by Ewan Sutherland

Broadband in Africa

A different scenario to other markets?

There has been growing interest in broadband in Africa, though with a recognition that this must be different from North-East Asia and North-West Europe. It will have to be cheaper, since few customers are able to pay the significant invoices settled each month in Japan and France,[1] and the last mile will most likely be some form of wireless. While elsewhere the *"x"* in FTTx signifies the home or business premises, in Africa the most important *"x"* is fibre to the base station.

Many, perhaps most, countries in Africa would claim that ICTs are an important platform for their long-term economic development. Yet this is seldom convincingly reflected in national information society or ICT plans and strategies, which are often poorly customized to national needs, sometimes to the point of being repetitive. They are frequently ignored, rather than being carefully implemented, tending to jump from information society to e-government without proper evaluation of what has and has not been achieved. Most have yet to be updated for broadband.

While there is little prospect of attracting ICT manufacturing due to skills shortages and competition from Asia, the integration of

ICTs into government, services, manufacturing and agriculture are seen as a means to eliminate long-standing failures and inefficiencies. The economic evidence to support such measures is limited, with the danger that techno-optimism from vested interests is being pressed on ministers, urging the adoption of e-government, e-health, e-agriculture and e-everything. Often the use of ICTs becomes a competitive necessity, something required to be in the game, rather than a competitive advantage, eliminating the payback.

Perhaps the most obvious application of broadband is to run Voice over Internet Protocol (VoIP), in order to avoid the charges for conventional telephone calls. This has come to be accepted in developed countries, where a very large number of subscriptions have been sold for fixed and, more recently, for mobile broadband. It is potentially much more damaging in countries where nearly all the revenues are from customers using pre-paid services and where there is very limited evidence, as yet, of the willingness of large numbers of customers to pay monthly subscriptions for broadband, television or value-added services. It seems to require new commercial models, perhaps based on pay-per-view, pay-per-use or pay-per-app, combined with revenues from advertising and product placement, and requiring significant changes in the spending patterns of consumers that might

take several years to emerge. Providers will have to continue their experiments, developing new offers and packages for different cultures and levels of spending power.

Those African governments lacking solid democratic foundations, have looked with concern at the events of the "Arab spring".[2,3] Several years ago Ethiopia suppressed the SMS service of its state-owned monopolist, because of concern that opponents of the government were using text messages to organise demonstrations, despite only 1 or 2 people in 100 having a mobile phone.[4] Today, the combination of very large numbers of citizens armed with digital cameras, with the potential to upload images to social network sites from where they might be acquired by satellite television stations for transmission to very large numbers of citizens and foreigners is not something welcomed by ageing autocrats. Colonel Ghaddafi delightfully dismissed the satellite channels as dogs, sending out his forces and mercenaries in the dark to limit opportunities for amateur photog-

1 Free.fr charges €29.99 per month for up to 28 Mbps. Softbank's Yahoo! BB in Japan costs ¥4,017 for 26 Mbps and ¥4,122 for 50 Mbps per month. Most households would additionally have mobile subscriptions for all family members over the age of 8 or 9.

2 Philip N. Howard & Muzammil M. Hussain (2011) "The role of digital media" Journal of Democracy 22 (3) 35-48.
3 Sahar Khamis & Katherine Vaughn (2011) "Cyberactivism in the Egyptian revolution: How civic engagement and citizen journalism tilted the balance" Arab Media & Society, Issue 13. http://www.arabmediasociety.com/?article=769
4 Ethio Telecom is presently managed by France Telecom, but remains 100% owned by the Ethiopian state.

raphy. It is doubtful now that following the Egyptian example of shutting off Internet access is likely to be effective, not least as people are watching for this. Hosni Mubarak has been convicted and fined USD33 million for the damage done to the Egyptian economy by his network closures.[5] It seems *glasnost* may have arrived in Africa, albeit two decades late.

The need for content

Providing access to broadband is only the very beginning of the story, there is a need for content that is relevant and in the myriad of local languages, as well as the four principal colonial languages: Arabic, English, French and Portuguese. People only take up the Internet when they believe they can afford it and perceive a range of interesting uses in languages with which they are comfortable. These are serious obstacles, given that so many people have never heard of the Internet, let alone used it. There are real challenges to be overcome in illiteracy and digital illiteracy, in addition to the lack of electricity and networks.

Relevant and engaging content will only be possible if there is a significant improvement in the skills and opportunities for training for those who are to create the audio, video, games and mobile apps. These are areas in which African countries have been weak, with few exceptions, notably the Nigerian movie industry. There is a pressing need for courses at all levels in technology, creative skills and business management, with training the trainers the obvious starting point.

Once trained, people need to be able to move into existing content providers or, more realistically, to create their own businesses. That means they must have access to software and servers, venture capital and finance, coupled with mentoring and continuing professional development. Some of those services may be found in the cloud, though that presupposes resilient broadband connections, unconstrained by download caps, latency and jitter.

It also raises concerns at the missed opportunities for local providers of infrastructure services. To date, much of the attention has been on technical incubators and often in South Africa.[6, 7] There are opportunities for technical and creative incubators across the continent to allow people to address the challenges of making engaging content.

Many of the established providers of content are traditional linear analogue broadcasters, with some little more than propaganda outlets. The extent to which such institutions can adapt to a world of digital content available from a myriad of sources is open to doubt, with the risk that they will not survive digitalisation. Yet, this may help to open the way for new content delivered through new channels.

Aside from a few satellite channels there is an absence of distribution systems for innovative content. Music and movies are generally copied and sold very cheaply as CDs and DVDs, with little if any money flowing back to finance new content and new businesses. The track record of the mobile network operators (which are an increasingly important, and, even, the primary channel to market) is not auspi-
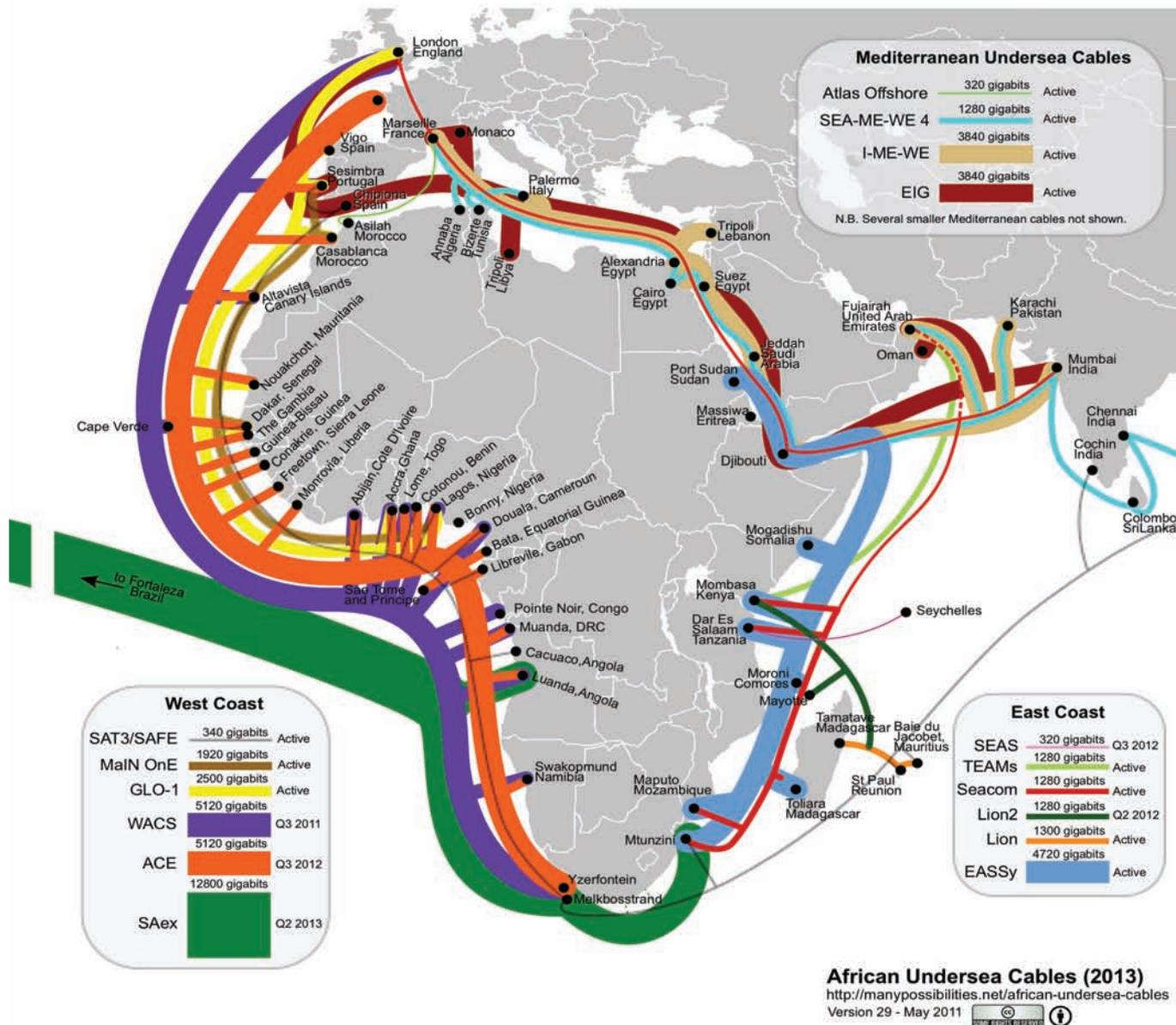
cious. Their oligopolistic dominance and their need for cash suggests that terms for carriage could be onerous. For all their talk of a mobile ecosystem, they see themselves at the top of the food chain - the new African "big five" are to be mobile operators.[8]

The lack of regulatory certainty for content is a significant inhibitor. Many countries do not have explicit rules about the limits of political debate, for example, how much criticism is permitted of the government. Nor are there clear rules on decency, for example, how much flesh is permitted to be exposed, nor the extent to which homosexuality can be portrayed. In the past, the small number of players knew implicitly the rules or could obtain clarification from officials. Now that there are many more providers, often across borders, it is essential to set out both the rules and the formal procedures for their infringement, including rapid legal challenges. Uncertainty or ignorance of the rules may be satisfactory for lone, amateur and anonymous bloggers. It is wholly unacceptable for those building businesses who need loans to buy assets and for whom the business case rests on the certainty of remaining within the law. One of the biggest challenges is the need to conduct a public debate to agree on such rules, often when there has never been such a policy debate.

The linguistic diversity of Africa is both an opportunity and a challenge, since most languages provide vast scope for new content. Not only will there be a domestic market, there is a potentially wealthier audience of economic migrants and asylum seekers scattered around the planet.

5 Molly Hennessy-Fiske & Amro Hassan "Mubarak, other former Egypt officials fined $91 million for blocking cellphones, Internet" Los Angeles Times, 29th May 2011. http://www.latimes.com/news/nationworld/world/la-fg-egypt-mubarak-fines-20110529,0,1157831.story

6 See, for example, the Google incubator project in South Africa at http://www.google.co.za/intl/en/umbono/index.html
7 Innovative Partners Inc. (2009) A model for sustainable and replicable ICT incubators in Sub-Saharan Africa. Washington DC: InfoDev.

8 Rahul C Basole (2009) "Visualization of inter-firm relations in a converging mobile ecosystem" Journal of Information Technology (2009) 24 (2) 144-59. http://dx.doi.org/10.1057/jit.2008.34

Broadband in Africa

Figure 1   Undersea cables serving Africa (Source: Steve Song[10])

Undersea cables

For years there were complaints in West Africa that there was only one cable, monopolised by state operators which charged very high rates for limited service, while in East Africa there were no cables at all, forcing the use of satellite connections. Suddenly, that position has been overthrown with a profusion of new cables already in operation and yet more to be laid (see Figure 1). The most recent proposal is the South Atlantic Express (SAex), funded by the Bank of China, to connect South Africa to Brazil, aiming to take traffic presently carried to and from the USA on more northerly routes.[9]

Indeed so great is the increase in capacity that it must be possible that one or more of the operators will go bankrupt, which happened some years ago with the collapse of Teleglobe and Tyco, both acquired at very low prices by Tata Commu-

9 Pamela Weaver "Bank of China to fund Africa-America submarine cable system" Telecoms.com, 15 April 2011.
http://www.telecoms.com/26631/bank-of-china-to-fund-africa-america-submarine-cable-system/

10 http://manypossibilities.net/african-under-sea-cables/

nications.[11] Where it concerns only private operators there should be no problems, but where governments are involved they may try to avoid bankruptcy by distorting tariffs or by forcing traffic onto their cables.

There have been complaints that despite the arrival of so much capacity it has not reduced the cost of Internet access and thus boosted adoption. While this requires more research on the ground, there are plausible explanations. In particular, there seems to be insufficient competition in national markets for Internet service providers to be required to pass on the cost reductions, this is despite competition with mobile operators. Equally, the importance of international connectivity may have been over-stated, so that even the significant price reductions do not translate into cheaper retail broadband. Some longer contracts for international capacity may not yet have expired and prices might still fall. Finally, a very real problem is that all providers are committed to expenditure on network upgrades and expansions, making it difficult for them to cut prices when they face heavy investment costs.

Some of the efficiencies found in more developed Internet markets arise from well-established Internet exchange points (IXPs) and the presence of Content Delivery Networks (CDNs), notably Akamai and Limelight, bringing dynamic content to within a few milliseconds of customers.[12] As markets expand then IXPs can be expected to grow and CDNs establish local presences, improving connectivity and access to content, while also reducing costs.

A recent study found that it was feasible to deploy a regional backbone network to connect existing National Research and Education Networks (NRENs) in Africa to each other and to their peers on other continents.[13] These networks are essential to boost research and innovation, establishing cooperative projects with partners on other continents. Infrastructure, including optical fibre, had already been deployed or would soon be available. While telecommunications policies and regulations were mostly permissive, though implementation was often painfully slow, the authorities had little awareness of the needs of dedicated higher education networks. Competition was limited so that prices were often still too high to be affordable. However, the primary bottleneck was that only one third of 53 African states had academic communities ready or reasonably ready to make use of NRENs. Consequently, much of the work to be done is in the universities, in installing hardware and especially training people in the use of NRENs. The EC is supporting this work through the Africa Connect project,[14] with Ubuntu Net.[15]

Terrestrial fibre networks are filling in the map, crossing the continent to link the landing stations, for example, as part of the process of building electricity grids.[16] Though it will take many years to achieve the density and coverage of network that is necessary. The role of the satellite operators in providing backhaul is changing, able to address more remote locations as fibre reaches major cities.

Local access networks

Telecommunications in Africa, with a few exceptions, is provided by markets with infrastructure-based competition, with mobile operators competing against each other with their own networks. The predominant technology is GSM, with some migration to UMTS for 3G in South Africa and in some tourist destinations, with plans and commitments for LTE for 4G. By comparison little use has been made of service-based competition, with very few customers being served by Mobile Virtual Network Operators (MVNOs), while the only substantial user of unbundled local loops is Inwi in Morocco. In South Africa, unbundling has been repeatedly delayed, despite legal provisions being in place for some years.[17] The general view has been that there are too few loops, often not in the right locations, that their quality is uncertain and, given the limited regulatory capacity to oversee the complex processes, that leasing loops is an unattractive route to the market.

For some years WiMAX was pushed as an alternative to copper local loops, though for a variety of reasons this has not been a success. The equipment for customers was, quite predictably, late and has proved expensive. There has been competition from 3G in the lucrative business user market, perhaps with mobile operators seeking to exclude potential competitors.

One of the most important forms of Internet access is through a range of Internet cafés, teleshops, sometimes delivered as converted forty-foot containers or buses, providing computers with access to the Internet for limited periods either free of charge or at low cost. The challenge in many cases has been to develop sufficient revenues to make these ventures sustainable, given

11 "VSNL acquires Teleglobe for $239m" Economic Times, 26 July 2005.
http://economictimes.indiatimes.com/vsnl-acquires-teleglobe-for-239m/articleshow/1182430.cms
12 See the quarterly "State of the Internet" from Akamai at http://www.akamai.com/stateoftheInternet/

13 Bjorn Pehrson (2010) Feasibility Study on the AfricaConnect Initiative. Brussels: European Commission.
http://www.feast-project.org/documents/FEAST-Final-Report-2010-03-22.pdf
14 http://www.africaconnect.eu/
15 http://www.ubuntunet.net/
16 IDRC (2009) Overview of the fibre opportunities available in the UbuntuNet region. Ottawa: International Development Research Centre. http://web.idrc.ca/uploads/user-S/12754213711Overview_Opportunities.pdf

17 See section 43(8) of the Electronic Communications Act, No. 36 of 2005.

Broadband in Africa

the costs of equipment, access, physical and Internet security, plus training. There is no shortage of demand for Internet cafés.

In addition to a few incumbent operators, such as Algérie Télécom, FTTP services are being offered by new entrants, including:

» AccessKenya (Kenya);
» i3 Africa (South Africa);
» Dark Fibre Africa (South Africa);
» Jamii Telecom (Kenya);
» Metrofibre Networx (South Africa);
» Wananchi (East Africa); and
» Zuku (Kenya).

This is primarily for businesses, but has also been taken up by some "gated communities" willing to pay for optical fibre, since it increases the value to existing and potential tenants and purchasers. More generally, the costs are considered far too high to be viable for homes.

The enormous growth in telecommunications has, until very recently, been on mobile voice telephony, requiring only limited backhaul. To move to mobile broadband requires massive and expensive upgrading not only of base stations, but especially of the backhaul networks.[18] The intercontinental elements are

now in place with the new undersea cables, while core national and regional fibre networks are increasingly being constructed providing the core connections. However, some countries prevent mobile operators from selling backbone services to other operators, which is holding back the upgrading of networks and misrepresents the problems of ensuring competition.

For much of the continent there is still limited fixed infrastructure, consequently, the most likely technology for broadband, at least in the short term, is satellite. This can be to the base station, connecting to the core national network, or direct to the customer. The recent launch of services in the Ka-band opens the way to reaching many people in rural areas, if it can be afforded.[19]

Conclusion

Many of the pieces are falling into place for broadband in Africa. Infrastructure-based competition in access networks seems strong enough to ensure that operators will have the incentives to meet demand in creative ways and at reasonable prices. Their transnational operations provide both economies of scale and means to learn for experimentation in a number of markets. The capital for investment is available.

Policies and regulation need to be aligned with the new objectives of mass, if not yet universal, access to broadband. Operators need to be encouraged both to deploy the necessary networks and to experiment with services and tariffs. Consequently, regulation needs to make more use of the analyses common in competition law and in impact assessment, moving beyond simple exercises in market opening.

To maintain a virtuous circle, as broadband becomes available it needs to be attractive to customers and that means exciting and engaging content. Here there are enormous opportunities, provided the legal frameworks, training and support mechanisms can be put in place.

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18 Mark D. J. Williams (2010) Broadband for Africa: developing backbone communications networks. Washington DC: World Bank.

19 See, in particular, O3B networks at http://www.o3bnetworks.com/