chapter 2 Cellular Networks

Cina Lawson,
minister of digital economy and digital transformation – government of Togo

Closing the gender gap through digital and social inclusion

Over the past decade in Togo, the mobile penetration rate has nearly doubled · from 40% in 2011 to 78% in 2021; the internet penetration rate, while below 5% in 2011 reached 75% in 2021 — a fifteenfold increase; and the mobile money penetration rate grew rapidly from 0% in 2011 to 58% in 2021.

These statistics show that Togo has made a significant leap in digital infrastructure. Yet, more than 40% of the country's telephone base is made up of 2G mobile phones, which are not suitable for exploiting the full potential of digitized public and social services, as well as the universe of possibilities offered by the internet.

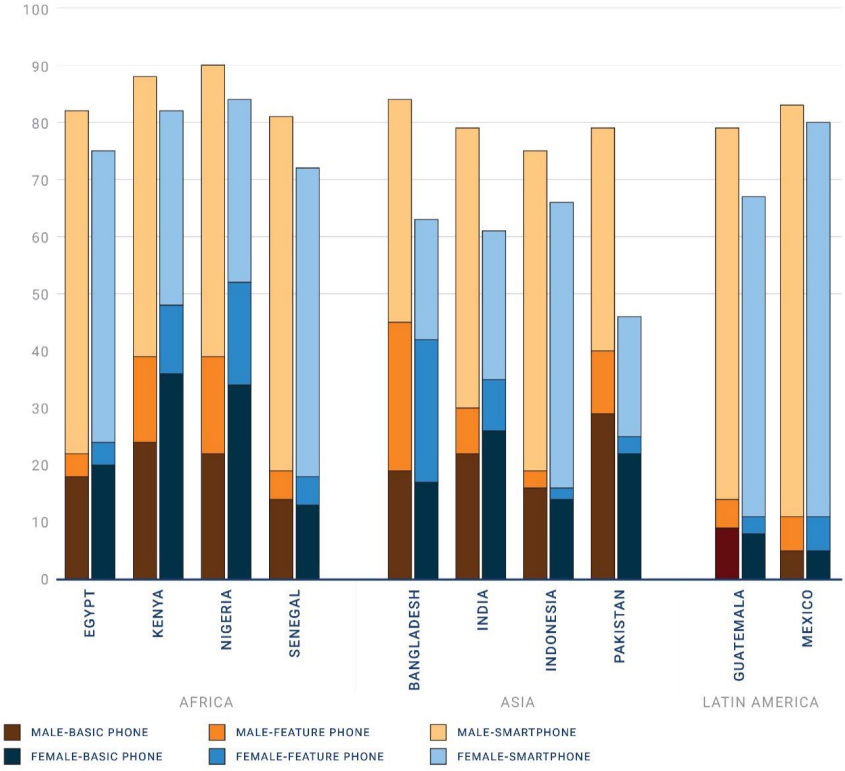
If we have learned anything from the COVID·19 pandemic, it is that digital transformation can be a powerful tool to ease inequalities in society, by providing essential services to those in remote and hard·to·reach areas, as well as to those most in need. Regrettably, however, in low· and middle·income countries, women are 7% less likely than men to own a mobile phone and are 16% less likely to use mobile internet.

During the pandemic, Togo launched 'NOVISSI,' a digital cash transfer program that distributed $34 million in financial aid to 25% of all its adults. The program aimed to help people in the informal sector impacted by the mobility restriction and social distancing measures was adopted by the government in the context of the state of health emergency. NOVISSI revealed the importance of having a national ID, registered SIM, and mobile phone to easily enrol in, and directly benefit from, the program. Globally, and beyond Togo, it demonstrated that widespread access to mobile devices could enable shock·responsive, and contactless delivery systems, to expand the reach of social protection.

As part of the cash transfer program, Togo decided to give more money to women than men, because of the key role women and girls played in supporting households (e.g., in homecare for the sick and performing daily housekeeping type functions including — but not limited to — childcare, cooking and shopping).

GENDER GAPS IN QUANTITY AND QUALITY OF MOBILE PHONE OWNERSHIP

A 2021 GSMA survey of 10 countries revealed significant disparities in mobile phone ownership between men and women. Although the four African economies surveyed (Egypt, Kenya, Nigeria, and Senegal) have comparatively small mobile phone ownership gaps, there exist large differences in phone quality capabilities between men and women. In Nigeria, for instance, more than half of men 18+ have smart phones, while less than a third of women 18+ do.



Source: GSMA. 2021. GSMA Consumer Survey 2021. Global System for Mobile Communications.

Africa Growth Initiative at BROOKINGS

While women constituted 61.4% of the total beneficiaries of the program, learnings from monitoring done throughout the scheme revealed that women (mostly in rural areas), had lower access to digital terminals than men. Moreover, in many households, the only existing phone belonged to men, making it difficult or almost impossible for women to have direct access to the social assistance funds allocated to them. Closing the gender gap in mobile phone access and use would therefore directly contribute to the economic

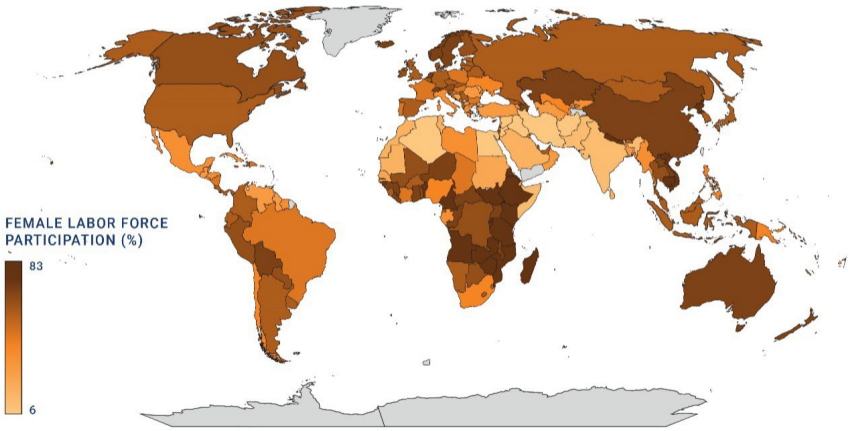
empowerment of women and girls, and to achieving equal opportunity.

Several barriers hinder women's ownership and use of mobile phones, such as affordability of mobile devices and lack of proof of identification required to register SIM cards and take loans. The lessons learned in Togo throughout the pandemic have inspired our new 2025 digital transformation strategy. One of the key initiatives of this strategy is to build a universal, foundational ID system to boost citizens' inclusion in the economy by providing each person with a biometric ID and a unique identification number. Once citizens have a unique biometric and digital ID, well thought-out partnerships with the private sector and innovative pay-as-you-go business models or micro loans could popularize access to mobile devices (especially smartphones) for everyone—and at subsidized rates for women. The ID system will also underpin the dynamic and unique social registry Togo is looking to set up to support all its social protection programs. Coupling the government-led unique electronic identifiers with a mobile phone and a mobile wallet could help to systematically close digital, social, and financial inclusion gaps for women, the poor, and vulnerable. The Togolese ID system will also underpin the dynamic unique social registry Togo is looking at setting up to support all its social protection programs.

Originally published in Brookings' Foresight Africa 2023. ■

AFRICAN COUNTRIES LEAD THE WORLD IN FEMALE LABOR FORCE PARTICIPATION

Countries like Rwanda (83 percent), Madagascar (82 percent), and Tanzania (80 percent) have among the highest rates of female representation in the workforce. Their female labor force participation rates are higher than comparable countries in Eastern Europe, the Middle East, and South America.



Source: World Bank. 2022. World Development Indicators. World Bank Group.

Africa Growth Initiative at BROOKINGS

Jordan Cox,
research manager, GSA

Africa's lack of infrastructure and communication coverage, and its issues with older network infrastructure, are well-documented. But there is real potential for new-generation technologies to connect the continent to the rest of the world. Indeed, many operators and countries are now investing in and launching 5G networks across Africa.

Globally, there are 983 operators investing in LTE networks, with 825 now having launched public LTE networks in 243 countries and territories. In North Africa, 19 operators have rolled out LTE mobile services, of which ten have launched LTE-Advanced in Algeria, Libya, Morocco, Sudan, and Tunisia, with one other operator currently in a testing phase.

Of these 19 telecom providers in North Africa, 16 have also launched LTE fixed wireless access (FWA) services. In the larger sub-Saharan Africa region, 182 operators are investing in LTE, with 151 networks launched and a further nine operators actively deploying LTE. Furthermore, 37 operators in this region have deployed LTEAdvanced, and a further four are deploying, plan to deploy or are testing the technology. There are also 87 operators in this area that have deployed or launched LTE FWA networks, with four more currently in the process or planning to deploy.

As a result, Africa now makes up 20.8% of the total number of operators investing in LTE and 20.9% of all commercially deployed networks, a steady increase of 0.4% and 1.3% respectively since last year. Although the continent still accounts for many places without LTE access, it has seen a dramatic drop in the number of not-spots. The only African countries and territories with no LTE network known to GSA are Central African Republic and Eritrea.

In terms of LTE and 5G subscribers, however, the continent is further behind. Mobile subscriptions in Africa stood at 1.2 billion by the end of December 2021, according to data supplied by OMDIA. In absolute terms, LTE was the fastest-growing mobile technology in Africa in the 12 months to the end of 2021, gaining 57.3 million subscribers to reach a total of 247.9 million, although this pales in comparison with WCDMA networks, which reached 646.6 million subscribers by December 2021. GSM continued to decline, falling from 393.6 million to 337.9 million subscribers.

LTE is now gaining a foothold in Africa. It was the fastest-growing technology in percentage terms and just above WCDMA in absolute terms. LTE subscriptions hit 247.9 million by the end of 2021, up more than 30% over 12 months, accounting for slightly more than 20% of all mobile subscribers on the continent. In comparison, globally, LTE represents over 67%. As LTE gains ground, eventually delivering gigabit speeds, GSA expects a migration from 3G to 4G or LTE and later 5G. But for now, Africa represents only 3.6% of the world's LTE subscribers. It is important to note that LTE population penetration in Africa was still only about 18% in March 2021.

5G is on the horizon

Network suppliers and operators worldwide are currently testing and deploying 5G networks — in fact, 292 commercial 5G networks have now been launched worldwide. The pace of evaluation and deployment has been

accelerating in Africa too. GSA is aware of 70 African operators from 38 countries that have been investing in 5G networks, including pre-commitment evaluation, testing, and trialling, all the way to service launch.

Southern African operators are at the vanguard of the region's 5G development efforts, with 5G network launches by MTN, Rain and Vodacom. GSA has also recorded 5G launches in Angola, Botswana, Burundi, Ethiopia, Gambia, Kenya Madagascar, Mauritius, Reunion, Seychelles, South Africa, Togo, and Zimbabwe, among others. There has been a soft launch in Lesotho, precommercial deployments in Ethiopia, Kenya, Libya and Mozambique and further active deployments underway in Angola and South Africa.

Furthermore, GSA has identified other operators with plans to deploy in Cape Verde, Cameroon, Ghana, Kenya, Mauritius, Namibia, Nigeria, Republic of the Congo, Seychelles, South Africa, and Tunisia.

New generation technologies

We are starting to see more and more LTE solutions for voice and IoT services in Africa. VoLTE is now commercially available in at least 22 African networks, with three other operators known to be actively deploying the technology and two planning to do so.

Narrowband IoT, meanwhile, has been launched in Kenya, South Africa, and Tunisia, with further investments in Liberia and Nigeria. MTN has been involved in trials of LTE-M in South Africa.

The year ahead

GSA expects LTE to continue its rise in Africa during 2024. With at least nine operators known to be deploying new LTE networks as of November 2023, we might expect to reach nearly 170 LTE networks providing either FWA or full mobile services in Africa by the end of the year, which is slightly down from our prediction of 170 in 2022.

It will be a few years before the technology is as widely used as 3G. But given the recent rise in commercially launched networks, the expected launch of more LTE services in 2024 and the fact that it will be available to many more people as network coverage widens, LTE will attract more and more users.

In addition to the growth in use of LTE, GSA expects the quality of the LTE infrastructure to improve. We forecast that the number of networks being upgraded from LTE to LTEAdvanced and LTE Advanced Pro will increase — predominantly through the introduction of carrier aggregation to improve speeds, and the launch of 3GPP IoT technologies. Currently, few networks in Africa can boast maximum (peak theoretical) download speeds of much more than LTE Category 4. GSA has identified 20 operators offering Category 6 or better.

Beyond LTE-Advanced and LTE Advanced Pro services, the launch of 5G networks will help to deliver higher speeds for end-users and will additionally open new opportunities for industry.

With more than 10 operators having launched or currently deploying 5G networks, rollout of 5G will continue to gather pace across the African continent over the next few years, supported by more governments and regulators making spectrum available — a critical enabler for 5G deployment.

At the same time, new technologies designed to improve rural coverage, coupled with wider availability of lower-cost mobile devices, will bring LTE and 5G within reach of more households. ■

James Williams,
director of programmes, Mobile Ecosystem Forum

Control through data abstinence
MEF 9th Annual Trust study

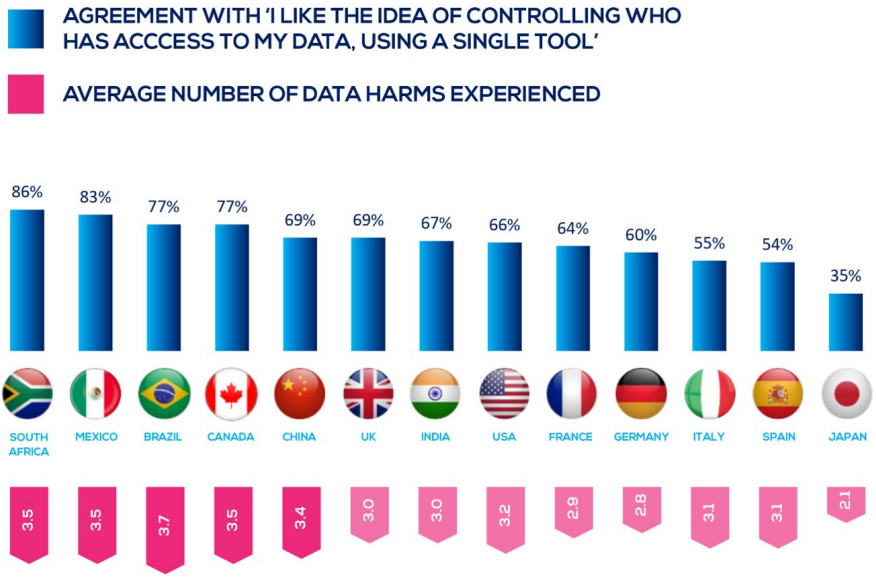
The 9th Mobile Ecosystem Forum's benchmark on consumer trust highlights the concept of 'data abstinence,' a triangulation from users' desire to participate in mobile services, the appeal of free services, and concerns around privacy and security.

MEF's 9th Annual Global Trust Study was carried out in January and February 2023. On Device Research surveyed 8,450 smartphone users, 650 in each of 13 markets, including South Africa.

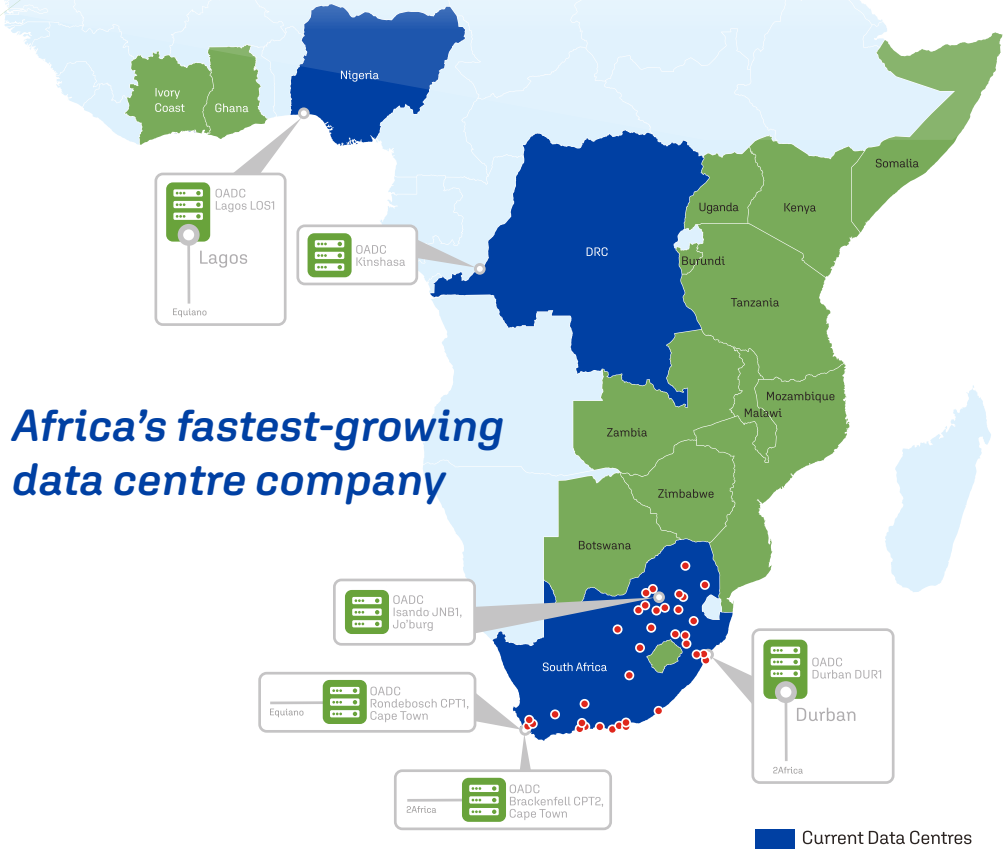
Trust in data sharing is weak, with the report finding an average Trust Index of 54% across the 13 markets – although this value is notably higher in South Africa, at 64%. The mobile economy is growing fast and is central to the lives of many, and so is the sharing of information in the data economy. Users are reluctant to share data, but are embracing mobile services, and data powered ones, at a consistent rate. The uneasiness of data sharing is well established though.

The 54% Trust Index shows work is still needed to build awareness, control, and defence tools. Many commentators might reflect positively that the model 'free services in exchange for data' is still working. However, there is a form of decay in the system that is not easy to view from a distance – data abstinence. The quantity and quality of information that is shared in the system is deteriorating.

The study shows that 67% of global users avoid sharing their personal data, and only 12% of users say that they do not worry about control of their data. Deleting accounts and sharing as little as possible is impacting on social media. Users are increasingly passive, lowering their



Open Access DATA CENTRES



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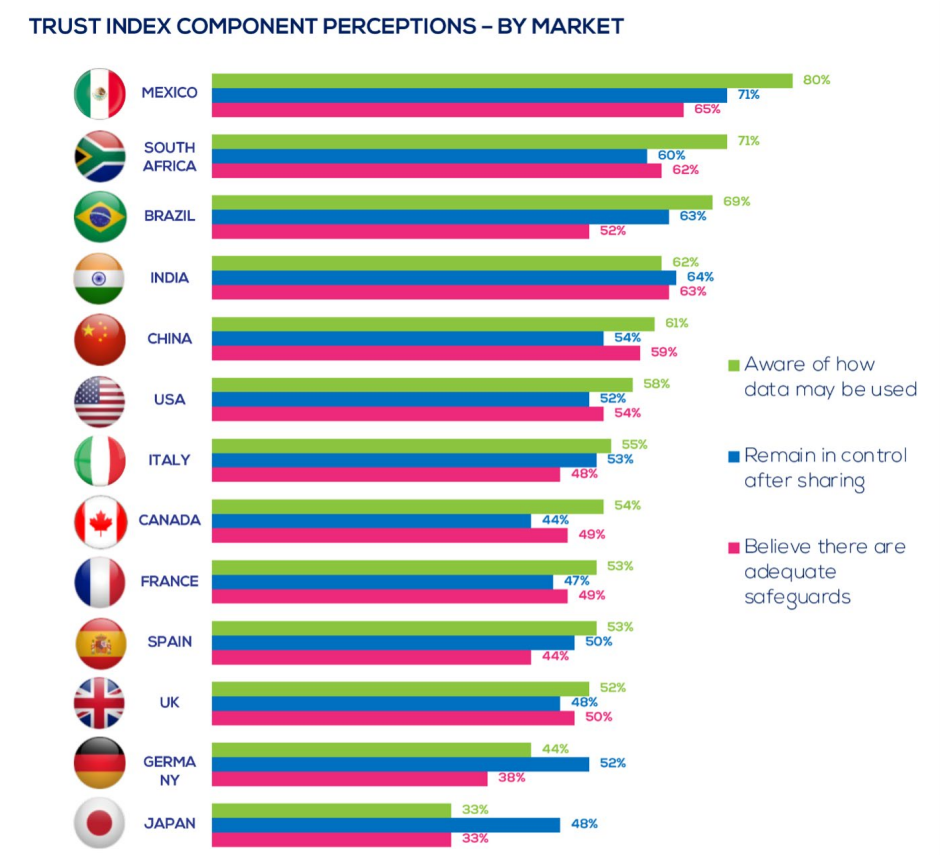
engagement and eventually the richness of the data profiles available.

Indeed, the industry is challenged by robots creating fake accounts and users limiting their data - this could be a real challenge over the next years. The industry must respond to these perceptions: data sharing can still represent a valid and thriving market in the future, but only if long-term buy-in from users is reinforced. The entire industry needs to address and show care for end users' concerns.

Diving deeper

Awareness of how personal data may be used is the strongest perception in most markets and is driving the high Trust Index in South Africa, Mexico, and Brazil. In South Africa, 71% are aware of how data may be used; 60% remain in control after sharing; and 62% believe there are adequate safeguards. It is important to note that the awareness measure reflects how users feel rather than any factual assessment and will be influenced by any past exposure to data harm.

There are widely varying levels of trust in different types of organisation when it comes to using and looking after personal data. Medical and banking institutions tend to be most trusted in all countries including South Africa, while social media companies and government (excluding China) tend to be least trusted.



In the past three years there has been an upward trend in unsolicited calls and messages, the most prevalent concern among mobile users. There were notable increases between 2020-2022 for fraudulent texts and emails, which have been maintained in 2023. This is key because the most common data 'harms' are unsolicited messages and calls, experienced by half of users globally. Two in five reported having received fraudulent emails or texts aiming to collect sensitive data. There are also above-average levels in South Africa, Brazil, Canada, Mexico, and China.

This year's study explored the appeal of personal information management systems (PIMS). The majority like the idea of controlling who accesses their data and claim they would check their data frequently. However, there is great inertia – over half state that organisations should look after their data without them needing to be involved in this way, and most also claim they would only use it if it was free. This kind of service will need to expound on a wider range of user benefits to appeal to more users. Unsurprisingly, there is a correlation between those markets indicating most interest for PIMS and those reporting the highest level of data harms: South Africa (86% interested), Mexico, Brazil, Canada, and China.

Lessons for industry

According to the reports findings, the global mobile industry should note the following lessons:

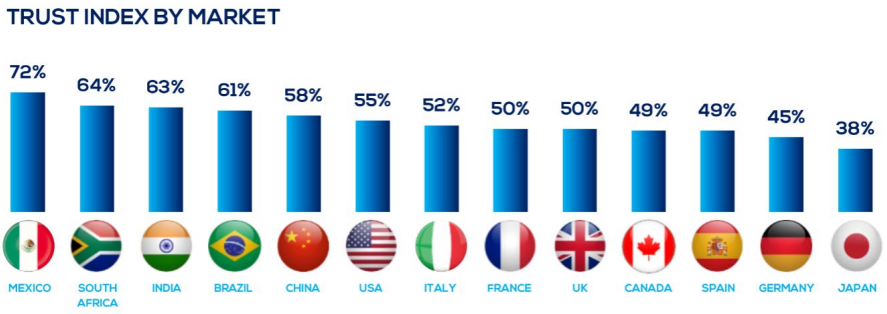
Social media giants must show care for users, not just data: as social media strengthens its position as the most prevalent and frequent mobile activity, increasing numbers of users feel their security and privacy are exposed. It is incumbent upon social media companies to adopt a leadership role in addressing perceived shortcomings on data transparency and trustworthiness.

Don't be complacent: despite increased usage of mobile apps and services, there remains a great deal of user concern about sharing personal data. It should not be forgotten that users would engage more fully in mobile life if their concerns were addressed.

Systems built on data are at risk of underperforming or failing: user reticence to share data poses a risk to any organisation seeking to leverage AI or build systems on data such as recommendation engines, advertising or mobile intelligence. All will be less powerful unless users share their data freely and willingly.

Users must take more active control: Users still tend to manage risk by abstaining from data sharing, with few exercising true 'control' over their data.

Dramatise benefits beyond addressing risk: few users currently appreciate the benefits of empowerment solutions such as PIMS, beyond preventing harm, and as a result these tools garner muted interest. ■



Pete Bell,
research analyst, Telegeography

All change in Ethiopia

Until recently, Ethiopia was one of the few telecom markets in the world that was still a monopoly, with no competition to state-owned firm Ethio Telecom.

The situation changed with the award of a new communications license in the first half of 2021. Market liberalization had been a long time coming; the government pledged to open the market up to competition as far back as 1999, when it outlined plans to authorize a new GSM operator, but it took years for this plan to come to fruition.

It was not until 2019, under a revised proposal published in July that year, that the government revealed it was looking to award a new full-service Unified Telecommunications Service License to Ethio Telecom and similar concessions to a pair of new players.

While 12 groups expressed an interest in the new licenses, only two bids were submitted. One from South Africa-based MTN Group and another from Global Partnership for Ethiopia (GPE), a consortium comprising Kenya's Safaricom, Vodafone Group, Vodacom Group, CDC Group, and Sumitomo Corporation.

In May 2021, it was confirmed that GPE would be awarded one of the licenses for $850 million, but MTN's offer of $600 million was too low and had been rejected.

Arrival of Safaricom

The winning consortium subsequently unveiled plans to launch commercially in April 2022 under the name Safaricom Telecommunications Ethiopia.

It said it would invest around $590 million in the initial start-up phase, with between $1.5-2 billion to be spent over its first five years of operation.

Although unable to meet this launch target — in part due to delays finalizing a roaming agreement with Ethio Telecom — Safaricom Ethiopia eventually announced the start of a network pilot in August 2022, before confirming its commercial launch in 11 locations in October that year.

It was an instant hit. By the end of October 2022, it claimed 740,000 subscriptions and hit 1 million less than a month later. It also had a staggering 5 million subscriptions by August 2023. Market leader Ethio Telecom had an estimated 70 million mobile subscriptions at the same date.

Safaricom has also been busy expanding its network reach. It covered 21 cities by early 2023 and was active in 22 cities and 49 towns by the middle of the year, covering approximately 25% of the country's 105 million population.

In June 2023, World Bank Group members

Year	Revenue	ARPU
2013	10,426	46.7
2014	12,490	50.0
2015	16,082	54.1
2016	21,280	60.4
2017	24,174	61.3
2018	26,122	58.5
2019	27,951	55.7
2020	38,494	69.0
2021	44,861	69.5
2022	49,539	64.3

Table: Ethiopia Mobile Market Revenue and ARPU

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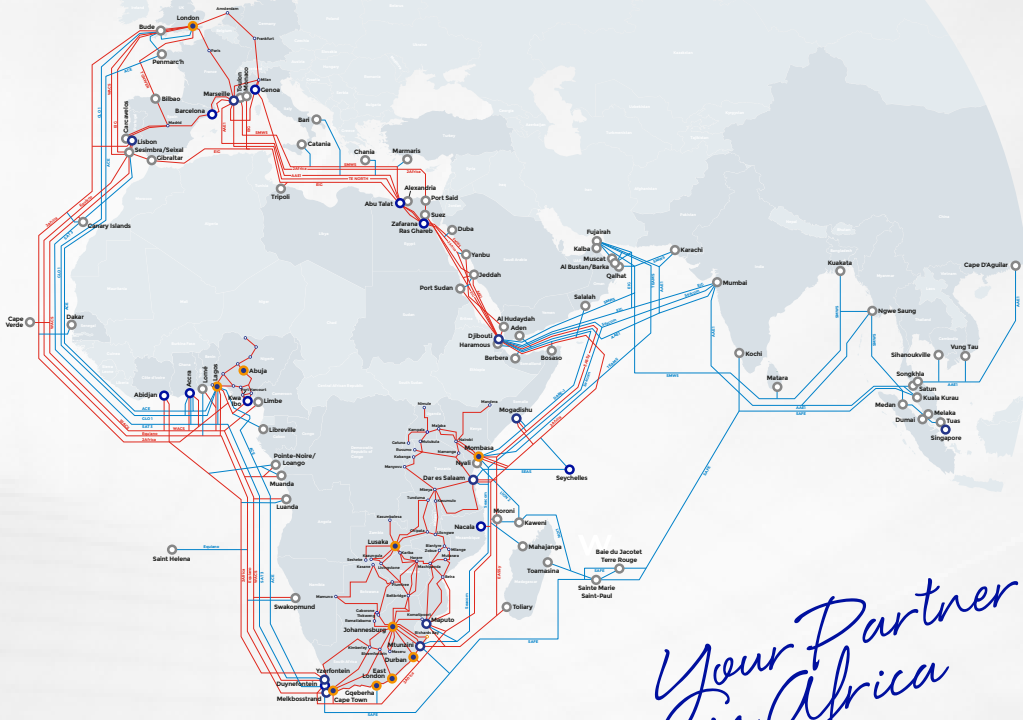
Africa's Digital Backbone



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the International Finance Corporation and the Multilateral Investment Guarantee Agency announced plans to make an equity investment in Safaricom Ethiopia, as well as providing loans for the cellco. Under the deal, the World Bank Group is providing equity, debt, and insurance facilities to support the construction and operation of Safaricom Ethiopia's 4G and 5G mobile networks.

Third license award restarted

Meanwhile, the process to award the third new full-service license was re-launched in September 2021, but then postponed three months later. The regulator, the Ethiopian Communications Authority (ECA), said that it had "received concerns and requests from several prospective bidders to delay the process and issue the RFP at a convenient time in the future."

Applications were eventually invited once again at the end of June 2023. Announcing the development, the ECA said it was inviting "world-class" telecommunications operators to take part in what it called an "exciting opportunity to operate within Ethiopia's rapidly growing economy." The deadline for submissions was October 2023.

Editor's note: Recent news reports indicate that the search for a third MNO has been put on hold indefinitely after a lack of interest due to the conflict in parts of the country.

Ethio Telecom privatization

While the search for a third mobile operator continues, the government's been looking to sell off a stake in Ethio Telecom. Like the licensing process, however, things have not always gone smoothly.

While it published the RFP for the sale of a 40% stake in the telco in September 2021, the following March the sale was postponed.

The country's Ministry of Finance (MoF) said that the decision to press pause on the process had been taken "given the recent developments and fast-moving macroeconomic changes both globally and from a country perspective."

The tender was restarted in February 2023, with the stake on offer having been increased to 45%. The government's interested in receiving "proposals from interested parties who can add value to the company by bringing in best practices in terms of operations, infrastructure management, and next-generation technological capabilities."

No further developments have so far been reported.

Mobile market growth

Meanwhile, the Ethiopian mobile market has continued to grow.

At the end of June 2023 there were an estimated 72.2 million mobile subscriptions, up from 64.5 million a year earlier and 54.3 million in mid-2021.

Ethio Telecom isn't taking the arrival of competition lying down. In September 2023 it launched the country's first 5G network at 145 sites in the capital, Addis Ababa. Later that month it teamed up with Gilat to modernize its portfolio of satellite-based business services and improve satellite backhaul for its mobile networks.

While the search for a third mobile operator continues, the government has been looking to sell off a stake in Ethio Telecom. Like the licensing process, however, things have not always gone smoothly. ■

Kees Snijders,
managing director, SIMcontrol

We have been actively expanding our business into the continent from a South African (SA) base since 2016. The common prerequisite to success is lots of patience and investment in local partnerships and relationships. We offer a cloud-based B2B SaaS solution, but we have had to invest in local people, infrastructure, and relationships to gain traction.

Opportunities abound, especially since Africa isn't necessarily a focus area for first world competitors. There has been significant investment in network infrastructure, enabling OTT solution providers like us to offer our services in more markets.

In SA, NB-IoT based solutions, at least on the Vodacom network, have become viable for the first time. Improvements in coverage and the underlying commercials on offer have enabled this. Roaming providers have started investing in local packet gateways to improve quality of service. Consumer app-based eSIM solutions have seen adoption, and there has been movement on the GSMA standards to enable MNOs to offer eSIM solutions for IoT.

The 'leapfrog' effect is a recurring theme. From a connectivity perspective, this happens when quality, relatively affordable, broadband connectivity becomes available to a market that has effectively been cut off from the internet. There is no gradual migration from previous connectivity technology as was typically the case in the first world. This can lead to exciting innovations and rapid adoption without parallel.

In 2023, the coupling of mobile money and renewable energy has enabled a few businesses to rapidly scale their customer bases. M-Kopa is the most prominent example of this; they distribute subsidized off-grid solar-powered kits to consumers who pay these off over time using M-Pesa. Ubiquitous reliable connectivity and large-scale mobile money adoption were the enabling factors - and lots of sunshine.

This year, some markets opened to external service providers for the first time, Ethiopia for example has licensed Safaricom as a second operator. They have rapidly rolled out a quality network with Vodacom, and they have seen excellent uptake because of pent-up demand for affordable and reliable broadband connectivity. The key question for anyone doing business in Africa is how easy it is to repatriate earnings; we try to steer clear of markets with volatile currencies and cumbersome tax regimes and exchange control restrictions.

We mostly rely on deploying white-label versions of our software in partnership with MNOs. We do so in a telco-agnostic fashion. As we have gained traction in markets and proven the business model, it has become easier to sell the concept. The use cases that require scaling of connectivity management solutions are gaining traction. Tracking and asset management is at the forefront, but other verticals are following suit. ■

Looking ahead: We expect to see continued rapid growth in most African markets - we are still a long way from saturation.

The most important market need is the insatiable demand for reliable, affordable, and ubiquitous connectivity; this is true in Africa and the developing world in general. In the B2B world where it's necessary to manage connectivity at scale, OTT software tools providing real-time management and cost-control are key.

Jerusha Rooplall,
managing director for sub-Saharan Africa, G+D Mobile Security

Connectivity in sub-Saharan Africa is still very hardware-based with physical pluggable SIMs being the overwhelming standard. This is partly led by the fact that very few African MNOs have adopted eSIM technology. As this changes and more original equipment manufacturers (OEMs) include eSIMs in lower cost and entry-level devices, it will become a great opportunity.

The availability of 4G services has been steadily increasing – with 5G to come – which in theory is giving people more access to wireless networks. But in general, there is still the barrier of the price of even entry level smartphones which, according to the GSMA, exceeds 60% of the average monthly income. This remains one of the greatest challenges.

Above all, however, the African Union's 'Digital Transformation Strategy for Africa' opens up new exciting opportunities with its potential in the digital economy space and the increased collaboration and harmonization between countries. Under the motto of 'digital economy, collaborative economy,' more governments are looking at harmonizing policies, legislation, and regulations. This allows them to strengthen intra-Africa trade, investment and socio-economic integration while also maintaining a balance regarding other continents. These strategies and developments are extremely positive. In addition, a key step in South Africa is that the telecommunications regulator is requiring MNOs to support and onboard MVNOs. This market will see a boom in MVNOs in 2024 and 2025.

"In general, there is still the barrier of the price of even entry level smartphones which, according to the GSMA, exceeds 60% of the average monthly income. This remains one of the greatest challenges."

"eSIMs have a lot of potential. Usage will grow and deliver more flexibility to end users. Beyond that, an increasing number of connected IoT devices can be foreseen due to the logistic needs of the African continent. Things that are on the move need to be tracked, things that are sensitive to environmental conditions need to be monitored."

Consumer use cases are expected to drive growth in the eSIM market in Africa in the short term. The central feature of the eSIM is that the SIM module is permanently installed in the device as a chip. The arrival of eSIMs gives the mobile ecosystem a new tool to help reduce Africa's digital divide. They offer OEMs the potential to reduce costs by creating devices that do not require space for a physical SIM and, therefore, make it possible to cut the price

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"For many years, South Africa and Nigeria have competed to become the best and most advanced economies in Africa. Both countries will continue to lead the pack into 2024 and 2025."

Looking ahead: As 5G networks begin to replace 4G and 3G networks and data speeds increase, there are several exciting possibilities that eSIMs can enable in the IoT field. Examples of this include connected vehicles, remote farming monitoring or the tracking of assets such as containers and livestock.

Overall, however, the dominant number of connections is still in the mobile consumer space. Other cellular connected solutions are becoming increasingly visible, but still on a much smaller scale. Nevertheless, cellular communication has massive advantages over wired communication due to the vastness of the African continent and therefore offers much more capabilities to also connect rural areas. For even remoter areas, a smart interconnection between various types of connectivity can play a crucial role, such as WiFi, LPWA, satellite, private network, and cellular interaction.

Small, even micro businesses drive a lot of innovation on the African continent compared with the rest of the world. For example, delivery-people on their bikes, scooters and vehicles for tracking or following orders power demand for connectivity. One common challenge in Africa is the lower access to reliable mobile connectivity. 3G still remains the dominant connectivity technology with over half of all connections still expected to be 3G even by 2025. But 2022 marked the first time that this number declined in favour of the introduction of 4G and 5G.

eSIMs have a lot of potential for the future. Usage will grow and deliver more flexibility to end users. Beyond that, an increasing number of connected IoT devices can be foreseen due to the logistic needs of the African continent. Things that are on the move need to be tracked, things that are sensitive to environmental conditions need to be monitored, smart farming for example. And the increasing population in the urban areas demands efficient connectivity solutions for the promotion of smart cities and smart health.

For many years, South Africa and Nigeria have competed to become the best and most advanced economies in Africa. Both countries will continue to lead the pack into 2024 and 2025. Early adoptions of eSIMs was seen in South Africa and Nigeria, with Nigeria dominating the number of active eSIMs.

Africa remains very hardware-based. Therefore, our SIM cards will remain the front runner of our business. The eSIM is of course top of mind for many of the bigger MNOs and we will see adoption of eSIM grow in parts of Africa that have not yet adopted the technology. As soon as the lower cost phones introduce eSIM, the adoption rate will increase exponentially. In addition, there is a big transport industry in Africa and our Track and Trace solution will be of great benefit in this field. We plan to explore this opportunity further.

of smartphones. They also enable consumers to store multiple numbers or contracts on a single device. Moreover, they give MNOs the opportunity to speed up onboarding, eliminate distribution costs, and create new sales channels. Beyond mobile-telephony-related solutions, eSIMs can be used in wearable devices to improve healthcare outcomes, or in a wide-range of smart home products and services, such as security offerings. ■

Bonface Ndawala,
founder, CEO and deputy executive chairman, Malcel PLC

The past year has been an eventful one and one of lots of promise but of course also beset by challenges. We managed to win a mobile license in Malawi and set out on the process engaging various partners to work alongside us to achieve our rollout plan so that we can enter the market at the end of 2024.

The major challenges have been due to the impact of the global economy which has seen central banks try to curb inflation by increasing their base lending rates by some really unprecedented rates. For instance, the Federal Reserve in the US at the time we were applying for our license had their base rate at 0.25% - but by the time we got to Q3 2023, this had gone up to 5.5% in just a space of 18 months!! That's the steepest interest rate hike in over half a century and the highest rate in 40 years. This means that while we had a lot of potential investors looking at Africa which would give them a return of 40% plus when the base rate was at 0.25%, they would reconsider such an investment decision with a base rate of 5.5%, as they consider investments in their own countries in the West risk-free.

"We have noted the growing 5G deployments in Africa, starting from South Africa and moving to other parts of the continent and we have also seen the explosion of mobile money and fintech solutions that are changing the mobile landscape and bringing the much-needed solutions to the continent."

In terms of opportunities, we have the most underserved populations in the world, with the world bank estimating that up to 45% of the population in sub-Saharan Africa is unbanked. There then lies the opportunity. In Malawi in particular, the real mobile penetration is under 40% - although the stats from MACRA show that it's 60%, if you take the impact of the multi-SIMmers (people with more than one active SIM card) you will arrive at less than 40%. Real internet penetration is less than 18% (officially 24% including the multi-SIMmers explained above) and financial inclusion versus population at around 22%. This is a virgin market, one that we intend to serve well.

We have noted the growing 5G deployments in Africa, starting from South Africa and moving to other parts of the continent and we have also seen the explosion of mobile money and fintech solutions that are changing the mobile landscape and bringing the much-needed solutions to the continent. With players like Cassava and Safaricom driving such change and bringing such solutions, it's an exciting marketplace that is fertile for exponential growth going into the future.

Africa is only now beginning to meaningfully develop. It has some unique requirements which require innovation. For instance, while western and other global economies have an integrated ID system which can track people that have borrowed money from the bank, in Africa we do not have such infrastructure. Thus, there is always a need to craft and develop smart solutions which will allow the disbursement of credit without running the risk of the lenders completely losing their money. There will be some smart solutions required to address such challenges.

"There is a move to have some sort of a 'one network area,' whereby Malawi, Zambia, Botswana, Zimbabwe, and Lesotho will have subscribers within their areas travel to each other's countries without paying roaming fees."

Fintech is the technology that will drive the African market into 2024 and 2025 - and at the heart of this will be providing reliable mobile broadband connectivity to as many subscribers as possible. The enablers of such fintech platforms are 5G, fibre and even satellite broadband, which is making a comeback through Space X getting licenses across the continent.

I foresee Southern and Eastern Africa will be the most vibrant in 2024 and 2025, mainly because there is still scope for growth. There are many natural resources that have yet to be exploited, like the gas deposits discovered on the coast of Northern Mozambique; the emphasis taken by the Malawi government to exploit mining resources; and the massive opportunities that have been unlocked by the Dar es Salaam Port Authority, which will increase trade into the east and central Africa.

For me, the success story of Safaricom in Ethiopia is the standout story of the year. When you see the growth that has been unlocked there, Safaricom M-Pesa has shown that with the right approach and solutions, exponential growth like we saw in the early 2000s in most of Africa is very possible - and that's what we would like to do with Malcel Plc in Malawi.

The regulatory environment has contributed mostly positively. In Malawi for instance, MACRA has brought in more changes in the market in 2023 than in the past 20 years. This is what happens when you put in place young and able management to lead such critical organizations. MACRA has acted swiftly to bring Malawi to par with her neighbours by implementing mobile number portability, a Central Equipment Identification Register to curb fraud, scrapping unnecessary levies on international termination rates, and introducing national roaming - all long overdue.

Prior to 2023, cross boarder cooperation was mostly non-existent, with each country focusing on its own territories but led by the heads of state for SADC (Southern Africa Development Community), which has advocated regional integration and cooperation we are seeing positive moves going into 2024/2025. There is a move to have some sort of a 'one network area,' whereby Malawi, Zambia, Botswana, Zimbabwe, and Lesotho will have subscribers within their areas travel to each other's countries without paying roaming fees. This will promote integration and enhance trade, and grow the industry faster than before. ■

Looking ahead: The outlook of next year and beyond is exciting. I see lots of growth and the uplighting of lives through technology. ICT will contribute even more to the region's GDPs, and I see investors from the West and East scrambling for the opportunities that we see today that they haven't seen yet.

With the heavy mining that's about to be unleashed, the explosion of fintech solutions, and a very young population (Malawi's median age is 17) who are tech savvy, I foresee Africa growing exponentially over the next ten years before stabilising. Anyone paying attention understands that this is the market to be in - it will be the new China, experiencing growth of at least 6% on a year-on-year basis into the foreseeable future. It's an exciting time to be an Africa.

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Soenke Peters,
head of technology and strategy,
Nokia, MEA

Ever since 1860 Nokia has been a partner for communication service providers (CSP) in Africa in providing reliable and performant communication networks to people and companies across the region.

Winning the 5G contract from MTN South Africa and being selected by Ooredoo to deploy 5G ready networks in Algeria and Tunisia are some of the many advances we made together with our customers in 2023. Our motto is to create the technology that helps the world act together, and to fulfil the mission we gained the opportunity to partner with UNICEF in Senegal. The partnership is to bridge the digital divide by providing digital education, benefiting more than 100 teachers and 10,000 schools in underserved areas is of particular importance, and in line with our ESG strategy.

One of the biggest challenges and conversely opportunities remain that more than 500 million people in Africa are not connected. As if connecting hundreds of millions of people and providing better broadband networks is not challenging enough, we as an industry will have to do it while reducing energy consumption and CO2 emissions. Depending on the country, we expect 3x to 9x traffic growth (according to the Nokia MEA Broadband Index) from 2023-2027 in Africa – and many countries have set targets to reduce CO2 emissions drastically; for example, Morocco 45% by 2030, Egypt 10% by 2023, Kenya 32% by 2050.

There is no 'one size fits all' solution to provide access to connectivity for more communities. Depending on population density and geographic distribution, we are working with our CSP partners to design the most optimal solution for coverage, often using a mix of complementing technologies. Our long-standing presence on the continent gives us the ability to combine leading technology and global best practices with a sound understanding of the local culture and requirements to deliver tailor-made solutions for each of our customers and partners.

While many new subscribers will be connected via wireless technologies, we see an increasing investment in fibre optic core and access networks, utilizing and distributing the massive new subsea cable capacities. Meanwhile, fixed wireless access (FWA), initially via 4G, later using 5G, has been proven to be an efficient way to provide broadband services to around 12 million subscribers in 2022, and is expected to grow to 19 million subscribers by 2027, almost half of it in South Africa.

African market characteristics are diverse across the countries, as are the requirements. One common denominator is the need to provide connectivity to rural areas, which poses a dilemma for CSPs as providing services using the regular models is often not commercially viable in sparsely populated areas. Meeting this demand requires a creative and innovative mix of technologies, like mobile, fixed and satellite.

From a consumer perspective, we see only a small number of early adopters of new technologies and handsets, and a long tail of consumers slow to adopt new technologies – mainly due to affordability limitations. Operators must balance the level of technology deployed in their networks to cater for the wide variety of customer needs. In remote areas the slow adoption of new handsets is also limited by unavailability, or limitation of electricity, so users prefer feature phones with better battery life.

While there is no single technology driving the market in Africa, there are four trends that will influence many of the African markets during the next two years:

1. The landing of several high capacity subsea optical cables in many African countries, which will provide unprecedented levels of connectivity. Terrestrial operators will invest to establish and upgrade optical backbone transport capacity, utilising 400GE/800GE technologies, to connect data centres, businesses, and end users. From 2025 onwards we expect to see an increase of edge data centres, catering for the increasing demand for compute, both for consumer and enterprise.
2. 5G will enable CPSs to provide advanced services to enterprises and mobile subscribers, initially in cities and densely populated areas. FWA via 4G is already a key use case and is expected to remain so going forward for wireless broadband services, using both 4G and 5G in the future.
3. Sharing passive and active infrastructure by neutral host companies will aid to address the dilemma of providing broadband access to more people, including those living in sparsely populated areas.
4. Satellite connectivity, either direct to device or as backhauling medium, will help to fill the remaining coverage gaps.

It remains of the utmost importance to develop and adhere to global standards, which allow for global scale in the telecommunication industry that in turn enabled economy of scale benefits. Fragmentation and techno-nationalism will lead to an increase of product variants to be produced in smaller quantities, which will increase cost positions. Especially in the very low ARPU market of Africa, any cost increase will further challenge the ambition of digital inclusion.

Given the ever-increasing need for spectrum, we believe that governments and regulators are well advised to consider new concepts, like spectrum for private networks, spectrum sharing, spectrum leasing and spectrum trading. Also, technology neutrality can ease the transition to new 3GPP generation by reusing existing spectrum assets. We see that the countries embracing these new concepts are benefiting from more digital inclusion. ■

Looking ahead: With the worldwide economic pressure, high inflation, currency devaluation and pressure on their profitability of operators in the markets, more cross border cooperation is expected. Easing of cross border projects and digital transport routes can lower required CAPEX and OPEX to provide connectivity across the continent, helping to close the digital divide and accelerate digital transformation.

Africa hosts a growing and young population, eager to join the digital economy, get access to better education, and healthcare.

This represents a huge opportunity.

The economic challenges in some African countries might temporarily slow down the speed of development, which can be at least partly mitigated by some of the actions and concepts mentioned above. Despite this short-term potential slowdown, we believe in the mid-term potential and remain fully committed to our customers, our partners, and our purpose to create technologies to help Africa act together.

Salman Tariq,
VP, Europe, Middle East & Africa, Optiva

The African telecommunications landscape is poised for transformative growth, and mobile virtual network operators (MVNOs) stand at the forefront of this evolution. The unique market dynamics of Africa, characterized by a predominant reliance on mobile communications over traditional landline infrastructure, create a fertile ground for MVNOs to flourish. This is particularly true as different communities, demographics, and use cases across the continent demand specialized mobile services.

Governments in key markets like Nigeria and South Africa have recognized this potential and are actively fostering a conducive environment for MVNOs. Recent policy initiatives, including the generation of new MVNO licenses, signal a strong governmental commitment to diversifying the telecommunications sector. This 'proactive stance' is a strategic move that serves multiple objectives. First and foremost, it fosters a competitive landscape, which is essential for driving innovation and efficiency within the telecommunications sector. Competition ensures that MVNOs are continually striving to differentiate themselves, be it through pricing, service quality, or unique value-added services. This not only benefits consumers by providing them with a broader range of choices but also pushes the industry as a whole towards higher standards of service delivery. Moreover, increased competition often leads to more affordable pricing models, making essential communication services more accessible to the general population. In a continent where mobile communication serves as a lifeline for many, especially in remote or underserved areas, this increased consumer choice and affordability have far-reaching social and economic implications.

However, the success of MVNOs is not merely a function of market demand or regulatory support; it is intrinsically tied to technological innovation. Specifically, the adoption of modern, cloud-native billing and charging software solutions is crucial. Traditional MVNOs, often launched by incumbent network operators, have been hampered by outdated BSS technology. As noted by Omdia analyst James Crawshaw, the evolution from "clunky systems'' to flexible, cloud-based solutions with open APIs has been a game-changer.

The case of Salam Mobile in Saudi Arabia exemplifies the transformative power of modern BSS platforms. Within just four months of receiving its MVNO license, Salam Mobile navigated complex regulatory landscapes to launch its service successfully. Their rapid time-to-market and focus on digital customer experience have resulted in over 1 million subscribers within a year, with an ARPU exceeding industry norms. Similarly, Nova Energy in New Zealand has leveraged a modern BSS platform to offer bundled services, enhancing customer loyalty and generating additional revenue streams.

Financial constraints often limit MVNOs, leading them to rely on the incumbent operator's billing and charging systems. However, cloud-native software-as-a-service (SaaS) BSS platforms eliminate the need for large upfront capital investments. Moreover, these platforms are continually updated by the service provider, reducing operational overhead for the MVNO, and allowing them to focus on market strategies and customer engagement.

For MVNOs aiming to capitalize on the burgeoning African telecommunications market, adopting a modern, cloud-native BSS platform is not just an option but a strategic imperative.

The future of the MVNO market in Africa is intrinsically linked to the broader telecommunications landscape, which is

undergoing a transformative shift. One of the most significant drivers of this transformation is the advent and proliferation of 5G technology. The promise of 5G is not merely about faster internet speeds; it's about enabling a new range of services and applications that could revolutionize sectors ranging from healthcare and education to agriculture and manufacturing. The low latency, high reliability, and increased capacity of 5G networks are expected to unlock countless use cases for IoT applications, real-time analytics, and even remote healthcare.

The momentum behind the rollout of 5G services in Africa is high, and it's being fuelled by a combination of market demand and governmental initiatives. Governments across the continent are aligning their digital strategies to leverage 5G as a catalyst for socio-economic development. This involves not just the rollout of 5G networks but also the creation of regulatory environments that encourage innovation and competition. The objective is twofold: to make high-speed, reliable internet access more widely available and to attract investment into a range of 5G-enabled services and technologies.

In this context, South Africa, Namibia, Kenya, and Nigeria stand out as particularly vibrant markets for MVNOs and broader telecommunications growth. Each country offers a unique blend of market potential and regulatory support, making them fertile grounds for innovation and investment. For instance, the Nigerian Communications Commission (NCC) recently took a monumental step by granting licenses to 25 companies, thereby opening up a plethora of opportunities in rural connectivity, Machine-to-Machine (M2M), and Business-to-Business (B2B) markets. This move is not just about expanding network coverage; it's about creating an ecosystem where digital inclusivity is the rule rather than the exception. Moreover, the licensing process has become a revenue-generating mechanism for the government, creating a sustainable digital transformation model.

The concept of a 'sustainable model for digital transformation' is particularly crucial for these African nations, given their broader socio-economic challenges including limited access to quality education and healthcare. A sustainable digital transformation model ensures that the benefits of technological advancements are not just short-lived or confined to urban centres but are widespread and long-lasting. It creates a virtuous cycle where increased connectivity leads to greater digital literacy, which in turn fosters innovation and entrepreneurship. This not only attracts further investment into the telecommunications sector but also spills over into other areas of the economy, thereby accelerating overall economic growth and improving quality of life. In essence, a sustainable digital transformation model serves as a cornerstone for achieving broader developmental goals, making it an imperative for governments and industry stakeholders alike. ■

Looking ahead: The combination of progressive regulatory frameworks, robust governmental support, and the burgeoning momentum for 5G services makes South Africa, Namibia, Kenya, and Nigeria the most promising landscapes for MVNO growth in 2024 and beyond.

These countries are not merely opening doors for business opportunities; they are laying the groundwork for a more inclusive, connected, and digitally empowered Africa. By aligning with these macro trends and leveraging the capabilities of 5G, MVNOs have a golden opportunity to play a pivotal role in shaping Africa's digital future.

Simon Yomtov,
general manager – Africa, Upstream

This year, Upstream achieved technological and product growth in Africa, being able to advance despite a clearly unfavorable external environment.

What do I mean by the latter? Slowdown of the economic growth in the continent, inflation peaking to very high levels and local currencies being vastly depreciated over currencies such as the Euro. In some countries, political and fiscal limitations made the transfer of money to other countries either too costly or even unfeasible. Such conditions were certainly obstacles to the progress of international companies operating in Africa.

Our belief is that when the conditions get more difficult, rather than halting your efforts, you should only push harder. This way you will emerge from challenging periods stronger and ready to reap the rewards. The World Bank predicts that inflation rates in most African countries have already peaked. So, we can be optimistic that it won't be long before the conditions normalize again. We have already seen this normalization take place in other markets where we operate, such as Brazil, where inflation decreased threefold after peaking about a year ago.

"Our belief is that when the conditions get more difficult, rather than halting your efforts, you should only push harder. This way you will emerge from challenging periods stronger and ready to reap the rewards."

" While we are already talking about 'mobile first' in most of the world, with 53% of the internet traffic worldwide coming from mobile phones, in Africa this percentage rises to 74%."

The African market is like no other and it has been a key market for Upstream over the years. One thing that makes it unique is that Africans must rely on their mobile phones to access the internet more than people on any other continent. While we are already talking about 'mobile first' in most of the world, with 53% of the internet traffic worldwide coming from mobile phones, in Africa this percentage rises to 74%. This means that when brands need to reach their customers online, mobile channels are pretty much their only option.

We must keep in mind that most of the people in Africa aren't always connected to the internet in the way people in the most developed markets are. WiFi connections are quite scarce, and most users rely on their mobile data, which isn't always affordable. What's more, over half of the users still use feature phones rather than smartphones. Given this context, channels such as SMS, which don't rely on an internet connection and are usable even on feature phones, are the most effective in engaging wide audiences in Africa.

For Upstream, the highlight of 2023 in Africa is the launch of our martech platform, Grow, with one of the largest mobile operators of the continent. The platform had already been launched with two mobile operators in Brazil, but this new development showcases the potential

for marketing technology in Africa as well. I would like to highlight especially the potential it holds for mobile operators in Africa, because on this continent more than anywhere else, they are the ones holding the keys to the interaction between brands and consumers on the mobile. Platforms like ours could prove to be the much-needed equipment for operators to realize their potential in the digital advertising landscape.

Grow is a mobile marketing platform that combines a series of different features to drive effective customer engagement. It allows for the creation of campaigns through a simple drag and drop user interface. These campaigns can run across a series of different mobile and digital channels, depending on the campaign's purpose and target audience. The various channels are centrally orchestrated through a single UI, which enables better collaboration between different individuals within the MNO, who manage different channels. In addition, marketers can set-up automated, event triggered messaging according to the end users' behavior. Platform users constantly have access to insights and analytics to check what works and what doesn't, while AI enabled optimization ensures that customers receive the best performing messages via the best performing channels at the optimal moment. Last but not least, an ad fraud prevention feature ensures that all interactions are genuine, protecting both a brand's budget and reputation.

"Despite the overall economic climate, in 2023 we have seen telcos willing to invest in innovation to tap into new revenue sources. After all, their traditional core revenues can only get them so far, as at one point, if not already, they'll hit a ceiling."

Despite the overall economic climate, in 2023 we have seen telcos willing to invest in innovation to tap into new revenue sources. After all, their traditional core revenues can only get them so far, as at one point, if not already, they'll hit a ceiling. ■

Looking ahead: We expect that in 2024, those that have already invested will reap the benefits and this will lead to more players trying to follow the same path.

Especially in the digital advertising industry, mobile operators in Africa have the potential to lead the game. We have already seen telcos in Europe acknowledging that they can and should play a bigger role in digital advertising by launching the TrustPid initiative. With the latter, they aim to use mobile numbers as unique user identifiers online to address a significant market need, particularly considering the impending demise of third-party cookies.

Telcos in Africa have an even stronger position and they should capitalize on it. Upstream has developed a user identification technology over the mobile network, called Mobile Identity and it has already been deployed by one of the biggest names in the African telco space. This tech enables approaching users with personalized and unified communications across different channels, streamlines user journeys and makes building CRM bases easier than ever.

Deploying the right tech will help telcos secure a leading position in digital marketing and much-needed additional revenue sources.

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