chapter 2 Cellular networks

The unstoppable rise of LTE

Joe Barrett, President, GSA

LTE is the fastest developing mobile system technology ever, and had 1.683 billion subscriptions by 3Q16. LTE connects almost one in four mobile users worldwide (22.4 per cent), and new subscriptions increased by more than 204 million in 3Q16. The *GSA Evolution to LTE* report updated in January 2017 identified the following facts:

- 790 operators investing in LTE in 201 countries
- 764 operator commitments to LTE in 196 countries
- 26 pre-commitment LTE trials in five more countries
- 581 commercially launched LTE or LTE-A networks in 186 countries, including 95 LTE TDD (TD-LTE) launched in 54 countries
- 183 launched networks are LTE-A or LTE-A Pro in 87 countries

The GSA forecasts there will be more than 635 commercially launched LTE networks by the end of 2017. Mobile operator focus is moving to LTE-A and LTE-A Pro – 233 operators are investing in LTE-A in 100 countries and 17 operators have commercially launched LTE-A Pro networks.

VoLTE is another major technology initiative with 165 mobile operators in 73 countries investing in it, and many are also testing Video over LTE (ViLTE).

Interest in LTE-A continues to grow in Africa with operators in nine countries deploying commercial networks. As yet, there are no LTE-A Pro networks commercially available on the continent of Africa. [Editor's note: Namibian operator MTC claimed a first in 2016 with its LTE-A Pro trial – see p.24.]

LTE is also gaining traction in unlicensed bands, and LTE-U, LAA (Licensed Assisted Access) LWA (LTE-WiFi link Aggregation) and MulteFire are technologies that are addressing the unlicensed band access requirements.

Algeria	Angola	Benin	Botswana	Burkina Faso
Burundi	Cameroon	Cape Verde	Chad	Comoros
Côte d'Ivoire	D.R. Congo	Rep. Congo	Djibouti	Egypt
Equatorial Guinea	Ethiopia	Gabon	Gambia	Ghana
Guinea-Bissau	Kenya	Lesotho	Liberia	Libya
Madagascar	Malawi	Mauritius	Mayotte	Morocco
Namibia	Nigeria	Réunion	Rwanda	Senegal
Seychelles	Somalia	South Africa	Sudan	Swaziland
Tanzania	Togo	Tunisia	Uganda	Zambia
Zanzibar	Zimbabwe			

47 countries in Africa are deploying LTE networks. SOURCE: GLOBAL MOBILE SUPPLIERS ASSOCIATION. WWW.GSACOM.COM

Gabon	Kenya	Mayotte	Morocco	Namibia
Nigeria	Réunion	South Africa	Tunisia	

LTE-Advanced networks in Africa. SOURCE: GLOBAL MOBILE SUPPLIERS ASSOCIATION. WWW.GSACOM.COM

Most LTE deployments globally use paired spectrum (FDD). The LTE TDD mode is complementary and the best choice for providing high-speed mobile broadband access in unpaired spectrum. Both FDD and TDD LTE networks are deployed in Africa matching operator spectrum assets and the different regulatory environments that prevail in the region.

Looking at the global scene and referencing GSA data, the most popular frequency bands are:

LTE-FDD: 1800MHz
2600MHz
2100MHz
800/850MHz
AWS – Band 4
APT700 (band 28) and 700MHz (band 12) are also growing strongly

LTE-TDD: 2300MHz (band 40)
2600MHz (band 38)
2600MHz (band 41)
1900MHz (band 39)

Devices

The GSA *LTE Ecosystem* report in January 2017 identified 7,037 LTE user devices launched in the worldwide market by 517 manufacturers, an increase of 2,621 or 59.3 per cent higher than the number of devices reported in February 2016.

Smartphones represent the largest segment (65 per cent) of all devices, while the LTE tablet segment is also growing with 570 devices identified.

Devices in User Equipment (UE) Category 4 (Cat-4) offer an enhanced user experience and a theoretical peak downlink rate up to 150Mbps with peak uplink up to 50Mbps on compatible networks. LTE-A

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deployment is a major trend with wide-scale commercialisation of carrier aggregation to combine different spectrum bands for greater bandwidth. Many operators have launched or are deploying networks supporting UE Cat-4 devices, and 3,726 devices (i.e. 52.9 per cent) of all LTE devices support speeds up to Cat-4.

Deployment of LTE-A systems for Cat-6 (300/50Mbps) or Cat-7 (300/100Mbps) user devices is a major trend. 544 devices support speeds up to UE Cat-6 (516 devices) or Cat-7 (28 devices) across most form factors.

GSA is also tracking Cat-9 and above UE devices. 74 Cat-9 devices have already been launched, supporting download/upload speeds of 450/50Mbps.

In addition, higher bandwidth devices are also starting to appear, and at the time of writing in mid-February 2017, 61 devices have already been launched, including:

1 Cat-10 (upload/download: 450/100Mbps)
16 Cat-11 (600/50Mbps)
18 Cat-12 UE (600/100Mbps)
24 Cat-13 UE devices (390/150Mbps)
1 Cat-15 (up to 750Mbps download)
1 Cat-16 (up to 1Gbps download)

In 2016, GSA introduced a new vendor-led Spectrum Group comprising spectrum and regulatory-standards experts from Ericsson, Huawei, Intel, Nokia and Qualcomm. The group is supporting work leading up to the World Radiocommunications Conference meeting in 2019 (WRC-19), and in Africa the GSA-SG African Telecommunications Union team is supporting and replying to regional consultations and enquiries on spectrum usage and availability. ■

"The grandmasters of data"

It wasn't just a rise in SIM card shipments for LTE, African operators were rolling out new launches and network expansions to satisfy the consumer demand for faster mobile connections.

At the beginning of 2016, Smile Telecom claimed it had launched East Africa's first VoLTE service. It had initially been introduced last November in Kampala, Entebbe and Mukono. Rollouts in other towns and cities, including Jinja, Mbale, Soroti, Tororo, Lira, Gulu, Masindi, Kasese, Fort Portal, Kabale, Mbarara and Masaka happened over the remainder of the year.

As well as in Uganda, Smile also operates LTE networks in Nigeria and Tanzania, both of which also launched the *SmileVoice* and *SmileUnlimited* LTE voice services later in 2016.

Despite Smile's progress in East Africa, it was a Southern African outfit that pushed the boundaries for even faster connections. April saw Namibian operator MTC commercially launch LTE-A in several parts of Windhoek, and also claim to have inaugurated the continent's first 4.5G trial which delivered "unprecedented" mobile speeds of almost 1Gbps.

During the closed trial which was attended by dignitaries such as the country's president, Dr. Hage Geingob, the operator worked with Huawei to demonstrate 4.5G or LTE-A Pro. According to the vendor, 4.5G is the natural evolution of 4G and a necessary transition to 5G. Compared to 4G, it said 4.5G has much better network performance in terms of bandwidth, capacity and latency, and will allow for speeds of up to 1Gbps over mobile and latency of less than 10 milliseconds. Huawei added that 4.5G will be better for developing the IoT with its ability to support up to 100,000 connections per cell.

As well as trialling LTE-A Pro, MTC also successfully demonstrated LTE-A with speed tests reaching close to 300Mbps.

In October, Nigerian operator Globacom claimed it had become the first in the country to launch 4G services. The rollout covered nine cities including Lagos, Port Harcourt, Abuja, amongst others. Barely a month later, another eight locations had been added to its *Glo 4* branded network: Okada (Igbinedion University); Ekpoma (Ambrose Alli University); Bonny, Escravos, Forcados, Abraka (Delta State University); Agbor (College of Education); and Sapele (Western Delta University).

Describing Globacom as the digital network for both the present and future generations, Kamaldeen Shonibare, head of corporate sales, said: "We're the next generation network, the grandmasters of data. That is why we have taken the lead in providing 4G LTE nationwide with mobility for Nigerians."

Algerian operators also talked up their new LTE offerings. Djezzy, a subsidiary of VEON (formerly VimpelCom) and Global Telecom Holding, announced its launch of LTE services in the country in early October in bombastic style: "Djezzy's 4G/LTE roll out is not simply an evolution, it's a revolution for Algeria and will change the way we interact with our customers through the digital world," claimed Djezzy CEO Tom Gutjahr.

The operator said its 16 million subscribers would benefit from the largest

JANUARY 2016

Tanzania's regulator has accused the country's operators of ignoring repeated requests to secure their networks against malicious and spoof callers. The Tanzania Communications Regulatory Authority (TCRA) claims consumers are being endangered by fraudsters sending deceitful and misleading messages aimed at tarnishing the targeted person's reputation or extorting money.

Over a two-month period towards the end of 2015, 42 incidents are said to have been reported to the regulator and the police, including one case where a victim stood to lose around TZS25,000,000 (USD11,435). An investigation was carried out in mid-December 2015 after which the authority said the country's operators were still not complying with statutory regulations by implementing measures to safeguard against the use of their networks in sending spoofed messages.

FEBRUARY

MTN has teamed up with Spain's Telefónica as part of a strategic agreement that will see the two companies work together to benefit from their joint scale, combined expertise, and market access. The initial aim is to improve their appeal to enterprise users. This will include services to multinational companies in each other's footprint, collaboration in M2M, and new digital products and services targeting the B2B segment.

Under a separate signed strategic agreement with Switching House, MTN has launched a cashless payment solution and claims to have bridged the divide between large enterprises and informal merchants. The solution leverages MTN's *Mobile Money* platform and will enable informal merchants and traders to pay for goods using basic SMS or USSD on smart or feature phones, and without the need for a formal bank account.

MARCH

ZTE has completed the upgrade of Airtel Uganda's 3G network. As part of the upgrade, the vendor says it deployed the country's first nationwide commercial UMTS900 system, and claims this has increased network performance by 20 per cent. The project consisted of Airtel swapping out a total of 674 3G sites. It involved the adoption of ZTE's multi-mode ultra band and integrated SDR 2.0 solution which is designed to support a "smooth evolution" towards LTE/LTE-A networks.

APRIL

The Independent Communications Authority of South Africa (ICASA) launched an enquiry into the existence of some licensees that are not traceable. This follows a number of futile attempts to trace the activities of four companies, and their non-compliance with the terms and

Sales head Kamaldeen Shonibare – seen here with some of his colleagues – said Globacom is committed to giving citizens access to 4G wherever they are in Nigeria.

coverage across Algeria as well as the fastest mobile digital service.

Not to be left behind, rival operator Ooredoo Algeria successfully completed its pre-launch phase for 4G and started introducing services last year.

However, the path to LTE didn't always run smoothly. Operators in Egypt weren't ready to sign on the dotted line until the issue of available spectrum had been satisfied Following months of pre-sale discussions, the National Telecom Regulatory Authority's (NTRA) deadline for the sale of the licenses ended on 22 September. But only new mobile entrant, fixed line incumbent Telecom Egypt, accepted a license for a fee of EGP7.08bn (USD797m). In the words of the NTRA, the country's three other cellcos – Vodafone, Orange and Etisalat – "shunned" the opportunity to acquire licenses.

Vodafone explained its decision by releasing a statement which said: "The license does not offer sufficient spectrum to operate 4G services efficiently and in a way that would allow the Egyptian user to experience significantly higher speeds. Furthermore, the lack of available 4G spectrum could also impact the quality of 2G and 3G services being enjoyed by over 40 million existing customers. Accordingly, the board has decided to decline the 4G license in its current form."

Orange Egypt supported this view. Even NTRA president Mustafa Abdul Wahid reportedly agreed that the amount of spectrum on offer was "not enough" for Egypt's 90 million users.

After the 4G sale failed to attract any bids from the three mobile operators, the GSMA called for renewed dialogue between the authorities and the country's mobile industry. Based on its own international experience, the association said the total amount of spectrum assigned to each operator for 4G needed to be in the range of 2 x 30MHz to 2 x 60MHz. It added that this had to be across a range of coverage and capacity bands, with a minimum contiguous bandwidth of 2 x 10MHz in each band to enable efficient network economics.

As a result of the rejections, the NTRA withdrew its original offer and considered alternatives, including offering the licenses in an international auction. But following restarted talks with local operators in early October, the regulator revised its terms. It took less than a couple of weeks for all three of the other cellcos to sign up for 4G licenses.

Regulators to the rescue

Healthy competition can be a force for good, but sometimes regulators need to step in to help things along. For example, the Postal and Telecommunications Regulatory Authority of Zimbabwe (POTRAZ) started working with local operators in an effort to lower prices for mobile data services.

According to reports, Zimbabwe had the third-most expensive data tariffs in Africa, and this was hindering both consumer access and businesses. POTRAZ said it hoped its discussions with the country's mobile operators would lead to the introduction of cheaper data services within the first few months of 2017.

The bulk of internet access in Zimbabwe is via mobile networks, with the country of more than 13 million people home to only around 100,000 fixed broadband subscribers at mid-2016. According to statistics published by the regulator earlier this year, a total of 1.8 million gigabytes of mobile data were consumed in the second quarter of 2016 – a 23 per cent increase from the 1.5 million gigabytes in the previous quarter. All three mobile operators – Econet Wireless, NetOne and Telecel – experienced an increase in internet and data utilisation, with Telecel experiencing the largest growth.

The data also showed that mobile penetration rate increased to 97 per cent in 2Q16. However, national traffic declined by 3.6 per cent despite the numerous mobile voice promotions that were available during the quarter. POTRAZ attributed this in part to declining consumer demand due to economic downturns.

conditions of their electronic communications licenses. The firms include: Sundial Telecom; Karel Greef; Mystic Blue Trading 55; and SBS Telecoms. They were each given a deadline of the end of April 2016 to inform the regulator that they were active licensees.

MAY

Sudan's National Authority for Communications released news that it is partnering with Sudatel (Sudanese Telecommunications) to help build towers in the country. The agreement is part of a project to expand telecoms services in Sudan, and will eventually see the creation of more than thirty towers in remote areas with funding from the universal access fund. In a deal worth SDG18m (USD2.9m), Sudatel will work with local contractors to build nine towers in the Blue Nile and central areas of Darfur, as well as in southern, western and northern Kordofan.

JUNE

Zambia's regulator confirmed that Vodafone will not be entering the market as a voice provider. Zambia Information and Communications Technology Authority (ZICTA) says there had been "rising speculation" and that it had received "numerous enquiries". A press statement from ZICTA issued earlier this year said: "The Authority wishes to dispel the perception that Mobile Broadband Zambia, trading as 'Vodafone Zambia', is entering the market as a voice provider". It added that the company's license was only for providing data services to the public.

JULY

Airtel, Millicom and Vodacom have launched what they say is East Africa's first active infrastructure sharing initiative. Working with the GSMA, the operators will launch six 3G pilot sites to test the sustainable provision of mobile broadband services to 13 million underserved people across rural Tanzania. The GSMA says operators have so far been able to deploy their 2G networks to up to 85 per cent of the country's population, while 3G network deployment is mostly limited to urban areas. This has resulted in only 35 per cent of Tanzania's people being able to access the mobile internet.

AUGUST

Communication Regulatory Authorities in Southern Africa (CRASA) and the GSMA ran a workshop on spectrum pricing and auction. Hosted by the Communications Regulatory Authority of Namibia, the event took place in Windhoek on 18-19 August. The focus was on bridging the skills and knowledge gaps in spectrum valuations and auctions and

In South Africa, all wireless service providers will be required to return their previously assigned spectrum under a new framework outlined in a policy whitepaper that was approved by the Government. The move is an attempt at levelling the playing field for operators.

The National Integrated ICT policy paper, which has been in development since 2012, called for the establishment of a wireless open access network (OAN) that places spectrum previously assigned to wireless operators in a pool. The paper stated: "This will ensure that operators with significant market power do not leverage access to their infrastructure and critical resources to maintain dominance and deny market access to competition."

Following the adoption of the whitepaper, the Independent Communications Authority of South Africa (ICASA) was required to conduct an industry-wide consultation process to determine the terms and conditions, as well as the timeframe, under which the currently exclusively/individually assigned high demand spectrum will be returned to the regulator.

ICASA will be addressing spectrum issues when it co-hosts the Dynamic Spectrum Alliance's (DSA) Global Summit that will be held in Cape Town in May 2017. The alliance said it was going to put spectrum sharing opportunities at the top of the agenda and that ICASA will play a "significant" role following its discussion paper on the framework for dynamic and opportunistic spectrum management. The consultation document covers a proposal to authorise license-exempt access to TVWS frequencies.

Paul Garnett, DSA chairman and also director of affordable access at Microsoft, said: "The spectrum sharing technologies and policies that the [alliance] began promoting almost four years ago are now central to discussions about current and future spectrum access and emerging 5G scenarios."

During late 2016, the DSA welcomed 11 new members including several from Africa. They included Project Isizwe which had been rolling out free public Wi-Fi in South Africa, and C3 which was building a wireless network across Malawi. Other new African members included AirJaldi Networks and Ekovolt.

Defending the networks

There are many challenges that mobile network operators have to face. One of the key problems is lost revenue. Djibouti Telecom signed up to use a variety of solutions from Syniverse to gain visibility into and manage its end-users' experiences, while protecting the network from fraud.

The state-owned mobile operator is using the vendor's *Roaming Data Analysis-Visibility Services* for real-time access to roaming performance data through what's said to be an "easy-to-use" window that aggregates all subscriber data into a single view.

Djibouti Telecom has also deployed the *Forecasting and Budget Management-Optimizer*. Syniverse promised that its product would automate the planning, forecasting and budget process to help make the operator's roaming inter-operator tariff discount negotiations more profitable.

The firm also said that *Roaming Fraud Protection* would offer Djibouti Telecom a managed service which includes an analyst team and a cloud-based application that monitors roaming data globally for suspicious behaviours 24 hours a day, seven days a week.

In Mozambique, however, the danger was coming from a glut of unregistered SIM cards. The National Institute of Communications of Mozambique (INCM) started taking steps to block the millions of unregistered SIMs in the country.

At the start of September 2016, the regulator said three million phone numbers issued by Mcel, Movitel and Vodacom would be affected as part of a phased deactivation that would run until November. It said that the move was in compliance with the provisions of the Rules of Registration and activation of Subscriber Identification Modules Mobile Telephone Service that was approved in August 2015.

The INCM said that despite joint industry campaigns carried out to make consumers aware of the importance of SIM registration, many subscribers are still not "regularised". As a result, each MNO was ordered to lock a million SIMs that had not been properly registered. "This action is critical to [ensure that] the entire telecommunications system is regulated and operates safely," stated the INCM.

This came in spite of an announcement back in March 2015 where the three operators said that they had disconnected one million unregistered accounts.

The physical infrastructure that powers the cellular networks can also come under attack. In the past, copper cables have been a tempting item to steal from operators because of the metals' worth. It was hoped that the move to fibre would stop such thefts, but sadly vandalism is still an issue.

On 2 August 2016, thousands of mobile and fixed line customers in the South African province of Limpopo were left without connectivity following a serious incident of sabotage to the Telkom network. The operator

how these can be used to achieve policy objectives. Participants were also provided with insights into how license conditions, reserve prices and regulatory policy impact spectrum values, auction participation and outcomes.

SEPTEMBER

The GSMA and the World Customs Organisation (WCO) announced that they will partner in the fight against the counterfeiting and fraudulent trading of mobile devices. The GSMA's mobile device database and the WCO's IPM mobile platform will be integrated. This will give customs officers global, real-time product information on devices, enabling them to assess the authenticity of device shipments as they cross borders. The move is intended to improve cross-border trade procedures, assist with the rapid detection of counterfeit goods, and secure the international trade supply chain.

OCTOBER

In mid-October, a Nigeria Communications Commission (NCC) operation unit backed by security forces reportedly arrested six men in Kano for being in possession of hundreds of pre-registered SIM cards. They were arrested in two separate raids in the GSM village located at the farm centre and the Yankura market in the metropolis. Selling pre-registered SIMs is a criminal offence in Nigeria, and the NCC said it would continue to raid markets across the country in order to stamp out the problem.

NOVEMBER

The Communications Authority of Kenya (CA) says its decision to license MVNOs two years ago is beginning to pay off.

In its statistics for the last quarter of the 2015/2016 financial year (April-June 2016), the regulator reported a significant increase in mobile subscriptions and usage of voice minutes. It said mobile subscription grew by 9.9 per cent to 39.7 million while the penetration level hit 90 per cent, having grown by 6.1 percentage points.

In April 2014, CA granted MVNO licenses to Finserve Africa, a subsidiary of Kenya's Equity Bank, and two Kenyan mobile money transfer services, Tangaza Mobile Pay and Zioncell Kenya. Sema Mobile Services also gained an MVNO license during in the 2015/16 financial year.

immediately sent its engineers to the sites where fibre cables had been cut. They worked through the night to restore connectivity. "Three significant cable breaks occurred, but this was not cable theft," said Telkom Group spokesperson Jacqui O'Sullivan. "This was the targeted and considered action of a person or persons who knew where to go, how to access the fibre, and how to do the most damage. This was sabotage."

She added that South Africa's Criminal Matters Amendment Act has created a new offence to criminalise damage to essential infrastructure or interfering with the functioning of basic services through criminal activity.

Telkom investigated and cooperated with the authorities to share all information that could be used to identify the saboteurs. As a precautionary measure, security was immediately bolstered at key communication points by state security services. The operator also announced a ZAR250,000 reward for information leading to the successful prosecution of the perpetrators. This was subsequently raised to ZAR1m.

The company said that since the start of a strike by members of the Communication Workers Union (CWU) in July, it had experienced an increase in acts of sabotage on its network, especially in Gauteng, Limpopo and the KZN province. In late August, Telkom said more than around 85 of its street cabinets had been damaged in the past few weeks and fibre and copper cables cut.

Strengthening the backbone

The backbone of any cellular network is the networking equipment that pipes all the data between the base stations. Backhaul capacity bottlenecks can be a key problem that affects the overall success of a cellco's operations. In a trailblazing move, Orange's mobile operation in Egypt became the first operator worldwide to deploy Ericsson's *MINI-LINK 6352* microwave radio – an outdoor unit for E-band frequencies (70/80GHz) which supports 5.5Gbps capacity over 750MHz channel.

Rafiah Ibrahim, head of Ericsson MEA, said: "The advantages of E-band are its wide spectrum and channels that enable very high capacities. An enhanced customer experience is the key to differentiation for operators to succeed in competitive markets such as Egypt."

According to the vendor, E-band spectrum will experience major growth globally and represent up to 20 per cent of new deployments in 2020, with traditional bands still accounting for 70 per cent. It believes the spectrum is instrumental in supporting microwave to meet the capacity increase for backhaul as well as fronthaul, and claimed the deployment of *MINI LINK* will improve Egypt's readiness for widespread LTE adoption, and enable Orange to become a data centric operator.

Over in Ethiopia, Ethio Telecom chose ZTE to construct its new high-bandwidth backbone transmission network covering the country's western and southern regions.

The 100G dense wavelength division multiplexing optical transport network (DWDM/OTN) promised to increase capacity by ten times.

According to ZTE, the network integrates an intelligent WDM automatic switch optical network (WASON) and uses polarisation-division multiplexing quadrature phase shift keying (PM-QPSK) modulation, coherent reception, and software decision forward error correction (SD-FEC) technologies. It said the transmission backbone network will be built to achieve a large-capacity OTN for cross connects, optical network intelligent scheduling and ultra-long distance transmission. The aim of the project was to provide Ethio Telecom with the capacity it needs to evolve its 2G, 3G, LTE, fixed-line voice and broadband services in the future.

In the quest for speed, South Africa took another leap forward. ADVA Optical Networking successfully conducted a trial to transmit data rates of 200, 300 and 400Gbps over Cape Town's metro network. The test was also one of the first field demos of DP-8QAM to achieve interim capacity of 300Gbps. The trial made use of the city's existing WDM infrastructure which stretches over more than 100km across the entire metropolitan area.

The meshed network is built on ADVA's *FSP 3000* modular optical networking platform. This was combined with its *CloudConnect* technology to connect the townships of Nyanga and Mitchells Plain.

To achieve the high capacity, the demonstrators created a two-wavelength super-channel. ADVA said data rates were then switched between 200, 300 and 400Gbps to show how capacity can be automatically adjusted according to the network's shifting traffic and transmission quality requirements.

The company added that successfully transmitting a 300Gbps channel at a modulation rate of just DP-8QAM is a "significant milestone". It claimed this format can handle lower signal-to-noise ratios for increased reliability, yet optimised fibre utilisation.

DECEMBER

Vodacom has completed the commercial deployment of a Dual-Carrier High-Speed Uplink Packet Access (DC-HSUPA) network solution in South Africa.

DC-HSUPA offers an uplink peak rate twice as much as single-carrier uplink peak rate on UMTS networks. The operator claims a doubled peak rate puts it in a better position to deliver a "superb" mobile internet experience by combining advanced 4G networks with the fastest 3G networks.

It adds that an overall DC-HSUPA deployment not only offers higher uplink data rate services with shorter delays, but also helps balance traffic loads between carriers to improve the uplink capacity of HSPA+ networks. Vodacom worked with Huawei on the implementation.

Luke Taylor, Deputy CEO & CCO, Neural Technologies

The year ahead: It is no longer enough to provide a communication line. Telcos need to start thinking outside the box and offer more features, more benefits, more reliable provision and a wider range of services in order to attract and retain customers and avoid becoming a 'dumb pipe'.

Further consolidation is needed, since diminishing margins and stretched profitability causes shareholders and investors to look at their possible returns as the market matures.

In order for African CSPs to break out of stagnation and increase their competitiveness, we will see an increase in mergers and acquisitions as companies seek to obtain the key features of complimentary companies. Such mergers and acquisitions will become more common as CSPs continue to look at new lines of business to maintain profitability and show increasing share value.

By upskilling existing staff and offering apprenticeships and work programmes to school leavers, African telcos could realistically keep quality of service and fraud management up, whilst keeping costs down. I would hope to see an increasing trend towards training and aspiration rising over the next 12-24 months, as we have already seen this with our own customers in the region of undertaking academies and education/apprentice type initiatives.

Babak Fouladi, CTO, MTN Group

Babak Fouladi joined MTN early last year. Prior to that, he was CTO of Vodafone Spain and held a similar role at Vodafone Romania.

In 2016, he says MTN's focus ranged from the deployment of networks to improve quality and capacity, to connecting subscribers to the world and enabling greater digital inclusion through connectivity and services.

"We are aware of the impact and potential of connectivity, and have made extensive investments in the past year across our operations in order to provide superior customer experience and a competitive data network. This in turn aims to better support the increasing demand for data and digital services."

On the network side, he says MTN increased its capital expenditure by 19.6 per cent to ZAR34,920m, and rolled out almost 2,500 2G sites, more than 8,200 3G sites, and almost 7,700 LTE sites across its footprint.

In particular, Fouladi says the company's South African operation was part of an "aggressive network rollout" which focused on 3G and LTE, as well as the rollout of FTTH connections. Key to MTN SA's FTTH rollout was the acquisition of Smart Village in December 2016. This added to MTN's existing fibre subscriber base, resulting in a total of 7,000 homes now connected.

Nigeria also benefited from substantial network investments by MTN. The company increased its capex in that country by more than 100 per cent in 2016 to roughly ZAR8.7m, and rolled out close to 1,800 3G sites and more than 1,800 LTE sites during the year. MTN also successfully launched its 4G network in Ghana, obtained LTE and fibre licenses in Congo Brazzaville, as well as a spectrum license in Nigeria.

"Recognising that ICT-enabled solutions not only connect people, but furthermore, improve economic participation, lead to social development, and make life better in many different ways, we also continue to drive digital services in our markets," adds Fouladi.

Of particular importance to MTN, is bridging the financial divide. With estimates showing that 326 million people living in sub-Saharan Africa do not use banks, he says there is evidence of the need for such services. In 2016, MTN's mobile money services evolved from offering basic transfers and micro-payment services to savings and loan products. In Uganda, for example, customers can now remotely open a *MoKash* account using their phones and access micro saving and loan services.

In addition, by the end of 2016, MTN had established 28 mobile remittance corridors between countries in Africa. The company is also making strides in its lifestyle offerings, says Fouladi.

In its *Mobile Economy Africa* 2016[1] report, the GSMA stated that mobile has emerged as the platform of choice for creating, distributing and consuming innovative digital solutions and services in Africa. Fouladi says it has therefore become essential for operators to stay ahead of the curve in catering to customers' needs.

With four million paying subscribers on its streaming product, he claims MTN is a leading distributor of digital music in Africa. The company has also launched a gaming offering in nine markets.

"In the past year, the industry continued its rapid evolution in both the traditional connectivity business and in non-traditional businesses such as mobile financial services and content-based services.

"We have also seen big shifts in terms of technology, with a distinct move from 2G to 3G in many markets, and even from 3G to 4G in some markets. Almost half of MTN's subscribers (112 million) are data users. Looking at how the industry is evolving and customer needs are changing, we continue to develop our offerings, with a strong focus on improving our network and driving smartphone penetration in our markets so that customers can benefit from our lifestyle, m-health, m-education, enterprise and MFS services, among others. Importantly, we now connect businesses as well as consumers.

"However, while the potential of mobile continues to be a driving force on the continent, it is not without its challenges. According to the GSMA: 'Mobile internet adoption in Africa continues to grow rapidly. The number of mobile internet subscribers tripled in the last five years to 300 million by the end of 2015, with an additional 250 million expected by 2020. However, by 2020, 60 per cent of the population will still be unconnected.'

"Affordability is a major barrier to adoption, with many low-income groups unable to experience the benefits of digital inclusion, because they cannot afford internet-enabled phones and devices. For its part, MTN has made low-cost devices available in many of its markets, enabling customers to access basic services such as application downloads and social media platforms. In 2016, 400,000 low-cost smart phones were made available in Cameroon, Nigeria, Congo and Liberia.

"Linked to smartphone penetration, however, is availability of the necessary spectrum, which continues to pose a problem for operators on the continent. Connectivity is dependent on mobile networks, with capacity of the network determined by the available radio frequencies.

"We understand how people across the continent stand to benefit from connectivity, and digital services. This is why we continue to drive affordable smartphone penetration in many of our markets. However, as customers move to smartphones, data usage increases. To meet these needs operators require spectrum, which is not available. At present, the spectrum available in most of Africa is good for 2G and 3G, and we are serving 4G on top of that spectrum as well."

Fouladi continues by saying that a point reaffirmed by the GSMA is that the shortage of appropriate spectrum for mobile operators, caused largely by the slow progress in the switch over from analogue to digital terrestrial television, must be addressed with haste. Its report states: "If policymakers across the region step up efforts to allow mobile operators to have access to the spectrum they need, Africa will enjoy major social and economic benefits. Spectrum has no intrinsic value, but can be a valuable resource when put to productive use."

Despite the challenges, Fouladi remains optimistic about the future. "Connectivity is central and has always been at the heart of who we are as MTN. It is a pillar of our mission to connect people, enable the unbanked to become banked, the unconnected to become connected and those who are banked and connected to be part of the digital inclusion journey. This includes businesses.

"We continue to make pan-African investments, connecting countries across the continent and enabling enterprises and businesses to work beyond borders. We want to continue to drive innovation to address social needs and enable greater digital inclusion.

"I am super-excited about where this industry is headed, where MTN is headed, and the potential we have to continue to impact lives for the better through our connectivity and digital services."

Further reading: MTN Group 2016 Sustainability Report (www.mtn.com/en/mtn-group/sustainability/more-on-sustainability/Pages/Report-archive.aspx)

[1] The Mobile Economy Africa 2016 (www.gsma.com/mobileeconomy/africa/)

Yves Bellego, Director of technical & network strategy, Orange

With its growing footprint of 21 markets across the region, Yves Bellego says Orange sees itself very much as a partner and facilitator of the continent's digital transformation that is now well under way.

"Our aim is to deliver an unmatchable customer experience and therefore the network and technology choices we make play a fundamental role in helping us achieve this goal.

"But navigating this diverse region presents many unique opportunities and challenges for us and the industry as a whole.

"Among the market trends we have seen over the last twelve months, the growth in data consumption is clearly the main one shaping our own network strategy for the region. With a 70 per cent growth in data traffic across the region there is clearly a need to anticipate and keep pace with this growing demand. As a result, there are now subscribers in Africa with very similar data usage statistics as their European counterparts.

"Coupled with this uptake of data services has been the increased adoption of smartphones, a growing proportion of which is 4G. Orange itself has seen a 40 per cent increase in LTE smartphone sales across the region in 2016, with the largest growth coming from sub-Saharan Africa at a staggering 350 per cent increase.

"Nonetheless, unlike Europe, a large proportion of the population are still using feature phones, particularly on 2G. This is because the 2G network is still the predominant network outside of cities where 4G is becoming commonplace (in countries where we have launched 4G). Serving populations with such diverse usages therefore presents a significant network challenge for operators which we do not have in Europe.

"As a result, Orange's focus for its network deployments in the region over the past year has concentrated on the deployment of mobile broadband access for customers using 3G and LTE. We started with 3G and now have that in all of our territories. The goal now is to do the same with 4G. So far, we have achieved this in 10 out of our 21 countries, including four added in 2016.

"Currently, 4G is rare outside of cities so our challenge (as is the rest of the industry's) will be to extend and improve 4G broadband coverage into rural areas. As we look ahead to the next twelve months, the rollout of 4G mobile broadband will undoubtedly continue to be a key focus. However, the pace of this deployment is dependent on obtaining licenses. With little harmonisation across the region and the discussions made on a country-by-country basis, this is a challenge that the whole industry faces as it strives to deliver faster mobile broadband for our customers.

"Another key area of focus for Orange in the region during 2016 was improving the backhaul through fibre connectivity in order to plan for progressive increases in data traffic.

"We began by upgrading international backbones through submarine and terrestrial fibre deployments. This gave international connectivity to many countries that were previously not connected and, crucially, gave them multiple connections to provided security, should one connection be cut. We are now upgrading national backbones, evolving them from pure microwave to a combination of microwave and fibre. To this end we are progressively bringing fibre closer to the mobile switches and radio sites. Roughly half of our countries now have national fibre backbones, which is encouraging progress as we look to ensure a good throughput across the country. This is a specific issue to Africa because in Europe there is a strong existing network of fibre.

"We have also witnessed the market evolve from one where the main services were just voice, money transfers and SMS. Today, we need to ensure QoS for video streaming and for increased data consumption more generally. This adds a new complexity to operators' network management plans.

"At Orange we have put a lot of effort in the last 12 months into improving and optimising the quality of service to support our goal to deliver an unmatchable customer experience. To this end we launched two new global network operation centres in 2016; in Abidjan in the Ivory Coast and Dakar in Senegal.

"Having two large GNOCs ensures that we have the same tools to manage the network at our disposal as we do in Europe. They enable us to measure what the current quality levels are and, crucially, we now have the tools to optimise and improve the quality to get it to the level we want. Having experts with the right competencies in just two locations rather than being spread out has made the management of QoS much more efficient.

"Orange expanded its footprint in 2016 with operations in three new countries – Sierra Leone, Liberia and Burkina Faso. The GNOCs will play a key role in terms of improving quality of service in these markets going forward. Naturally, it remains an ongoing challenge to master the quality, and as data levels rise this is going to be an increasing area of focus for the entire industry in the region.

"In the coming years we will see Africa becoming a continent with its own content and services which will need to be hosted locally. Today, there is a lot of effort on access network and the challenge for the industry going forward will be to develop local or regional data centres on the continent that will propel its digital transformation to the next level.

"Finally, although 5G is still some distance off, it needs to be anticipated. We are one of the operators pushing for the requirements for the MEA region into the 5G standardisation process. We believe 5G could be an important solution for the region in the next decade that enables the deployment of wide high broadband coverage at low cost. That is why we are pushing for this to be part of the standards.

"The next twelve months will undoubtedly be full of challenges and opportunities for operators in the region. But we anticipate a steady growth and adoption of new data-intensive services that will continue to challenge and shape the operators' networks and technology choices."

Paul Marshall, Co-founder & chief customer officer, Eseye

Eseye is an M2M connectivity provider for Internet of Things devices. The UK-headquartered company claims to take the risk out of large IoT deployments through the design and delivery of customer specific SLAs and managed services. The firm says it delivers this on its secure global "network of networks" which encompasses more than 440 operators.

Eseye co-founder and chief customer officer Paul Marshall reckons Africa presents a prime example of how connectivity is allowing mobile-enabled utility services to be delivered in the most remote locations.

"In the western world, utilities are often taken for granted. The majority of citizens live in a house with water, electricity and gas automatically connected and monitored on meters; very few will even consider the prospect of life without what they see as basic necessities.

"There is no starker contrast to the western world's approach to utilities than in Africa. 115 people on the continent die every hour from diseases linked to contaminated water,[2] while 589 million habitants live without electricity.[3]

"However, mobile technology is already starting to change the shape of utilities across the continent – so much so that other regions

could learn from the IoT deployments which are already changing lives."

Marshall says accessing utilities in the western world is relatively straightforward. "For instance, if you want to connect a phone line to your home, you contact a local phone company, give them your address, bank details, etc. and the provider runs a credit check on you. If you pass, the company connects you to the network. It understands that you have credit in place to pay for the service in advance, as you have an address and are associated with a bank, and have a measurable credit rating.

"However, if you are one of the millions of people across Africa who are 'unbanked', the process is not nearly as easy. Without credit, how do you show a provider it is worth building a phone line and connecting you to its service? How can you guarantee its investment in you and in your phone line is going to pay off?

"More importantly, it is staggering to see how this system for phone connectivity is the same as issues faced when looking at essential infrastructures such as water, waste disposal, electricity, or any utility the western world now takes for granted.

"If this problem was faced in the UK, various organisations would compete to build roads, infrastructure or whatever was required to allow the service to be sold and delivered. However across Africa, organisations don't have this option. Instead they are forced to find alternative solutions to solve the problem and drive innovation as they do so.

"Most are turning to the one universal infrastructure that exists across the world – the mobile network. As with the mobile expansion across Europe in the 1990s, Africa saw the same expansion, giving the continent its only universal utility service. In fact, more than double the population[4] in sub-Saharan Africa has mobile phone access compared with access to paved roads.

"Therefore, businesses looking to deliver utilities in African countries are surpassing their western world counterparts, maximising the mobile network to deliver innovative utility services to millions."

Marshall says that one such business delivering utilities in innovative ways is M-KOPA. The Nairobi-based company has provided light to more than 400,000 homes across Kenya, Tanzania and Uganda by offering solar-power home systems for low income and rural residents without electricity. Customers can light their homes by paying for their system through mobile money transfers. After finishing the payment plan, the customer owns the product and can then access more cost-effective financing for a range of other products, including further lights, televisions, stoves, smartphones, and water storage tanks.

To achieve all this, M-KOPA had to build mobile connectivity into its technology. In Kenya, for example, it partnered with Eseye and Safaricom to deliver solar-powered lighting and mobile charging to rural Kenyans on a pay-as-you-go basis, with payment via *M-PESA*. This requirement to integrate with *M-PESA* and exploit its distribution channel meant that a Safaricom-enabled product had to be used.

Eseye worked with the teams to design the platform, run the back office data processing, and integrate it into the Safaricom network. Eseye is now the only dedicated M2M service provider to integrate directly with the Safaricom network.

"Therefore, by utilising the mobile network, M-KOPA is delivering services to 'unbanked' people who would have not had access to finance services," said Marshall.

He cites another example of a business successfully innovating in Africa: "EWaterPay in West Africa has developed a sustainable solution which allows local water distribution schemes to become self-sustaining. It's a business model which also has the potential to be implemented on a wider scale across the continent. Mobile money, NFC, RFID tags and cellular communication all play a part by allowing secure financial transactions, the delivery of clean fresh water, and trained local engineers to be paid to manage and maintain the system.

"Innovations such as these are allowing mobile connectivity to have a wider impact. By ensuring people have access to credit and services, organisations can open further access to infrastructure, increase job opportunities and deliver a boost to local and national economies.

Africa is therefore at the beginning of its own industrial revolution – a revolution that will not be driven by steam and coal but by mobile and innovation.

Avi Kachlon, CEO, FTS

FTS specialises in convergent billing, charging, customer care, policy control and payment solutions. It claims to be the first billing company to provide policy management, analysing every transaction from a business standpoint, and reckons its solutions result in a dramatically lower total cost of ownership for CSPs.

The firm was involved in a number of activities in Africa during 2016, including a major upgrade for one of its long-standing customers: Zimbabwean national fixed line operator TelOne.

"TelOne is significantly modernising its network in order to keep pace with its aggressive growth plans," says FTS CEO Avi Kachlon. "A key component of this is the upgrade of its supporting systems and FTS has been replacing its years-old billing system with a new one."

The company also won a new project for what it describes as a "sizeable" African operator with a few million subscribers. Kachlon was unable to reveal further details at the time of writing but expects further information to be released later in 2017.

According to the CEO, FTS' overall activities in Africa now involve larger and bigger projects than it has previously undertaken in the region.

"We provide a greater number of turnkey, end-to-end solutions for mobile or mobile virtual network operators and enablers.

"We have also expanded our activities. We are not only an independent software vendor with our own solutions, but we are also acting as a systems integrator, bringing in solutions from different vendors including mobile network elements, value added services and other related software, and managing as one project. This is in part due to our experience on the supply side and we've found that on the demand side, certain operators want to work with a single operator. This is not an isolated incident – we're finding a demand for this service in other geographies, too."

In addition, Kachlon says FTS is also seeing many more opportunities to participate in mobile money and mobile financial services platforms.

"Our latest project involves a mobile money platform as part of a larger billing project, and we are also involved in many standalone mobile money platform opportunities across the continent. In many cases, the requirement is for more than just a mobile app, and we are using FTS technologies, including transaction management and billing. In some cases,

[2] UN Water for Life Decade 2005-2015: http://www.un.org/waterforlifedecade/africa.shtml

[3] The Borgen Project – Top 10 poverty in Africa facts blog, Jordanna Packtor, Nov 2014: http://borgenproject.org/10-quick-facts-about-poverty-in-africa/

[4] World Bank, Mobile connectivity in Africa has already arrived, Borko Handjiski, Mar 2015: http://blogs.worldbank.org/africacan/mobile-connectivity-in-africa-has-already-arrived

BSS / OSS Price vs Cost

There are two very important amounts associated with the purchase of any business-critical software. They are the purchase "Price" and the total operating "Cost" (TOC). In the case of billing, POS, CRM, OSS and other enterprise software, these amounts can be quite large, and are often vastly different. Furthermore, once the price is paid, if TOC gets out of hand, migration to replacement solutions can be expensive and painful. Heads may even roll. However, the opposite of this scenario is software that results in a negative TOC. In other words, it quickly pays for itself and returns TOC dividends throughout its lifecycle (often 10 years or more). Here are some thoughts in this regard:

Functionality First – Price Second

If you need to move a lot of earth, you buy a bulldozer, not a shovel. While the price difference may sting at first, if the bulldozer immediately nets a negative TOC, who cares? By way of comparison, the right BSS/OSS solution is the one that best fits the vast range of a user's daily operations, with the least amount of staffing and on-going expenses. This can usually be determined through an initial RFI, followed-up with a detailed RFP and scoring system, a detailed GAP analysis, customer reference checks, social media and on-line, on-site and hands-on demonstrations. Compliance with eTOM (www.tmforum.org/business-process-framework) and/or other industry standards are additional possible measuring sticks.

"Best of Breed" vs Single Source Solutions

There is no "one size fits all" BSS / OSS solution on the market today. However, some cover their short falls with a vast array of third-party bolt-on modules for functionality like CRM, POS, mediation, trouble ticketing, etc., and call it a "best-of-breed" offering. Translated, this means that users must deal with the support, future roadmaps and business continuation of multiple vendors. This can be very shaky ground that often requires extra staffing and the "swivel chair" method of data entry (i.e.: re-typing the same data into multiple applications). By contrast, some vendors offer a mostly all-inclusive solution, where any entered or edited data gets simultaneously updated everywhere and automatically "talks" to all components in real time (i.e.: lead tracking passes contact data to account creation, fulfillment, etc.). If such an application is market-wise and mature, mostly inclusive functionality makes the most sense from the standpoint of TOC.

A Successful Launch vs a Train Wreck

The best software in the world still requires certain steps to launch successfully. The most important is user buy-in. Users must be absolutely comfortable with the great unknown, as well as with management's commitment to their involvement in the end result. This all-important building block can be achieved through pre-launch demonstrations, training and both one-on-one and department level inter-action with the vendor's team. At the same time, management needs to free up time from staff's normal duties to achieve this end. Management must also be fully aware of each step in the end-to-end process at the onset. A well-conceived and realistic project plan supported by as many other details as possible is essential. Some examples can be found at www.advantage360.com/resource-library/.

Two Sides of a Budget

In most cases, the team that uses all of the often-exhausting investigative processes to vet a potential software implementation is not the same team that watches the budget expense line. So, when finance gets involved in vendor selection negotiations, their focus often tends to be on purchase price and not on the elements that are beneficial to TOC. As a result, while the total budget of the software, hardware, support and related products and services is simple addition, and easy to compare among potential vendors, finance may not be aware of tangible benefits that separate one solution from the next in the technical evaluation process, and that can add up to significant TOC dividends on other budget lines. These include reduced staffing dependencies and training costs, reduced churn through improved billing accuracy, improved communication channels and more professional customer support, competitive marketing functionality that grows subscriber counts and increases revenue, and process automation that reduces costly mistakes and revenue leakage, to name a few.

At the end of the day, both sides of the budget equation are very important and need to be openly shared among everyone involved in the acquisition. However, while the purchase price may quickly become a forgotten line item, the TOC (good or bad) can equate to big numbers that impact the budget long afterward.

network elements are required to deliver a mobile money platform so we are working with other vendors to provide a single solution.

"FTS has also expanded its reach in terms of sales, and we now have many more representatives working in the region. We are working more closely with our parent company Asseco Group's Nigerian branch, which is assisting us with our marketing and sales efforts on the continent."

With such varied experiences in Africa, how has FTS seen the continent's wireless communications market adapt and evolve over the last 12 months? Kachlon identifies two elements here.

"The first is the increasing demand for wireless data services. In other markets worldwide today, OTT messaging has surpassed text messaging, and OTT voice applications are causing traditional voice revenues to decline.

"In Africa however, operators have continued to grow revenues from traditional voice and text, but the growth of OTT messaging platforms is starting to have an impact. African operators are responding by offering bundles that are tailored to users' data requirements, such as social media bundles.

"The fast-growing penetration of smartphones in Africa – which up until now was not a problem – is finally starting to have an effect on the market. The more smartphone users there are, the greater the number of OTT applications. Both grow together. So the region's operators now need to offer different bundles and packages in order to encourage use of mobile data services.

"The second market evolution is that of mobile money and mobile financial services, which are growing exponentially. There are three drivers behind this growth.

"The first is mobile network operators, who have been providing mobile money services in Africa for years.

"The second is the continent's banks and financial institutions. While Africa has an unbanked population it also has around 100 per cent mobile phone penetration. So banks are utilising the mobile networks. The banks themselves now feel the need to join the party and so they are creating their own mobile money services.

"Thirdly, a group of different entities, including technology companies and retailers, are serving the refugee and diaspora communities in Europe – Ghanaians, Nigerians and other African communities based abroad – who want to establish relations including money transfer between countries."

According to Kachlon, the African MVNO market is not as successful compared to the rest of the world, and there are less than 20 virtual operators across the entire continent (of which the majority are in South Africa). But he believes that the MVNO market is starting to find its own niche, thanks to the growth of mobile money.

"MVNOs do not support the regulatory environment, nor do MNOs need them: margins and prices are so low anyway that there isn't much room for MVNOs as well.

"But the banks have no mobile infrastructure of their own which presents them with two opportunities: either to work with MNOs or create their own infrastructure to provide mobile financial services. Banks need this infrastructure so they are becoming a kind of MVNO that provides financial services only."

Kachlon goes on by saying that mobile money goes beyond simple fund transfers between two individuals. "Service providers are able to use the mobile money platform to transfer money or airtime, make bill payments (such as utilities), access banking services, loans and micropayments, enable mobile commerce, e-commerce, salary payments, international remittances and much more. A good platform will provide many services beyond straightforward money transfer.

"Revenue sharing schemes are complex business ventures and FTS provides customised tools that foster cooperation between mobile network operators and banks. Even when there are varying business objectives and different mindsets, FTS' partners and settlements solution ensures that mobile operators can deploy sophisticated revenue sharing and commissioning plans in a variety of ecosystems, defining transaction-based revenues rather than commonly used upfront payments."

What other challenges does Kachlon envisage for MNOs in Africa over the next 12 months? "The need to offer different wireless bundles and packages so as to encourage the use of mobile data services is not only an opportunity for the African market, but also a challenge. That's because it is taking place without voice LTE being widely deployed; indeed, in many markets, it is only at trial stage. Opportunity and challenge go hand-in-hand.

"The same is true for the development of mobile money and mobile financial services which, whilst already starting to experience strong growth, must be underpinned by flexible, scalable and reliable solutions to ensure consumer confidence and continued growth."

In 2017, Kachlon is hoping and expecting to see more demand for mobile financial services platforms, as well as a requirement for billing systems that enable operators to offer data-first products and plans that respond in real-time to subscriber requirements.

He says FTS also expects to grow its partner network across different countries, and is aiming to add a number of significant new upgrades and projects with new providers over the year.

Luke Taylor, Deputy CEO & CCO, Neural Technologies

Neural Technologies specialises in revenue management software, supporting fraud, credit/application risk, collections and revenue assurance strategies for communication service providers. Based in the UK, the firm reckons its risk management solutions analyse billions of transactions daily, and provide protection for one in seven of the world's mobile users.

In Africa, Neural Technologies works with Safaricom Kenya, MTN, Telkom South Africa, Meditel Morocco and Zain Sudan. Luke Taylor says the continent's wireless communications market has come a long way over the past couple of years, and is starting to show real signs of market maturity as some countries are heading towards mobile saturation.

"For example, Botswana, Mali and Mauritius have reached more than 70 per cent mobile penetration, and in South Africa, many reports cite over 100 per cent penetration as people are carrying more than one mobile phone. In countries where the penetration rates are highest, operators are beginning to focus on customer retention rather than new acquisitions – it costs far more to win a new customer than to retain an existing one.

"Africa is an incredibly large and diverse continent. South, West, East, North, Central and sub-Saharan Africa all host very unique demographics. Whilst countries in the North and South have reasonable network infrastructure, the 'middle' countries continue to face challenges typical of emerging markets.

"Research has shown that only a small percentage of phone users on the continent own smartphones. For example at Safaricom, our customer and the leading telecommunications company in Kenya and East Africa, a mere six million out of their 26 million subscribers own smartphones while the vast majority have feature phones."

Taylor continues by saying that reliable energy continues to be a problem across Africa. He says in some countries, less than 10 per cent of the populations have access to electricity at all, such as Burundi, Chad, Liberia, Malawi and South Sudan.

"Overall, 625 million people are without power in sub-Saharan Africa alone – that's

Système d'Information Commerciale Prix vs Coût

Il existe deux montants très importants associés à l'achat de tout logiciel essentiel au fonctionnement d'une société. Il s'agit du « Prix d'achat» et du «Coût» total de gestion (CTG). Dans le cas de la facturation, PDV, CRM, OSS et d'autres logiciels d'information commerciale, ces montants peuvent être importants, et sont souvent très différents. En outre, une fois que le montant est payé, si le CTG devient excessif ou incontrôlable, la migration vers des solutions de remplacement peut coûter très cher et être très pénible. Des carrières peuvent même s'en trouver ruinées. Cependant, le contraire de ce scénario est un logiciel qui produit un CTG au négatif. En d'autres termes, il se paye rapidement et génère les dividendes du CTG tout au long de son cycle de vie (généralement 10 ans ou plus). Voici quelques idées à cet égard:

Fonctionnalités en premier – Ensuite le Prix

Si vous devez déplacer beaucoup du sable, vous achetez un bulldozer (tracteur), et non une pelle. Bien que la différence de prix peut initialement faire mal, si le bulldozer produit immédiatement un CTG au négatif, on s'en fou! À titre de comparaison, le bon système d'information commercial est celui qui convient le mieux à l'ensemble des opérations quotidiennes de l'utilisateur, avec moins de personnel et de dépenses encourues. Cela peut généralement être déterminé à l'aide d'une demande initiale d'information, suivi d'un système d'évaluation et d'un appel d'offre détaillé, d'une analyse précise GAP, des vérifications de référence client, média sociaux et internet, et des démonstrations élaborées sur site. Le degré de conformité d'une solution au modèle eTOM (www.tmforum.org/business-process-framework) et / ou d'autres normes de l'industrie sont des critères de mesure additionnelles.

Solutions "Best of Breed" vs. source unique

Il n'y a aucun système d'information véritablement «prêt à porter» sur le marché aujourd'hui. Cependant, certains fournisseurs couvrent leurs lacunes avec un ensemble de modules importés de tierce partie pour des fonctionnalités telles que le CRM, les PDV, la médiation, tickets de dérangement, etc., et appellent ça «best of breed». En d'autres mots, cela signifie que les utilisateurs doivent gérer le support, les futurs roadmaps et les évolutions de plusieurs fournisseurs. Cela peut être un terrain miné qui nécessite souvent plusieurs personnel supplémentaire et une méthode redondante de saisie des données (c'est-à-dire: ressaisir les mêmes données dans multiples applications). Par contre, il y a des fournisseurs qui proposent une solution tout à fait complète et intégrée, où les données saisies ou éditées sont mises à jour simultanément dans tout le système, et qui automatiquement communique avec tous les modules en temps réel (Par exemple : le Suivi d'un prospect transfère les données de contact à la création du compte, ensuite à la mise en service, etc.). Si une telle application est orientée vers le marché et assez intelligente, c'est beaucoup plus rentable du point de vue du CTG.

Une mise en production réussie vs. une catastrophe potentielle

Le meilleur logiciel dans le monde nécessite certaines étapes pour une réussite de mise en production. Une des plus importantes est l'acceptation de la solution par les utilisateurs. Les utilisateurs doivent être absolument à l'aise avec le grand inconnu à venir, ainsi que leur engagement de la direction à participer au résultat final. Cette pierre angulaire peut être mise en place grâce à des démonstrations de pré-lancement, à la formation et à l'interaction individuelle et départementale avec l'équipe du fournisseur. En même temps, la direction doit libérer ce même personnel d'une partie de leurs tâches habituelles, afin d'accomplir cet objectif. La direction devrait au préalable être totalement consciente de chaque étape du processus de bout en bout. Un plan de projet bien conçu et réaliste, aussi détaillé que possible, est essentiel. Vous trouverez des exemples sur www.advantage360.com/resource-library/.

Deux faces d'un budget

Dans la plupart des cas, l'équipe qui analysera et évaluera l'implémentation d'un logiciel n'est pas la même équipe qui surveille les dépenses budgétaires. Cependant, lorsque la direction financière s'implique dans les négociations sur la sélection des fournisseurs, leur objectif tend souvent à être sur le prix d'achat et non sur les éléments qui sont bénéfiques pour le CTG. En conséquence, alors que le budget total du logiciel, du matériel, du support et des produits et services connexes est simple, et facile à comparer entre les fournisseurs potentiels, le département de finance (DAF) peut ne pas être conscient des avantages tangibles qui différentient une solution d'une autre dans le processus d'évaluation technique et qui peuvent produire des dividendes de CTG significatifs sur d'autres lignes budgétaires. Il s'agit notamment de la réduction des besoins de personnel et des coûts de formation, de la réduction de la perte de clients grâce à une meilleure facturation fiable, à des canaux de communication améliorés et à un support client plus professionnel, une fonctionnalité de marketing compétitive qui augmente le nombre d'abonnés et des revenus, et une automatisation accrue des processus qui réduit les erreurs coûteuses et les fuites de revenus.

En fin de compte, les deux côtés de l'équation budgétaire sont très importants et doivent être ouvertement partagés entre tous ceux qui participent à l'acquisition. Bien que le prix d'achat peut être rapidement oublié, le CTG (bon ou mauvais) peut devenir un facteur majeur qui impact le budget dans les années à venir.

about 50 per cent of the entire continent's population. This incredibly poor power infrastructure is the key limiter in these emerging markets.

"It is not really surprising, considering this intra-continental dichotomy, that most of the simpler mobile money transactions in the country are still SMS-focused. Even in this area, however, we are seeing developments in usage from simple money movement to more widespread banking functions, such as loans, and this is a prime example of how the telco industry is always evolving – even in what we might consider underdeveloped markets.

"Africa has, and is seeing, rapid urbanisation but today 70 per cent of the population still resides in rural areas. This means that *M-PESA*-like money remittance services that enable digital transfers between family members are crucial for an unbanked population that stands at more than 80 per cent. These mobile money services have made serious strides in progressing the global strategy of decreasing the aforementioned unbanked African populations. The change in Kenya alone, with more than 75 per cent of the population now using *M-PESA* and similar products, has helped the steady progress toward financial inclusion across the continent.

"Nonetheless, the African market has never been more fickle. Customers are expecting more – more features, more apps, more services. And as the smartphone market grows, operators must be able to deliver this as well as quality of service with as little downtime as possible, all for the minimum cost.

"At the same time, margins are being squeezed as prices have been lowered to attract customers to the point where there is very little ARPU for voice and SMS usage."

Taylor says these thin margins are encouraging operators to merge in order to amplify their offerings and share costs such as base stations. Furthermore, he believes African operators must look at standardising their internal systems. As opposed to using more traditional legacy systems that work in silos, he advises operators to find one platform that can handle all the user data, and then analyse these data to find additional revenue potential and secure existing revenue flows.

"In order to be more than a 'dumb pipe', telcos must look to change their business models, monitor services and discover what their customers want and how to give it to them. They must be able to interrogate their user data like never before and understand [them] intuitively.

"Many companies use data scientists, but these tend to be an import from places like the USA or UK and are expensive since in-country resources for such roles are low. It therefore makes sense for companies to use smarter technologies which can do the complicated data science for them and display simple, usable insights to their staff. By training staff and empowering them, companies will be able to add value internally without importing contractors at a greater expense. This will also assist with the skills gap in many of the emerging countries and encourage aspirations, as the local workforce becomes more invested and highly skilled.

"By simplifying processes and adding transparency through data, African telcos can also help the countries in which they operate to trade more freely with the West. In order to trade with the USA and EU, countries must be able to show that they are on top of any potential crime (money laundering) and terrorism threats within their borders. The data available to telcos makes them one of the best positioned to spot terrorism and crime and help law enforcement to stop these threats, enabling greater trust and better trading potential."

Taylor concludes by saying that whilst there have been a great many changes in African telcos throughout 2016, these are likely to come "thicker and faster" over 2017-18.

"It will be interesting to see which African countries and operators step up to the plate and diversify, and which will fade into the background. One thing is for sure: the traditional ways are 'out'. So it will be up to the most innovative and adaptable to drive the market forwards, and we at Neural are looking forward to assisting operators in moving onwards and upwards."

David King, CEO, Flexenclosure

Since 1989, Sweden's Flexenclosure has built a name for itself, first with its pre-fabricated *eCentre* data centres, and then *eSite*, its innovative hybrid power system for off-grid and bad grid base station sites.

Over the last year, the company has announced several deals for *eCentre* projects in Africa. These included a second deployment for MTN in Côte d'Ivoire, one for Angola Comunicações e Sistemas in Luanda, Chad's first data centre which was commissioned by Millicom, as well as Flexenclosure's first contract in Ethiopia.

So does all that mean there is now greater activity in the continent' data centre market? Flexenclosure CEO David King says he has been working with *eCentre* for nearly five years, and can now really feel it picking up pace. "When we started, we were still getting clear on what it was that we were offering in terms of a prefabricated data centre concept. And then we hit a wave of telecoms modernisation. I would say that all of the early deals that we did were with telcos who had expanded well in the first few years of the century with the mobile wave coming to Africa and then needing to upgrade those facilities. That was a very typical scenario for us."

Since then, King has seen the advent of colocation companies in Africa which has led to three different things. "One is that as the telcos modernise, they are creating additional space so they can rent racks to enterprises. MTN who worked with us in Côte d'Ivoire did exactly that, as did Millicom who worked with us in Chad.

"The second thing is home-grown colocation companies, such as Kenya's Kooba and icolo.io, which have realised that there is a world of opportunity as data comes back onto the continent.

"And then the third thing that we see is some of the big colo players from around the world taking a hard look at Africa. That includes both household names in data centres, as well as some of the big internet players, whether that be Google or Facebook, waiting to see what they do here.

"Africa is moving forward all the time, but progress is inevitably uneven. That's the nature of the beast. If you asked me will there be more data centres in 10 years' time or less, I'd say there will be lots more. That is the opportunity we are going to take."

King mentioned the prospect of telcos taking data centre rack space to sell more services to enterprise users on the continent. But some big name MNOs have previously stated that they have found the enterprise market difficult to crack in Africa.[5] So does he see the rise of local data centres as a market driver?

"I very much agree with this idea of 'ecosystem economics'. That's a phrase I picked up from a venture capitalist friend of mine, and it's a very good phrase because it gives us this idea that if you can think about what's good for everybody then the pieces start coming together. *eSite* is a good example here. We're trying to create something, both in terms of product and commercial offering, that is really attractive for tower companies so that they buy more and then the network gets better and everybody gains.

"If, on the other hand, we step back and say we can't solve some of your problems, that's for you to solve, the ecosystem stays broken.

"In the consumer experience, people have linked together cloud, software and hardware.

[5] *African Wireless Communications Yearbook 2013*, Chapter 1, p19, Marc Rennard, Orange; Kanagaratnam Lambotharan, MTN, ibid. p21.

It's the same with us. Which is why when people ask me, 'why are you in prefab data centres and power systems, where do they fit together?', I say they fit together under the umbrella of internet infrastructure. That's what we are trying to do."

In 2016, Flexenclosure launched the *x10*, the latest incarnation of *eSite*. It's claimed to be the world's first hybrid power system that is purpose-built for outdoor telecom sites and to outdoor telecom standards. The firm adds that the patented, sealed, tamper-proof unit features passive convection cooling, no filters, no moving parts and requires no maintenance.

When Flexenclosure first started selling its "green" *eSite* base station systems in Africa in 2011, its main customers were MNOs. But since then, have the company's conversations with the industry in Africa rapidly moved to tower companies? King says: "The short answer is 'yes'. In 2013/14, because the towercos were in the process of acquiring their portfolios, they weren't really interested in the likes of us. But by the end of '14, early '15, the picture changed. They said okay, now we have got our portfolios we need to start making these sites economical.

"The conversation was different because the towercos tend to be faster in their decision-making and they're very focused around site economics. It's not that the MNOs aren't interested in that – they have got so much more on their plate. So we found that the larger and faster deals, coming from tower companies.

"But the answer isn't a simple 'yes' because I see this swinging back a bit. The towercos are buying up all the sites that are attractive from a portfolio perspective – sites that will typically attract more than one tenant. There are still a lot of sites that won't attract more than one tenant. The MNOs have sold some sites but are left with lots that are less attractive.

"So our feeling now is that we have made a big impact on the tower world, we're known around there and we've got a couple of big deals. But we're also going to come back and re-address the MNO world and say look, we know you weren't ready to do this before because you were thinking about selling the sites, but now you need a really good bit of kit to drive down those costs. And that's where we think the *x10* will come in."

King says Flexenclosure could do such deals directly but added that one advantage of the *x10* is that it can also be sold indirectly through a channel. He adds that the firm could also team up with a big generator company that's already selling to MNOs and get it to bundle the new system with its own products.

But in either event, King says if Flexenclosure's early involvement with Africa was firmly with the telcos, it then moved firmly onto towercos, and now the future is a blend of the two. So has that been the story of the company on the continent over 2016?

"The last 12 months for us have been very tower focused. We have been in the middle of a large deployment for IHS Towers together with our partner in Nigeria, MPI. It's been a big undertaking and, from an operational, project perspective, taken a lot of effort. None of these things are without challenges – if you put 1,200 *eSites* around Nigeria you are going to get challenges! But the installation has gone well, and when I met with the COO at IHS recently he was very positive about our product.

With *eCentre*, King says Flexenclosure has been finishing off a number of deployments around the continent, although its more recent data centre deployments have all been in Latin America, specifically Paraguay and Colombia.

Flexenclosure builds all its *eCentres* at its factory in Vara, Sweden and then ships the custom made parts ready for assembly at the client's location. Would the company ever manufacture in Africa? King says he remains open to everything that makes economic sense, adding that he is a firm, long-term believer in sub-Saharan Africa.

"I come here a lot and there is an energy and drive here that I really like. I have studied the demographics that tell me that this is the youngest continent in the world. So there is no reason why you can't do all these things here at the right time. I don't have a short-term view on Flexenclosure. It is for the long-term.

"So we are going to keep doing what we do – we're going to get data centres all around Africa and build the infrastructure for the continent. And when it makes sense for us to be putting the pieces together in Kenya or Nigeria, [etc.], then we will."

But that will require local expertise. Are skills, training and the transference of specialist ICT knowledge to Africans a key part of the 'ecosystem economics' King referred to earlier on? He says the company's subsidiary in Nigeria already has team of 10 service engineers and praises them for their great experience, adaptability and diligence. But returning to demographics, he points out that Africa is going to be the continent with the largest working population in a very short period of time.

"I think there will be enough skills here, it's really just a matter of time. At a large scale, when we are training groups of people to roll out *eSites*, then you can get skill challenges. But at the sort of scale that we need to work – such as when we were building our Nigeria team – for us to get 10 really good people was not difficult. We found them relatively quickly and are extremely happy with them. They have all got bachelors and masters degrees."

So what about other hurdles, such as dealing with the MNO who is locked into its long-standing, big name technology vendor for all its infrastructure needs? "I have this sort of personal mantra which says we should never look at ourselves as a victim. It's all about making our proposition better. For example with the *x10*, I'm now thinking about how we can structure the deals in such a way that we create some very attractive propositions in terms of replacement cabinets. So for me, it's about getting that proposition right.

"The launch of the *x10* is a major step forward because it is a truly fit for purpose product. We designed this with Africa in mind. We have learned enough here and we have got great, battle-hardened engineers who have been out here and know what to do. So the resilience of that product is going to help us a lot.

"And it's the same with *eCentre*. There is nothing overly complicated about our strategy with this – all we are trying to produce are high-quality, customisable data centres at very competitive prices. That's it. If we can keep getting better at that, we won't have to worry about the Huaweis or the Ericssons, etc."

Mariam Abdullahi, Telco industry lead, SAP Africa

Despite ongoing economic challenges and some tricky regulatory issues, Africa is fast approaching the one billion mobile subscriptions landmark, says Mariam Abdullahi.

"The continued rollout of 3G and 4G networks, as well as an influx of low-cost smartphones, is changing the face of the African telecoms market by making the latest mobile innovations accessible and available to citizens.

"This is particularly significant in light of the continent's often underdeveloped broadband infrastructure as it finally brings African citizens into the global mobile fold, where anyone from business leaders and diplomats to smallholder farmers and school children can access the internet and increase their knowledge and economic opportunities.

"Africa has also often played a leadership role in mobile innovation: its mobile money products – such as *M-PESA* – are among the most successful of any around the world, and the continent often finds innovative ways to work around its infrastructural challenges by finding new uses for feature phone tech such as USSD and SMS.

"However, the continent is undergoing a process of broad and sweeping digital transformation which, in the telco industry, is being driven by three key forces.

"Firstly, there are OTT services putting pressure on the operator's traditional revenue streams. Globally, more than 1.8bn people use OTT mobile services, which is why Ovum predicts a USD293.4bn loss in the telco industry due to OTT VoIP services. In fact, it predicts that by 2020 there will be 2.7bn OTT VoIP users, which will upend the entire traditional telco industry as providers seek new ways to increase revenue.

"Telcos have already begun to incorporate OTT services as part of value-add packages to consumers. Of such telco-OTT partnerships, a quarter involve video content, 22 per cent offer music services, and a further 19 per cent offer social media to consumers at reduced rates.

"Secondly, consumer demand for online videos is forcing data costs down. According to recent stats, 62 per cent of mobile users consume online video content. In 2014 already, 50 per cent of all *YouTube* traffic came from mobile devices, and analysts estimate that video will account for 70 per cent of all mobile traffic by 2021.

"The continued growth of data consumption – fuelled in part by the demand for online video content – is creating robust revenue growth for operators. An Ovum report estimates that mobile data in Africa will grow from USD6.40bn in 2015 to more than USD27bn in 2021. As revenue from traditional voice services continue to be disrupted by OTT players, and consumers increasingly shift consumption habits to more data-intensive media such as video, operators will need to be in a position to innovate quickly and accurately or risk losing customers (and revenue).

"Thirdly, there is hyper connectivity from M2M and IoT devices creating opportunity for new revenue streams. Despite strong mobile revenue growth predicted for Africa over the coming years (from USD55.55bn in 2015 to USD69.67bn in 2021) it is the emergence of the Internet of Things that will make the biggest impact on the African telco industry. The World Economic Forum estimates there will be more than 50bn connected devices by 2020, creating what McKinsey estimates to be a USD6.2trillion industry by 2025.

"Telcos have a natural advantage in Africa as their infrastructure is often quite advanced, potentially making it easier for IoT devices to be connected to a single network with big data capabilities. As a company, we have also made a strategic decision to take advantage of the opportunities on offer around IoT: in September, SAP announced it will invest USD2.2bn in IoT by 2020.

"Telcos will need to navigate these forces if they are to create the new revenue streams they need to replace traditional voice income streams. The emergence of big data is likely to be the single biggest tool in their attempts in this regard, with a recent Ovum report identifying it as the top strategic investment among African telcos in the next 18 months. Building on that, through real-time analytics that allow for better decision-making and enable a deeper level of personalisation that opens the door to new digital services, will give telcos the opportunity to transform their business models.

"With a continent-wide mobile penetration rate of over 83 per cent, Africa is well-poised to take advantage of the immense socio-economic and technology benefits promised by connected IoT devices.

"For example, telcos could merge data from commuters' phones with smart sensors to determine traffic patterns and provide accurate insights to city planners in an effort to improve integrated transport plans. Up-to-date weather information could be merged with agricultural sensors to provide African farmers with critical insights that can boost crop productivity and minimise risks to crops.

"The telecom operator's advanced infrastructure and data-processing capabilities can bring these benefits to life: by delivering personalised and accurate information to mobile users, telcos are uniquely poised to discover new opportunities for value-added digital services that bring true benefit to the end-user while creating entirely new revenue streams for the telcos themselves.

"To thrive on the continent, telcos need to find innovative new partnerships with OTT partners, video providers, and others to drive monetised traffic on their networks. Simultaneously, there is an urgent need for operators to modernise their networks and IT infrastructure to ensure they are capturing all revenue opportunities, such as releasing new digital services including connected cars, home automation, and more."

Oluwole Babatope, Senior regional analyst West Africa, IDC

"Africa still holds promise for growth but it's not without challenges and we have seen telcos such as Zain, Etisalat, Airtel, Orange, etc., partially or completely exit some markets.

"So although the continent is rightly touted as the next frontier for growth in telecoms services, it is not proving to be a walk in the park with respect to maximising revenue opportunities and maintaining profitability, especially as most markets grow towards maturity.

"Telcos are faced with the reality that business models that excelled about 20 years ago when mobile voice services were introduced to the continent, can no longer deliver expected returns on investment. More markets now have independent regulatory bodies that have introduced market liberalisation policies, driven competition by encouraging new market entrants, and also forced down tariffs by cutting interconnection rates. It is therefore becoming increasingly challenging for telcos to maintain the same levels of profitability as before without a long-term strategic approach.

"Most African markets have three to four operators, while some markets like Nigeria and Ghana actually have five. There is therefore increased competition across the continent that has led to fierce battles to retain and attract new subscribers.

"This in turn has resulted in increased customer retention and acquisition costs for telcos. Customers are becoming more aware, demanding more for less, and the large pre-paid subscriber bases in most markets have resulted in high levels of churn.

"Increased competition coupled with increasing market penetration have recently driven consolidation across the continent. Telcos and ISPs with weak financial positions are finding it difficult to remain profitable and run sustainable operations. IDC therefore expects more market consolidation as has been witnessed recently in Nigeria, Kenya and Tanzania.

"Depreciation of currencies such as the rand and the naira against the dollar has impacted telcos severely across Africa, especially as network investment costs continue to be in US dollars.

"For regional and multinational telcos who still have to repatriate some of their earnings to home countries, currency devaluation or depreciation has had a net negative impact on the bottom line. This is even more worrisome as emerging market risk continues to increase on the back of weak commodity prices, so-called 'Brexit' in the UK, and insular protectionist policies in the US adding greater strain on most African currencies.

"Further compounding the situation is the continued decline in ARPU negatively affecting revenue even as costs escalate.

"Telecom operations in some parts of the continent, particularly sub-Saharan Africa, are capital intensive because significant investments are required for infrastructure to cater for the lack of public infrastructure, i.e., electricity and roads. Telcos have therefore become responsible for ensuring the availability of critical infrastructure necessary for seamless network operation.

In Nigeria for example, public power

supply is so unreliable that all telcos depend strictly on power generators and green energy solutions like solar power. Diesel generators, solar panels, battery banks, etc., add significant costs to an MNO's network expansion and operation. As a consequence, power is a basic requirement for the functioning of network equipment and is a major threat to the overall profitability of Nigerian telcos.

"Reinvestment due to theft and vandalisation of equipment also negatively impacts the bottom line. In addition, obtaining right of way permits for fixed network deployments have been used by local municipalities to unfairly extract more money from telcos in some countries. Telcos are subjected to multiple levies and taxation when deploying fibre cables. All these high capital and operational expenditure cumulatively affects the bottom lines of telcos and in contributes to erosion of profits."

Price war strategy

"This is a strategy usually implemented by new entrants to attract subscribers. However, it is not sustainable, especially in predominantly pre-paid markets where one or two dominant players exist. In the long term, lower tariffs hurt the revenue of the new entrant. Moreover, it is not a sustainable strategy to gain market share if there is no other value proposition for further differentiation.

"Airtel and Cell C are two particular cellcos that have tried implementing a price war strategy, but both have ended up being saddled with debt burdens and are currently contemplating various restructuring or acquisition options.

"Telcos across the continent are faced with diverse challenges with respect to profitability, however IDC believes the following strategies are able to guide them to sustain revenue generation and ultimately lead to profitability.

"Firstly, operators need to have a differentiation strategy. The need to focus on segmenting niche markets and invest in differentiating themselves from the competition. Key areas for differentiation include seamless network service, excellent customer service, competitive SLAs, reward or appreciation for loyal customers, etc.

"Operators need to transform into brands that target specific subscriber segments. For example Lebara, an MVNO in Europe and the Middle East, differentiates itself by offering competitive tariffs to home countries of immigrants. It has branded itself as the 'network for immigrants'. African telcos need to step up and elaborate on their uniqueness.

"Secondly, telcos need to invest in understanding their current subscribers through analytics to be able to retain and attract new customers effectively as several markets move towards saturation.

Churn is a major challenge in the region because the market is predominantly pre-paid. Therefore, telcos need to invest in understanding and retaining each customer by creating unique experiences. For example, they can provide directed promotions and rewards to specific users based on their usage pattern – heavy data users who regularly spend above the target data ARPU can be offered free gigabytes, or those who spend more on voice above voice ARPU can be rewarded with free minutes.

"Similarly, advertising can be further segmented depending on user profiles. For example, health tips could be more relevant to a specific demographic while sports scores and highlights or entertainment updates could be applicable to certain user profiles.

"Finally, telcos need to focus on the enterprise market as the margins in the consumer segment are declining. They need to invest in understanding the unique requirements of each vertical and develop capabilities to be the go to telco for solutions.

"For example, a telemedicine solution deployed in partnership with organisations in the health sector and targeted at, say, antenatal sessions for pregnant women in rural communities, will suddenly open up a niche market of millions of women annually.

"Furthermore, it is imperative telcos completely outsource network deployment and maintenance to third-party infrastructure providers so that they focus on services and growing their respective businesses as their key objectives.

"Operators will also need to transform internally to become digital transformation partners for their clients. Consolidation of internal and client facing IT systems will further lead to cost efficiencies and enable them to improve the customer experience."

Joseph Habib, VP of wireless, CommScope, MEA

Looking back at the market in 2016, Joseph Habib says Africa has been driven by an unprecedented increase in wireless traffic especially in countries such as Algeria, Egypt, Ghana, Libya, Kenya, Nigeria, Morocco, and Tunisia, etc.[6]

"The number of internet users during the middle of 2016 was more than 340,000. iPass says Africa and the Middle East has massively increased the number of commercial Wi-Fi hotspots from 38,000 in 2014 to 62,000 in 2016, and the number is expected to jump to 102,000 by 2018.[7]

"There are many emerging markets in Africa and we see a lot of potential to deploy new fibre networks in the region. We are in the early stages of what may be the greatest transformation of networking yet, driven by mobility, video consumption and cloud.

"Consumer behaviours and technology trends are also straining networks in Africa and require new thinking regarding infrastructure requirements of the future. Fibre is the most efficient technology to transport large amounts of data quickly and reliably."

Habib believes that among some of the main challenges CommScope faces on the continent is the cost of deploying fibre networks as well as a scarcity of qualified technicians. He reckons this is where the *FACT Optical Distribution Frame* can help.

"Minimising the number of technicians needed and the amount of time they spend onsite is critical. Not only does the CommScope solution reduce typical installation time by 50 per cent but, with factory pre-testing, it also reduces the likelihood of future field visits to replace failed components. With simplified installation and no need for field testing, operators save on labour costs and can deploy workers to perform other network maintenance and troubleshooting tasks as needed.

"With the rising expenses to deploy such networks, another area that network operators can explore is network sharing. This will lead to all the operators benefiting from the networks, as well as the end consumer seeing the cost of fibre going down, ultimately driving faster adoption of fibre. Another way to mitigate the high cost involved is by working with network operators to provide additional services on these networks generating more revenue out of the given network."

Over the course of 2017, Habib says CommScope's aim is to bring fibre deeper into the network, and reduce total cost of ownership while accelerating time-to-market. "We see high-speed fibre networks supporting the demands of the future's mobile population. CommScope is well positioned to address bandwidth needs through a convergence of network technology, including outdoor cellular towers infrastructure, small cells, distributed antenna systems, fibre optic connectivity and data centre infrastructure."

[6] Internet World Stats, 30 Jun 2016: www.internetworldstats.com/stats1.htm
[7] iPass Wi-Fi Growth Map: www.ipass.com/wifi-growth-map/