIMs in the market, rather than unique subscribers, assessing penetration (the traditional indicator of number of users per 100 of the population) becomes a fiction. This is reflected in the divergent numbers.

Some of this discrepancy can be explained by other data from the survey that tells us that on average each user in Lesotho has 1.3 SIMs. This is roughly the 22.24 per cent difference between the ITU figure and that of the LCA with the demand side data. Due to multiple SIM card use, these estimates tend to overestimate penetration rates. In this particular case, the access and usage demand survey by the LCA (2017), provides accurate and reliable penetration estimates. The study shows that 32.5 per cent of Lesotho residents have access to the Internet (from any device, school, home or public access point) - a figure that is way above the 2016 ITU estimate of 16 per cent, but which is based on data collected in 2015. Furthermore, the study shows that mobile broadband penetration (use a data service/ own a mobile phone) in Lesotho stands at 28 per cent.

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There is no doubt that the long-term future of the automotive mobility is electric. In 2016 nearly 774,000 electric vehicles (EV) and plug-in hybrid electric vehicles (PHEV) were sold worldwide, pushing the number of electrically powered vehicles on global roads over the two-million mark.

While that figure may represent just 1.1% of international vehicle sales, cuts in global emissions targets and a drive towards sustainability as well as energy-savings in the automotive sector mean that the future trajectory of electric drivetrains has been accelerated.

WHERE HAVE WE SEEN GROWTH IN ELECTRO-MOBILITY AND WHY?
The current growth in EV and PHEV sales is attributable largely to incentives and legislation put in place by governments, with aggressive emissions targets only attainable if electro-mobility is embraced on a massive scale. China is one of the leading markets for EV and PHEV vehicles, with over half a million EVs sold in 2016. One of the motivations behind the rapid adoption of EVs in the country’s major cities is their exemption from license plate lotteries and significant registration fees that apply to vehicles with internal combustion engines. In all, China provides subsidies that amount to approximately 23% of the price of a mid-size EV car.

While the Chinese 23% subsidy may seem staggering, consider that the prices of EVs and PHEVs in Scandinavian countries are subsidised by as much as 49% (Denmark) and 45% (Norway). Subsidy percentages are lower, but still significant elsewhere: the United States subsidises purchase prices by 18%, Germany by 13% and Japan by 10%. In the UK (the largest market for EVs in Europe), the introduction of the 2017 Automated and Electric Vehicles Bill means that, amongst other things, every petrol station and motorway service centre must install electric charging stations. It also establishes common technical and operational standards for these charging stations. The UK government’s aim is for the country to ‘lead the world in EV technology and use’, with almost every car and van to be zero-emission by 2050.

BMW GROUP’S ELECTRO-MOBILITY JOURNEY
The BMW Group started its electro-mobility journey in 2008, when we began testing our MINI E fleet worldwide. The results gleaned from those tests not only formed the basis for our global electro-
mobility strategy but they were also integrated into the BMW i range, which features our first fully electric production car, the BMW i3 and the revolutionary BMW i8 PHEV – the most progressive sports car.

BMW i is the innovation driver for the BMW Group. We have successfully transferred the technology featured in the BMW i8 to models within BMW and MINI, firstly with the introduction of the BMW iPerformance model range and recently the MINI Cooper SE Countryman ALL4. The eDrive technology featured in BMW i3 has been transferred to the first fully electric BMW X3, which will make its debut in 2020 as well as a fully electric MINI which will be introduced in 2019.

Our long-term goal is to offer customers the broadest range of electrified premium cars. By the end of 2017, we will offer 10 models, which by 2025 we will increase to 25 – of which 12 will be pure-electric.

In 2017 alone, we will deliver 100,000 electrified vehicles to customers, which will mean that by the end of 2017, there will be a total of more than 200,000 BMW Group electrified vehicles on the road.

The BMW Group's global electro-mobility strategy includes South Africa. Since market introduction in March 2015, a total of 439 BMW i models have been delivered to customers in South Africa.

In terms of the BMW i3 a total of 211 units have found homes, making it the most successful EV ever launched locally, while the BMW i8 is the market leader among PHEVs, with a total of 228 units delivered to customers. While we are proud of the strides we have made in this young electro-mobility market the role of legislation in the development of the EV market is pivotal – as clearly evidenced by the global trends.

OVERCOMING BARRIERS TO ENTRY IN SOUTH AFRICA

One of the biggest stumbling blocks to a competitive EV market in South Africa is the current rate of import duty tax which currently stands at 25%. Imported petrol and diesel vehicles with engine capacities under one litre attract zero percent duties, and other traditionally-powered, imported vehicles under EU trade agreements attract duties of 18%. In December 2016, BMW Group South Africa submitted a formal application to the International Trade Administration Commission of South Africa (ITAC), for the reduction of the import duty on pure EVs. The submission calls for a zero percent duty on the import of all electric vehicles for a period of three years and thereafter, for a 10% import duty to be applied.

It is our belief that a reduction in the import duty on EVs will create a more competitive market, with a wider offering for customers and with the added benefit of attracting potential long-term investment in electro-mobility in South Africa.

We believe that the reduction of import duty tax will not only make EVs more affordable, but also will give the whole automotive industry the means to contribute to the expansion of a public charging network.

Our approach to electro-mobility is holistic and is typified by our 360° ELECTRIC strategy, of which the introduction of public charging infrastructure is key. Range anxiety remains a stumbling block for many would-be buyers of EVs in South Africa, which is why a more comprehensive charging network is a critical tool to mitigating the anxiety.

With the market introduction of BMWi we established a nationwide public charging network of 54 charging stations, free to customers with ChargeNow cards. In Scandinavia, public charging stations are abundant in large cities. There is no reason why this cannot be the case in South Africa.

The proposed review of the import taxation issue is a the first step in a long journey, over time further adjustments may be required to enable sound thinking to become good practice in action. This is when we will see the benefit to all manufacturers who currently offer or have plans to introduce EVs in South Africa. More importantly, this is when we will see the conversation around electro-mobility take on real meaning.

The BMW Group will continue to be at the forefront of these conversations, helping bring about real, sustainable change in the electro-mobility field.

Tim Abbott is CEO of BMW Group South Africa and Sub-Saharan Africa.
For Africa, in my view, each country needs to perform an assessment of its current Information Communication Technology architecture and infrastructure when it comes to broadband and analyse the current market conditions for broadband services.

The issues that currently have, or potentially could have, an impact on broadband service delivery include:

• Spectrum: the laws of physics limit how much spectrum is available for any one purpose
• Open access
• Ownership structure
• International interconnection
• Impact of Government initiatives
• Current institutional contracts for broadband services
• Security requirements
• The degree to which the education, health and other government sectors have autonomy over telecommunications spending and determine their interest in partnerships

I find the issue of spectrum of greatest importance. Thomas Hazlett did too and his book entitled, “The Political Spectrum: The Tumultuous Liberation of Wireless Technology, from Herbert Hoover to the Smartphone” (Yale University Press, 2017) is a perfect blend of economic insight, historical anecdotes,
and lessons and equips present and future regulators in any industry with the insights to use their position to benefit citizens and society rather than being guided by their own aims, biases or fears. Anybody interested in the telecoms industry, politics, regulation, or economics should read this book.

Some experts have recommended that the solution to the wireless spectrum shortage is more wires. Not bound to such a philosophy I propose three technical solutions to mitigate the problem of limited RF spectrum.

**SOLUTION 1: DYNAMIC SPECTRUM ACCESS (DSA)**

What is necessary is to investigate how the use of dynamic spectrum access (DSA) management and geo-location database technology combined with software defined radio (SDR) implementations may be used to enable effective and efficient wireless networks to be built at scale that would support affordable Internet access using the shared spectrum resource.

Research & development (R&D) issues could include but are not limited to:

- Designing a software defined radio (SDR) using commercial or open source solutions
- Designing an SDR or cognitive radio multi-band antenna
- Performing RF measurement techniques and wireless network analysis in any spectrum band
- Designing a wireless channel or spectrum access database based on RF conditions measured in real-time or calculated based on priori information and
- Generating a real-time or dynamically changing spectrum use and re-use map. Such a map could be a tool for spectrum reduce (plan and acquire), re-use (deploy and utilize), and recycle (decommission and re-farm) as proposed by other experts and practiced by some Communications Regulatory Authorities in Africa.

**SOLUTION 2: CREATION OF VILLAGE NETWORKS (VNS) AS COMMUNITY NETWORKS**

Rural Africa could depend on communication in order to survive from hunger and related disasters due to adverse weather conditions for example. Early warning systems (EWS) along with improved agriculture techniques (crop weather monitoring and general climate conditions prediction) could save million lives. However, the challenge is that the economic capacity of rural Africans prevents them from accessing the Internet.

For this reason, the general population in Africa is technically left out and only the business segment has access to internet resources and its related benefits, further widening the digital gap. This is against the universal access policies set up in many countries and retrogressive of the efforts of many African countries in supporting digital goals, as supported by the World Bank.

To address the situation, in the short term; and considering the fact that FM radio through community radio stations is the widest, most popular and dominant communication channel, albeit being one-way (two-way on purpose, supported through mobile or landline networks), we need to exploit a two-way communication in the unused or underutilized HF band (30 kHz to 30 MHz). This would, if need be, support a low-power data link over the HF band to connect to the Internet from places where HF is the only viable alternative. Such an ultra-low cost HF intranet hooked to the Internet could be used for early warning notifications and community emergency response teams in line with the Commonwealth Telecommunications Organisation’s (CTO) agenda.

Additionally, there could be a novel IPv6 intranet architecture that could connect Internet of Things (IoT) sensors like the single board computer Raspberry Pi 2 /3 and above with a SenseHAT (cluster of sensors on a single board) programmed in python to collect all possible sensor data and share it using Wi-Fi (short range) or LoRA (long range) to a local cloud service within the intranet of VNs.

Wi-Fi in the villages would be less congested than in the metros. In the metros, a DSA technique like white
space communication would be more useful. The LoRa has the longest tested link range of 316 km (data) at 14 dBm transmit power and high gain antenna at 868 MHz, while the HF radio, 40 meter SSB transceiver module kit with digital control could cover a distance of 1000 km (voice) at any of the 400 kHz channel in the 7 MHz or 14 MHz band. If you read this today, you would remember the wireless legend and Nobel Prize winner in Physics, Gugliemo Marconi, an Italian inventor and electrical engineer known for his pioneering work on long-distance radio transmission and for his development of Marconi’s law and a radio telegraph system, nearly a century ago.

Research & development (R&D) issues include but are not limited to:

a) Assemble and hack the BITX40 HF transceiver radio
b) Collect text streams of data from the IoT sensors (Fig. 1)
c) Deploy LoRa or related networks

**SOLUTION 3: LABOUR TO PRODUCE THE MULTI-BAND CHIPSET FOR MOBILE TERMINALS TO GUARANTEE QUALITY OF SERVICE (QOS) AND COST BENEFIT OVER MANY FREQUENCIES**

A simple example for this technical solution is described in the “multi-frequency directional access point communication,” a patent granted with publication number: WO2016089908 A1, in which it acknowledged that, “some chipsets may soon provide the ability to alternate between TVWS and Wi-Fi communication channels.” I leave it to the academia and industry to intensify research and development in this direction and secure patents of the same, as the products flow to commercialisation and ultimately utilisation.

If consumer demand for wireless broadband continues to increase at predicted levels policymakers will need to employ all available approaches to encourage efficient use of the wireless spectrum. Ultimately the regulators in particular need to act. Our wireless future depends largely on access to reasonably priced, efficient fiber backbone connections to the global Internet, with articulate information super highways or special purpose vehicles (SPVs) in country. Until the day that they announce a Nobel Prize winner in Physics for manufacturing more spectrum, unblocking the fibre connection bottleneck and unleashing the power of competition is the most effective way to expand and improve wireless service in Africa and beyond.

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Dr. Chomora Mikeka is a senior lecturer in Physics at the University of Malawi and Director for the e-Communications Research Group (eCRG) Consulting.
In nature, the falcon is a fierce fighter. In business, the Falcon 8X is just as powerful and agile. Every inch reflects its military DNA, with lean and mean aerodynamics and advanced Digital Flight Controls to get you to places others can’t. Nothing flies like a Falcon because no other jet is built like one. Fierce. Fast. Agile. Falcon 8X.
The rapid spread of mobile networks in the last twenty years has made news of new mobile networks almost blasé. According to Ericsson, as of 2015, about two-thirds of the population in sub-Saharan Africa has mobile phone reception and about one-quarter have access to 3G or better mobile data services.

There is a tacit assumption that continued growth in mobile access networks will eventually connect everyone on the planet, but more recent news tells a slightly different story. A recent ITU report suggests that a digital urban-rural divide is growing. The GSM Association (GSMA) reports that mobile network subscriber growth in Africa is in fact slowing, as is revenue growth for mobile network operators. This slowdown is linked to the fact that a significant percentage of newer users come from lower income brackets living in regions that present challenges to operators, ranging from sparser population distributions to lack of effective power infrastructure.

Meanwhile, operators are experiencing pressures in their existing markets, from increased competition, erosion of revenue from over-the-top (OTT) voice and data services such as WhatsApp, Skype, etc., and insistence from regulators on network quality improvements.

SPECTRUM AUCTIONS NO LONGER A GUARANTEED ECONOMIC WINDFALL

As demand for wireless spectrum has increased and begun to exceed its immediate availability, regulators are challenged to find effective means of making frequencies available to operators in a timely and efficient manner. Where demand exceeds availability, an auction of spectrum is widely regarded as ‘best practice’ in the assignment of wireless frequencies, making spectrum available to those who value it most.

Around the world spectrum auctions have generated billions of dollars in revenue for governments. The last four years has seen a number of African countries embracing spectrum auctions. It is worth examining the results so far:

• Nigeria: In late 2013 the Nigerian Communications Commission (NCC) announced a spectrum auction for 30MHz of 2.3GHz spectrum. The auction attracted only two bidders and was won by Bitflux, a local consortium and new market entrant. Bitflux paid just over the reserve price of US$23 million for the spectrum license. At the time this was lauded as a success in bringing a new market entrant into the field of LTE services in Nigeria. By mid-2015 however pundits began to wonder why Bitflux had yet to offer services. As of early 2017, little evidence of widespread...
rollout appears to exist. Following this, the NCC tried again in 2014 to launch an auction in 2.6GHz. This was withdrawn and re-attempted in 2015 but again withdrawn. In March 2016 an auction was finally launched successfully. Fourteen lots of 2x5MHz spectrum were put up for bid. By the end of the bidding process only one operator, MTN Nigeria was willing to meet the reserve prices of 16 million USD per lot. MTN bid for six lots, paying a total of $96 million. The remaining lots of spectrum remain unsold.

- Mozambique: In 2013, the regulator (INCM) announced the auction of five lots of 2x5MHz of spectrum in the 800MHz band with a reserve price of $30 million per lot. The auction did not attract any bids and was widely perceived to have an excessively high reserve price. The auction was quietly withdrawn and no subsequent auction has been attempted by INCM.
- Ghana: In 2015, the Ghanaian regulator announced an auction of 800MHz spectrum, offering two lots of 2x10MHz spectrum with a reserve price of $67.5 million per lot. While local companies were encouraged to participate, none of the three Ghanaian companies that registered for the auction were able to meet the reserve price. The only company to meet the reserve price was Scancor (MTN) resulting in an effective monopoly for MTN in the 800MHz band. The regulator has announced plans to attempt to auction the remaining spectrum, in response to which, MTN has argued that any successful bid must match the price paid by MTN.
- Kenya: The assignment of spectrum in the 800MHz band began in 2014 with a request from the Kenyan government to the largest operator, Safaricom, to build a national police communications network. Safaricom initially agreed to pay $56.2 million and build the requested network in exchange for access to 2x15MHz of spectrum. After complaints from Airtel and Telkom Kenya, the regulator compelled Safaricom to relinquish 2x5MHz of spectrum so that each of the three incumbent mobile network operators would be assigned 2x10MHz of 800MHz spectrum each for a total of 60MHz of spectrum. The three operators have agreed to each pay $25 million for the spectrum licenses.
- Senegal: In 2015, the Senegalese regulator announced an invitation to apply for LTE spectrum in the 700MHz, 800MHz, and 1800MHz bands. The reserve price was set at XOF 30 billion or approximately USD $50 million. Operators objected to reserve price and a standoff was finally resolved when the regulator restarted the licensing process having negotiated a deal with the former fixed-line incumbent operator, Sonatel, to pay XOF 32 billion or $53 million for 2x10MHz of 800MHz spectrum and 2x10Mhz in the 1800Mhz band.

These recent results suggest that spectrum auctions have not generally enabled new competition. Even where they have, the cost of the spectrum auction may be such a millstone around the neck of the new operator that they are unable to roll out infrastructure. We can also see that governments often treat spectrum auctions as a tempting economic windfall, which can lead them to exact such a premium that only the largest, wealthiest operators can participate.

**CREATE AN ENABLING ENVIRONMENT FOR RURAL CONNECTIVITY**

It is reasonable to speculate that expensive spectrum licenses will not lead to increased rollout in rural areas. By committing millions of dollars in advance of rolling out any network infrastructure, operators are likely to roll out infrastructure in areas where they are likely to generate the highest revenues, in more densely populated urban areas.

If governments are to create a truly inclusive digital economy where access is available to all, regulators must embrace strategies that go beyond auctions to create an enabling environment for operators targeting rural access. The success of unlicensed (WiFi) spectrum, and the more recent introduction dynamic spectrum management in the form of Television White Spaces spectrum regulation and the Citizens Broadband Radio Service in 3.5GHz offer, represent alternative spectrum management strategies that can complement more traditional exclusive use spectrum licenses. In Mexico, the communication regulator has set aside free access to small amounts of GSM spectrum specifically for connecting the rural unserved in indigenous regions.

While there is little doubt that long term, exclusive spectrum licenses continue to play a critical role in increasing affordable access to communication, regulators will need to adopt a more diversified approach if affordable rural access is to be effectively addressed. This would not only serve to enable a more affordable and ubiquitous access ecosystem, but would also reduce risk for regulators. Smart investors diversify their portfolios in order to mitigate risk; regulators would be wise to do the same. 

*Steve Song is Research Associate at Wireless Spectrum, a Network Startup Research Centre.*
Education and training are at the heart of both the United Nations’ Sustainable Development Goals and the African Union’s 2063 agenda. Both organisations have recognised that education and training are vital elements in securing significant and sustainable improvements in living standards across Africa. In the words of Nelson Mandela, “Education is the key to everything.”

Noble sentiments and fine words are the easy part though. Africa has had plenty of them in the past but little has changed. The point now is to move to action, to turn words into reality and to implement real change.

There is a new mood on the African continent. For the past decade I have travelled around Africa, discussing education and technology with teachers, students, political leaders and business people. Across the continent, people are discovering a new sense of confidence – about themselves and their prospects.

Many African economies are now growing at rates that are the stuff of the dreams of their European and North American counterparts. Between 2001 and 2011, six of the world’s 10 fastest growing economies were African. Africa, as a whole, has been growing at over five per cent for several years. With plans already well advanced for the creation of a single African market, free from the obstacles of national bureaucracies, international investors are alive to the multitude of opportunities opening up across the continent.

STRIVING TOWARDS A TRANSFORMED CONTINENT
This is the new economic climate that has inspired the African Union (AU) to dream of a transformed continent where the misery of the past is at last consigned to the history books. The AU’s 2063 Vision is an inspiring call-to-arms, an action plan for change. It points the way ahead to a new future, in which Africans at last become the masters of their destiny and the beneficiaries of the immense resources with which their continent is endowed. It is a vision of the future, which shows Africa in a partnership of equals with Europe, holding its head high in the world.

This bold vision, however, will be nothing without education. In sub-Saharan Africa, more than 60% of the population are under the age of 25, yet the region only captures 55% of its human capital potential, compared to a global average of 65%.
Although Africa as a whole is blessed with the youngest population on the planet (a huge potential demographic advantage for the continent), as many as 17 million of the continent’s 128 million children of school age will never actually attend school, according to the African Learning Barometer. That is not only a tragedy and a colossal waste of opportunity, but also the seedbed of future resentment and discontent. Unless something is done about it, and quickly, it will feed itself into the crimes, corruption and petty wars of the remaining decades of the 21st century.

ELEARNING TRANSFORMING AGRICULTURAL OUTCOMES

There is a better way, though. The combination of education and technology is what can change this dire prognosis. The past two decades of rapid development of information and communications technologies (ICTs) have opened up a vast new horizon of opportunity in education. Information, expertise, courses and software that had previously been the preserve of a select few have now increasingly become both affordable and accessible for millions of people throughout the world. In Africa, the effects are already astonishing and, year-by-year, they will continue to magnify and spread.

It is perhaps easiest to see both the effects of what has happened, and the contours of what is possible, in one of Africa’s most important industries: agriculture. Still a highly labour intensive industry at the heart of the African economy, it employs 65-70% of the overall workforce and accounts for about a third of the continent’s GDP.

There is a fast-growing regional food market and the sector continues to hold great promise for broad-based economic growth and job creation. Significantly, however, it is increased efficiency in smallholder farming, rather than simply foreign investment, which is driving growth in the agriculture sector. What is behind the increase in efficiency? It is clear that ICTs, access to information and the spread of education are all playing an important role.

As a recent World Bank report made plain, “the strategic application of ICT to the agricultural industry, the largest economic sector in most African countries, offers the best opportunity for economic growth and poverty alleviation on the continent.” Typical examples of successful projects, based on improved access to information and eLearning are the mFarmer initiative and Farm Radio. mFarmer, which was started with a grant from the Bill and Melinda Gates Foundation, now provides farmers with information and advice via their mobile phones. Farm Radio helped to overcome traditional obstacles and change farming practices in Malawi with subtle information campaigns woven into the storylines of a popular soap opera. Both contributed to improved production.

FUTURE PROOFING AFRICA’S WORKFORCE

The challenge now throughout the African economy is to match future jobs with the skills that are needed for them. Although Africa’s youngsters are far better educated than older generations and the share of the overall population with at least a secondary education is set to increase from 36 per cent in 2010 to 52% in 2030, the continent’s capacity to adapt itself to the job disruption associated with the arrival of ‘the fourth industrial revolution’ is doubtful. Employers across Africa are concerned about a lack of appropriate skills.

In a report in May 2017, the World Economic Forum urged Africa’s educators to build a pipeline of future skills and design future-ready curricula that encourage critical thinking, creativity and emotional intelligence as well as accelerate acquisition of digital and STEM skills to match the way people will work and collaborate in the fourth industrial revolution.

Whatever happens, it is clear that eLearning (or ‘technology-assisted learning’) will have an important role to play. Africa’s eLearning market doubled in size between 2011 and 2016 and several countries, such Senegal and Gambia, are showing annual growth in their eLearning markets of 25%. With its youthful, ambitious and knowledge-hungry population, Africa is set to show continuing growth in this sector for many years to come.

If it wants to guarantee it, however, its political leaders will have to continue to work hard to tackle the major obstacles to growth, the most important of which are power (unreliable electricity supplies in many areas), poor connectivity and the cost of data. I know how seriously African governments take these issues. They realise that they are much important to the growth of the eLearning sector than the provision of hardware (an expensive mistake some governments made in the past). The subject of connectivity has been a regular theme of ministerial round tables at the annual eLearning Africa conference for the past six years or more.

Yet, change is coming. Better systems are being put in place. Improvements are being made and I have no doubt that, by 2063, just as the African Union intends, Africa will be a transformed continent.

Rebecca Stromeyer is the CEO of ICWE GmbH and the Founder of eLearning Africa.
Red tape and taxes on mobile phone components are strangling MINT Mobile’s plan to launch the first smartphones and tablets to be designed and made in South Africa.

MINT Mobile Chief Executive Officer, Sagran Pillay, talks about the company’s plans and offers some thoughts about why the rest of the world is slashing red tape and relaxing stringent tax policies while Africa is drowning in bureaucratic tax laws. Pillay says that the mobile manufacturing sector is particularly hamstrung by the ad-valorem tariff, a tax on an import calculated as a percentage of the value of the import.

Q: What is MINT Mobile’s mission?
A: We are dedicated to bringing the South African market affordable, locally designed devices that can compete with leading products worldwide. We are working hard to bridge the gap in the market for smartphones, feature phones, ruggedized phones and tablets that are high quality, affordable and locally designed. By designing mobile devices in South Africa, MINT Mobile is boosting the country’s economic, employment and investment opportunities.

We have spent a significant amount on research and development over the last two years and believe that the design and production of handsets locally will not only create jobs, but will boost growth and data consumption.

We are confident that in spite of the dominance of global brands like Samsung, Apple and Huawei, South Africans and eventually Africans, will embrace the MINT-branded products.

Q: Why is it difficult to design and manufacture smartphones locally?
A: Africa is the second largest mobile phone market in the world, and according to the International Data Corporation shipments of smartphones into Africa go up every year. The number of mobile phone users in Africa is rising steeply, making the continent an alluring target for both network operators and handset manufacturers alike.

With so many consumers ready to purchase smartphones or upgrade their current feature phones to newer models, the question of whether or not Africa is ready to satisfy the market is relevant. Put simply, why are there not more locally manufactured smartphones on the continent? Could it be price? It is likely down to a number of factors, most notable being price and technology, government red tape and taxation.

To date manufacturers and distributors have spent a significant amount on research and development over the last two years and believe that the design and production of handsets locally will not only create jobs, but will boost growth and data consumption.

We are confident that in spite of the dominance of global brands like Samsung, Apple and Huawei, South Africans and eventually Africans, will embrace the MINT-branded products.
base their manufacturing, research and development and distribution warehouses in inexpensive labour markets, particularly in China. A key factor in the development of individual markets has been the role of government policy in refusing to offer tax incentives.

Large companies have an established distribution footprint in Africa, have the capital and technology for research and development and have the ability to enter new markets very quickly, but none can design and manufacture their own handsets in Africa.

Has it not been easy to deal with the tax implications? The biggest hurdle is the ad valorem tax.

Q: What is ad valorem tax and how does it work?
A: It can be simplified as ‘luxury tax’. It is a tariff levied on imports, defined in terms of a fixed percentage of value. For example, 7% ad valorem means 7% of the value of the entered merchandise: This contrasts with tariffs on the weight, size, or quantity of the import. Like all tariffs, ad valorem tariffs are controversial, with opponents arguing that they are economically inefficient. After many years of economic liberalisation, it appears that bureaucracy and over-regulation is still a huge problem. While South Africa’s ad-valorem tax is high at 7%, many other African economies are no better. The level of red tape affects all types of businesses, from major corporations to sole traders.

Many governments use such administrative processes as a means of raising funds, but this results in the suffocation of the very businesses that would create genuine economic growth in the first place.

This obviously provides a disincentive to start-ups and even those wishing to import parts and assemble locally.

A World Bank report concludes that 80% of the countries difficult to do business in are located in Africa. While most African countries are struggling to catch up with competitors elsewhere in the world, surely it should be easier to set up a business in Africa than elsewhere, rather than more difficult.

The kind of liberalisation that forces African countries to import foreign manufactured goods without restriction but places heavy tariffs on mobile handsets is certainly unfair.

For example, not one mobile telephone handset manufacturer produces and assembles its products in sub-Saharan Africa. Ethiopia is one example of a country where parts are imported into the country and handsets assembled locally.

Q: Are you saying African companies are helpless in the face of unfair rules of trade?
A: I am saying that cutting red tape is one way in which government can help the private sector. Everyone stands to gain from this. It will make South Africa and other countries more attractive for international trade and this translates into jobs and earnings for citizens. The private sector needs to do more to help government identify bottlenecks in the system and remove them. Ad valorem tax is one of the bottlenecks. Simpler and better custom duties for imports and exports could yield considerable benefits to small- and middle-income countries.

We have been having discussions with the Department of Trade and Industry for years without success.

While most countries are speeding up processes such as registering a company, including opening a bank account and obtaining tax clearance certificates, there is much to be done to offer companies tax incentives.

For example, in the latest Global Competitiveness Report, South Africa is ranked 120th out of 144, while Rwanda is ranked sixth out of 144 in terms of the ‘burden of government regulation’. What is more, while it takes a mere six and a half days to start a business in Rwanda, South African business owners a day, while South African business owners can expect to wait up to 21 days.

If African companies are to prosper, it is important that governments improve the ease of doing business by alleviating some of these pertinent red tape-related constraints and offer tax incentives.

Africa requires more liberal policies and greater business inclusion. We cannot afford an unproductive economy and red tape that deters investment and entrepreneurial activity or one that chases innovation enterprise development away.

Lawmakers should listen to us. If not, the continent will remain uncompetitive.

Q: So, what is MINT Mobile’s plan for the future?
A: Our aim is to remain committed to bring globally acclaimed mobile technology to the African continent. We are forming strategic partnerships with several companies that have similar cultures to ours. By sharing our objectives, we will be able to increase our competitive advantage, core competencies and skills base. In February 2018 we will launch top of the range low-cost devices which will compete with current international brands.
The Forbes Africa ICT Outlook Team wish to thank the following contributors for providing information and insights about the continent’s ICT as the next potential enabler of sustainable economic growth, driving innovation for the developing world.

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With special thanks to our sponsor, MTN Business South Africa.
Founded in 2015 by a team of business leaders with decades of experience in the African telecommunications industry, Uniq Axxess specialises in helping companies to prosper on the continent.

The company works with both new entrants into the African market, as well as businesses who already have African operations, offering bespoke sales and distribution strategies that drive revenue growth.

With a client base that includes mobile device manufacturers and software development companies, Uniq Axxess’s strong relationships and deep understanding of this complex marketplace make them an invaluable partner to any business operating on the continent.

To find out what Uniq Axxess can do for your business, contact Managing Director, Victor Rakhale at victor@uniqaxxess.co.za or visit www.uniqaxxess.co.za
MTN Business is dedicated to building African success stories. As one of the first to bring the internet to Africa, we’ve established a strong local presence in 22 countries across Africa and the Middle East. Our extensive infrastructure ensures both reliability and agility, making it easier than ever before to expand across these fast-growing regions.

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