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Beyond Access: Addressing Digital Inequality in Africa

Alison Gillwald



**BEYOND ACCESS:
ADDRESSING DIGITAL INEQUALITY IN AFRICA**

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ABOUT THE GLOBAL COMMISSION ON INTERNET GOVERNANCE

The Global Commission on Internet Governance was established in January 2014 to articulate and advance a strategic vision for the future of Internet governance. The two-year project conducts and supports independent research on Internet-related dimensions of global public policy, culminating in an official commission report that will articulate concrete policy recommendations for the future of Internet governance. These recommendations will address concerns about the stability, interoperability, security and resilience of the Internet ecosystem.

Launched by two independent global think tanks, the Centre for International Governance Innovation (CIGI) and Chatham House, the Global Commission on Internet Governance will help educate the wider public on the most effective ways to promote Internet access, while simultaneously championing the principles of freedom of expression and the free flow of ideas over the Internet.

The Global Commission on Internet Governance will focus on four key themes:

- enhancing governance legitimacy — including regulatory approaches and standards;
- stimulating economic innovation and growth — including critical Internet resources, infrastructure and competition policy;
- ensuring human rights online — including establishing the principle of technological neutrality for human rights, privacy and free expression; and
- avoiding systemic risk — including establishing norms regarding state conduct, cybercrime cooperation and non-proliferation, confidence-building measures and disarmament issues.

The goal of the Global Commission on Internet Governance is two-fold. First, it will encourage globally inclusive public discussions on the future of Internet governance. Second, through its comprehensive policy-oriented report, and the subsequent promotion of this final report, the Global Commission on Internet Governance will communicate its findings with senior stakeholders at key Internet governance events.

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ABOUT THE AUTHOR

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ACRONYMS

ARPU	average revenue per user
BoFiNet	Botswana Fibre Networks
CRASA	Communications Regulators' Association of Southern Africa
DRC	Democratic Republic of the Congo
ICTs	Information and communication technologies
IP	Internet Protocol
ISP	Internet service provider
ITU	International Telecommunication Union
LTE	Long-Term Evolution
MTC	Mobile Telecommunications Ltd.
OECD	Organisation for Economic Co-operation and Development
OTT	over-the-top
RAMP	Research ICT Africa Mobile Pricing
RIA	Research ICT Africa
SADC	Southern African Development Community
SMS	Short Message Service

EXECUTIVE SUMMARY

Although most Africans remain disconnected from the Internet, and access to broadband services continues to be a central policy issue, the increased availability of broadband services alone will not reduce digital inequality on the continent. While the provision of access to the Internet remains a key public policy issue — as a necessary condition of digital participation in the economy and society — it is insufficient. Even where networks and services are available, large numbers of people are unable to access these services affordably or use them optimally to enhance their social and economic well-being, unlike in more mature economies, where levels of human development and equality are higher. Even where enabling environments have been created for the extension of services, or where regulatory interventions have driven prices down, the limited demand-side data available in Africa illustrates how the socially and economically marginalized — particularly those at the intersection of class, gender, race or ethnicity, with generally lower education, employment and income — are unable to harness the benefits of the Internet. For this reason, this paper argues broadband can no longer be seen as a supply-side infrastructural issue alone. Nor can public policy have a narrow sectoral focus any longer, with information and communication technologies (ICTs) cutting across public-private and formal-informal sectors alike. Demand stimulation measures — such as the reduction of prices to make services more affordable, the

development of relevant local content and applications, the enhancement of citizens' e-literacy and national skills development plans — are the focus areas of this paper. It examines alternative policy and regulatory interventions to so-called “international best practice” — assuming in the process certain political and economic conditions, by recognizing the institutional and resource constraints that generally exist in African countries — and proposes multiple strategies across the ICT ecosystem that could result in more inclusive digital development.

INTRODUCTION¹

Africa is undergoing rapid social and economic change as a result of the confluence of mobile and broadband technologies on the continent. Increased availability of mobile broadband, declining smart phone prices and the appeal of social networking have contributed to the rapid increase in Internet use. Although Internet penetration in most countries is still very low, more than 70 percent of Ugandan and 67 percent of Ethiopian Internet users first used the Internet on a mobile phone. In Tanzania, Namibia and Nigeria, half of the populations first used the Internet on a mobile phone (Stork, Calandro and Gillwald 2013). Mobile Internet access requires fewer skills than computer-based access, does not require electricity at home and is prepaid — all important conditions for use by low-income groups in Africa. While data is still expensive, sold in micro units, it provides access to “free” over-the-top (OTT) substitutes for costly voice and text services (Stork et al. 2016).

This much-vaunted, enabling mobile broadband environment that promises enhanced economic and social well-being and political participation within African nations is dependent upon prices becoming sufficiently affordable for a critical mass of people — those with the rights and skills to be online for the time they need to be — to harness the potential of the Internet.

In the meantime, digital inequality between those with access to broadband services and the means to utilize them and those marginalized from them increases. Although people place great value on the improved access that mobile phones offer, the high cost of that access across the continent — often resulting from policy-induced constraints on competition and ineffectual regulation of operators — places a greater burden on low-income households. The 2007-2008 RIA demand-side survey across 14 African countries found that the bottom three-quarters

¹ This paper draws extensively on some of the only publicly available supply- and demand-side data gathered by Research ICT Africa (RIA) over the past decade. This research has been made possible through the support of the Canadian International Development Research Centre and the UK Department for International Development. The author thanks the Rockefeller Foundation for a writing residency in 2016, where this paper gestated, and RIA researchers Enrico Calandro, Chenai Chair, Steve Esselaar, Safia Khan and Broc Rademan for their contributions to this paper.

of mobile phone users spent on average between 11 percent and 27 percent of their income on mobile communications, rather than the standard reference of two percent to three percent of income spent in developed economies (Gillwald, Moyo and Stork 2013; see also Box 1). A forthcoming World Bank sector performance review of Zambia undertaken by RIA demonstrates that while those working in the management and professional sectors spend two to three percent of their average income on 1 GB of data, trade and craft workers spend seven percent of their average income and agricultural, forestry and fishery workers spend on average 23 percent of their average income for 1 GB of data.²

While the advent of mobile broadband has driven Internet uptake in Africa, the representation of it as a panacea for underdevelopment masks the fact that six billion people do not have access to the Internet and their lives are largely untouched by this digital revolution (World Bank 2016, v).

More importantly, increased connectivity in itself does not correlate with reduced information inequality. For those connected people, the intensity of use within Africa is highly uneven, because it is between developed economies and developing economies.³ While this unevenness clearly has implications for the digital rights of individuals and the equality of citizenry and justice that democratic states have an obligation to uphold, from a policy perspective the failure to address these informational asymmetries has wider social and economic implications.

Though broadband impact studies vary on the exact contribution that increases in broadband penetration make to economic growth, there is enough evidence to support claims that they correlate with increases in GDP, job creation, the broadening of educational opportunities, enhanced public service delivery and rural development.⁴ For countries to enjoy the network externalities associated with investment in broadband infrastructure, however, a critical mass has to be reached. And the network externalities compound as there are more network connections. Pantelis Koutrompis (2009), for example, found that a broadband penetration of between 20 percent

2 See the RIA African Mobile Pricing (RAMP) data portal: www.datafirst.uct.ac.za/dataportal/index.php/catalog/535.

3 Mark Graham and Christopher Foster (2014, 5) have pointed out that there are more contributions to Wikipedia from Hong Kong than from all of Africa combined, despite the fact that Africa has 50 times more Internet users.

4 A high-level assessment undertaken by Raul Katz, Pantelis Koutrompis and Fernando Martin Callorda (2014) using a digitization index indicates that — if the necessary conditions were in place and the broadband targets of the South African broadband policy and plan “SA Connect” were met — a relatively conservative broadband investment figure of R65 billion could result in more than 400,000 jobs being created and more than R130 billion being contributed to GDP in South Africa over 10 years.

Box 1: Less Use, for More Money

Evidence is growing that people in the developing world are spending on average considerably more on communications than the five percent of income used as the benchmark by the Broadband Commission for Digital Development (2015).

This is confirmed in regional case studies conducted in Africa, Asia and Latin America reported in the book *Information Lives of the Poor* by Laurent Elder and colleagues (2014). They cite Roxana Barrantes and Hernán Galperin’s study (2008), which showed that in developing countries, mobile voice services were regarded more as a luxury good, with expenditures taking up as much as eight percent of household income, rather than the 2.5 percent spent on voice communications in developed countries. The evidence suggests the expenditure on broadband data communications is much higher.

For a public hearing on the cost of communications held by the Parliament of the Republic of South Africa (2016), a study was submitted by Carlos Rey-Morena on the community of Zenzeleni. Data collected on average expenditures and pricing data from the RAMP data portal indicated that in this remote village in the East Cape Province of South Africa, villagers (whose monthly income averaged R338, 55 percent of which was from government social grants) were spending 22 percent of their disposable income for a very limited basket of services. This service included only seven Short Message Service (SMS) messages and 77 minutes of calling time a month, which is considerably below the number of calls in the Organisation for Economic Co-operation and Development’s (OECD’s) low-usage basket (40 calls/month). The quantity of voice and data services and percentage of disposable income are also, respectively, far below and far above the Government of South Africa broadband policy targets, which are 90 minutes and 500 MB per month for five percent of disposable income. Further, “40% of the time the SIM cards do not have airtime[,] making it impossible to use those services. Factors, such as charging the phone’s battery and airtime costs added by resellers[,] account for about 23.24% of the total expenditure of household’s income. Regarding data, 22.2% of the poor people access Internet monthly, but are limited to 25–30 MB a month” (ibid.).

and 30 percent is required to have a 0.8 percent increase in GDP. It is at this point that the improvement in efficiencies in the flows of information and the reduction in transaction costs as a result of ICT diffusion result in systemic changes that can have transformative effects on economies.

Many developing countries have not yet reached this rate of connectivity, and further, it is becoming evident that unlike voice network services, data network services have effects linked not only to access but also to the intensity of use now reflected in global ICT indices.⁵ The nature and extent of use relates not only to the affordability of services (although the high cost of communication in Africa makes this a primary constraint) but also to the capabilities of people to exercise their rights to use the information for certain political, social or economic ends (Sen 1999) — two conditions not fulfilled in most African countries. Without significant progress toward universal access to affordable services, accompanied by significant improvements in human development, these technological developments do not redress digital inequality — in fact, they amplify it.

BROADBAND IN THE ICT ECOSYSTEM

To deal with these dynamic developments and the inequalities underlying them, broadband is understood less as a technical measurement of a network operating at a minimum transmission speed, as reflected in traditional ITU standards definitions, and more as an integrated system of networks, the services that they carry, the applications and services delivered on them and, centrally, the users.⁶ Each component of the ecosystem has been transformed by global technological, governance and market developments (Kim, Kelly and Raja 2010) with major implications for policy formulation at the national level. How nations respond to these changes determines their attractiveness to investors, the competitiveness of their markets and their digital inclusiveness. With such networks, services and content regarded as necessary conditions for the development of information societies and knowledge economies, the costs of not redressing digital inequality are high.

For the purposes of this paper, broadband is conceptualized within an even wider ICT ecosystem that “encompasses the policies, strategies, processes, information, technologies, applications and stakeholders that together make up a

technology environment for a country, government or an enterprise. Most importantly, an ICT ecosystem includes people — diverse individuals — who create, buy, sell, regulate, manage and use technology” (Kaplan 2005).⁷

This broader context not only allows for more specific points of policy and regulatory intervention across a wider governance framework, but, with the critical inclusion of users — as both consumers and producers — at the core of the ecosystem, it also compels a range of demand-side interventions, to ensure they have the capabilities to realize the potential of the Internet, in addition to the more classical supply-side approach to infrastructure developments.

The conceptual framework is used to examine the limited empirical evidence available in the public domain from Africa to identify the factors perpetuating digital inequality and to inform strategies for digital inclusion. Taking into account the political economy of the Internet in Africa, the next section assesses policy outcomes manifest in the institutional arrangements and market structure of many African countries by examining the supply-side factors — primarily access, costs and pricing — together with demand-side constraints, in order to explain the poor access to and use of broadband levels on the continent. From this analysis, the third section examines a range of policies and regulatory strategies to stimulate broadband extension under the conditions of resource restraint with which African countries find themselves operating.

POLICY OUTCOMES

INSTITUTIONAL ARRANGEMENTS

The failure of inadequately reformed markets and the dearth of institutional capacity to regulate them effectively are factors that can be shown to have undermined the first round of telecommunications reform initiatives across the Global South. These challenges of institutional reform for the telecommunications sector have been identified by a number of authors (Levy and Spiller 1997; Singh 1999, Melody 1997; Samarajiva 1999, Gillwald 2005). Also, the policy and regulatory challenges in this specialized sector are amplified through a wider crisis of limited statehood in many developing countries, specifically, the lack of institutional capacity to govern effectively (Acemoglu and Robinson 2012; Livingston and Walter-Drop 2014). This problem is compounded as ICT moves from being a

⁵ See the International Telecommunication Union’s (ITU’s) ICT Development Index (ITU 2015) and OECD (2004).

⁶ The World Bank moved to an understanding of broadband that included these elements in 1997, an expansion of the dominant international definition of broadband by the ITU, which is that “broadband combines connection capacity (bandwidth) and speed. Recommendation I.113 of the ITU Standardization Sector defines broadband as a ‘transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 Megabits per second (Mbps)’” (ITU 2003).

⁷ Some authors have begun to re-conceptualize ICTs, and broadband in particular, as a more organic network than the hierarchical, layered models used to describe communication systems in the past (Kaplan 2005; Fransman 2006; Smith, Elder and Emdon 2011). This more organic, ecological approach captures the adaptive nature of the Internet Protocol (IP) environment with its properties of self-organization, scalability and sustainability in which new communication systems operate, but this conceptualization goes even further, moving beyond the infrastructural and usage realm to the wide political economy from which it emerges.

sectoral policy issue to one cutting across all government sectors, from education and health to finance and trade, and public and private sectors, formal and informal, and to the ensuring of fundamental rights of individuals in a modern economy.

Reform models proposed by multilateral agencies and donor organizations assume a functional ICT ecosystem with an enabling policy environment for investment, competition and innovation. To create these conditions requires a capable state with a national regulatory agency empowered to implement national policy, independently of state and industry influence, in ways that will optimize consumer welfare and safeguard citizens' rights. For the policy and legal framework to meet the needs of the country, the executive needs to have sufficient competency in policy making and use processes to consult the public and harness expertise outside of government, particularly in this fast-changing global environment. The translation of policy into practice requires transparent and accountable regulatory decision making and the resources and competencies to fulfill its mandate in an increasingly complex global environment. Although these conditions do not exist in most developing countries — a situation unlikely to change in the short term (because of the conditions' structural nature) — they underpin many of the broadband models proposed by multilateral agencies.

Rather than presenting such an environment as a prerequisite or solution, when it is known it cannot be achieved, an ICT ecosystem approach can instead be used as a diagnostic tool that enables the identification of the weaknesses in the system, as well as their linkages to other elements of the system, how corrections in one part of the system might address others and the resources available to self-repair the system. In this way, the failure of current institutional arrangements between state and market, and their regulation independently of both state and market, can be linked to poor policy outcomes. Viewing the political economy of a country with this ICT ecosystem approach enables the identification of alternative strategies for the realistic delivery of policy goals, within the institutional endowments and resources of the country.

Such an approach is critical to realizing the strategic policy objectives for Africa. In most countries, the current institutional arrangements and market structuring that produced the negative policy outcomes of poor extension of broadband networks beyond the major centres and the high price of communication constitute a problematic foundation on which to overlay new enabling policies and regulatory strategies for broadband developments.

The poor outcomes (in relation to the extension of broadband networks beyond the major centres and the high price of communication services), together with a greater understanding of the strategic importance of national broadband development, have resurrected

debates on the role of the state in broadband infrastructure extension. In several African states the low levels of broadband penetration outside of the main metropolises are often attributed to market failure and as such provide the rationale for public investments, which few African governments can self-finance.⁸ As discussed in the next section, these poor policy outcomes are often not a result of markets not working but of competitive markets not having been established, through either limitations on market entry or ineffectual regulation.

Though a strong case has been made for the developmental gains associated with investments in infrastructure industries and broadband in particular, there is no reason, as Robert and Charles Kenny have pointed out (2011), why these ventures have to be either operated or invested in by the state. Considerable evidence indicates that monopolies, whether public or private, are far less effective in meeting national objectives of affordable access than are well-regulated competitive markets. Little evidence exists that state-owned operators are able to compete successfully in open markets, despite years of protection in some cases. However, the replication of certain network elements in small or under-resourced markets simply might not be economically feasible. For the same reasons, where broadband networks do not exist, provisioning might only be feasible through a regulated common carrier.

In most African countries, the scale of investment required to build out next-generation networks means that — even in developed countries, and particularly in developing economies — neither the state nor the private sector on its own can meet the broadband needs of countries in increasingly information-dependent economies. This reality calls for policy that understands the need for a new interplay between state and market, creating new access, service delivery, investments and business models. It will require even greater regulatory agility and insight to manage the tensions between the different policy objectives of competitiveness, innovation and consumer welfare, but much of the operational risk can be transferred to the private sector.

MARKET DEVELOPMENTS AND COSTS

Market shifts — such as the dramatic reduction (20 percent) in international bandwidth prices since the

⁸ This need underpins the decisions to establish state-owned broadband networks in Botswana (Botswana Fibre Networks [BoFiNet]; see www.bofinet.co.bw/) and Tanzania (National ICT Broadband Backbone; see www.nictbb.co.tz), both of which have resulted in lower wholesale prices but apparently not in lower prices passed on to end-users (Botswana Communications Regulatory Authority 2014) or in stimulating demand, because access and use remaining relatively low. In South Africa, this reality was the rationale for the introduction of a second state-owned, wholesale broadband carrier, Broadband Infraco, in 2007, and continues to be the rationale for the Department of Telecommunications and Postal Services wanting the 4G and digital dividend spectrum to be reserved for a state-owned public access network (see Roetter 2015).

introduction of competition to the SAT-3 (South Atlantic 3 submarine communications cable) monopoly in 2006 by the entry into the market of Seacom, EASSy (Eastern Africa Submarine Cable System) and WASC (West Africa Submarine Cable) — have fundamentally changed the cost structure and operating dynamics for operators in the African broadband market (Gillwald and Calandro 2013). Wholesale international bandwidth is now priced at a fraction of what it was then (although these benefits have not always been passed on fully to end-users to stimulate adoption). Constantly reducing prices for smarter devices and for service, marketing and pricing innovation fuelled the uptake of broadband services (*ibid.*).

As a result, all over Africa mobile broadband has overtaken the limited fixed broadband that existed and historically was the mode of broadband delivery, winning more subscribers and providing better prices and speed of service. As with voice services, where massive pent-up demand was met by the wireless revolution that transformed communications on the African continent, demand for Internet by those unable to access or afford the limited ADSL (asymmetric digital subscriber line) services available on the continent is also being met through mobile services (*ibid.*). With no monthly line rental charges and installation fees, and with convenient prepaid charging options, along with the lower set-up costs of mobile data compared to fixed — particularly appealing for those with low data use and uneven consumption — the dominance of mobile is unsurprising.

The biggest barrier to access — and the reason for the limited time online, the shift to cost-saving OTT services and the inability in most African countries to use broadband in the always-on way in which it was intended — is price (Stork, Calandro and Gillwald 2013). A key aspect of demand stimulation where penetration is low, or suboptimal, is price reduction. This aspect is intrinsically linked to the issues of market structure and the regulation of wholesale access discussed below. As indicated above, new bottlenecks appear to be emerging in traditional peering connectivity between Internet service providers (ISPs) and with the shift to cost-based IP transit. The high cost of domestic IP transit in many countries — several times greater than the international bandwidth price, once the major cause of high end-user prices — now makes up the lion's share of ISP input costs. Just as mobile termination rate regulation was needed to bring down retail prices dramatically in many of the leading jurisdictions in Africa, regulation of the wholesale market might be required to reduce the input costs for service providers and to reduce retail data prices. (See Figure 1.)

The vast difference in leased line prices demonstrates the extreme differences in the wholesale prices in the Southern African Development Community (SADC) region and is indicative of what is happening on the rest

of the continent.⁹ It is interesting to observe that BoFiNet is fulfilling its mandate of providing low-cost bandwidth, having been structurally separated to form an open-access common carrier. However, if one examines the retail prices in Botswana in Figure 2, it appears that these wholesale price benefits are not being passed on to retail consumers, with Botswana's rates among the more expensive for 1 GB of data.

Identifying the cost-drivers underlying high broadband prices is essential. While international bandwidth prices, once the major factor in African data prices, have plummeted, terrestrial and IP transit prices are now major cost factors. The impact of these factors on the cost of communications requires regulatory assessment. On the other hand, any policy and regulatory bottlenecks that constrain operators and potential players from responding dynamically to the changing nature of telecommunications require policy and regulatory attention. The challenges of implementing wholesale access are discussed below.

Retail prices discussed in the next section are an excellent barometer of the effectiveness of competition or regulation of downstream networks.

AFFORDABLE ACCESS

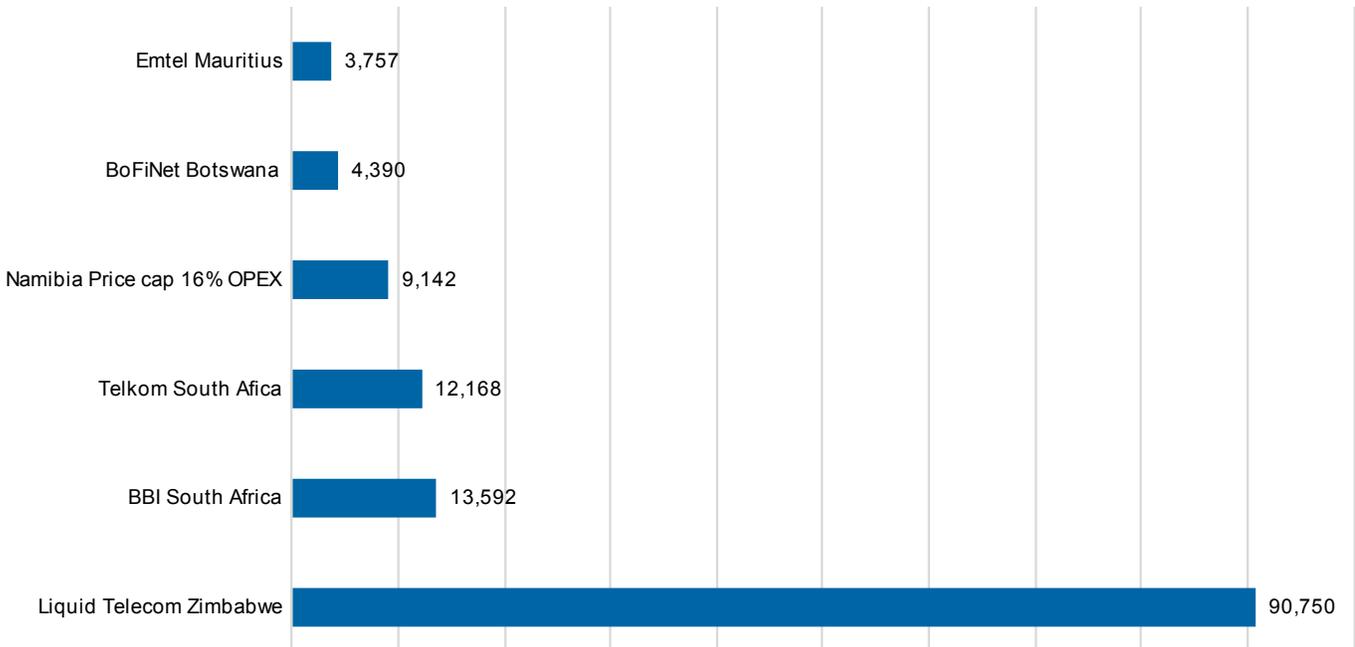
While broadband access is a necessary condition for social and economic inclusion, it is not a sufficient condition. As services and devices become more sophisticated and knowledge more pervasive, issues of affordability and the ability to use services and devices optimally are likely to marginalize more users.

Figure 2 plots the ITU's 2015 figures for Internet penetration and the number of licensees in a market against the dominant operators' prices per gigabyte as collected for the RAMP index.¹⁰ The data shows that, despite its low wholesale prices, Botswana is not among the cheapest countries when comparing retail prices. In fact, it only comes fourth to last, or 39th, out of 42 countries assessed. Although Botswana does not have particularly

9 Obtaining wholesale prices from operators is extremely difficult, even through regulators empowered to do so. According to a recent study prepared for the Communications Regulators' Association of Southern Africa (CRASA) and ITU (Coleago Consulting 2016) on open access, operators from all SADC countries see wholesale prices as opaque and either only available on request or individually negotiated. Of the dozens of operators in 14 countries in SADC requested by their national regulatory agencies to provide wholesale leased line prices across SADC using the modified (2010) OECD basket methodology, only six operators did. The baskets are based on the same distance distributions as the OECD baskets but do not include the cost of local leads or end-user devices. The cost of a leased line is calculated as a wholesale input from one point of presence to another. As an alternative to the OECD baskets calculation, the wholesale price for a single domestic leased line with a length of 1,500 km was also calculated (*ibid.*).

10 See the RAMP portal: www.datafirst.uct.ac.za/dataportal/index.php/catalog/535.

Figure 1: STM-1 Leased Line Comparison Based on Modified OECD Basket in US\$ in 2015



Source: Author, using historic data from operators' websites.

Note: STM-1 = Synchronous Transport Module level-1; OPEX = operating expenses.

high penetration rates either, the rate is approaching the 30 percent critical mass level that should allow the middle-income economy to capitalize on network effects as connectivity and intensity of use increase.

Tanzania, on the other hand, has also built a state-owned backbone network, which appears to have driven down its prices to make them more affordable for consumers in this least-developed economy. Although the wholesale prices are not available for this analysis, clearly the low GDP per capita has compelled operators to pass on any benefits enjoyed from the open-access wholesale provider. Tanzania operators Airtel, Millicom (Tigo) and Vodacom also recently launched an infrastructure-sharing initiative to expand mobile broadband network coverage to underserved people in rural areas (TeleGeography 2016).

What is concerning about the Tanzanian case is that Internet penetration remains low at little over five percent, which raises the question of whether or not there are sufficient surpluses in the network to reinvest in the extension of their broadband networks, or whether even at these low prices they are not affordable.

The countries with the highest penetration include Morocco, Mauritius, South Africa and Seychelles, all of which have more than 50 percent Internet penetration. Of these, Morocco has the lowest prices by a dominant operator, at US\$5.20 for 1 GB, while Mauritius and South Africa are more mid range at US\$8.80 and US\$9.94, respectively, for 1 GB. Seychelles' price is considerably more, at around US\$20 for 1 GB (US\$18.37, to be specific).

These figures suggest that the pricing in Mauritius and South Africa might be optimal for continued investment in network extension, although the prices are not affordable for a large number of people.¹¹

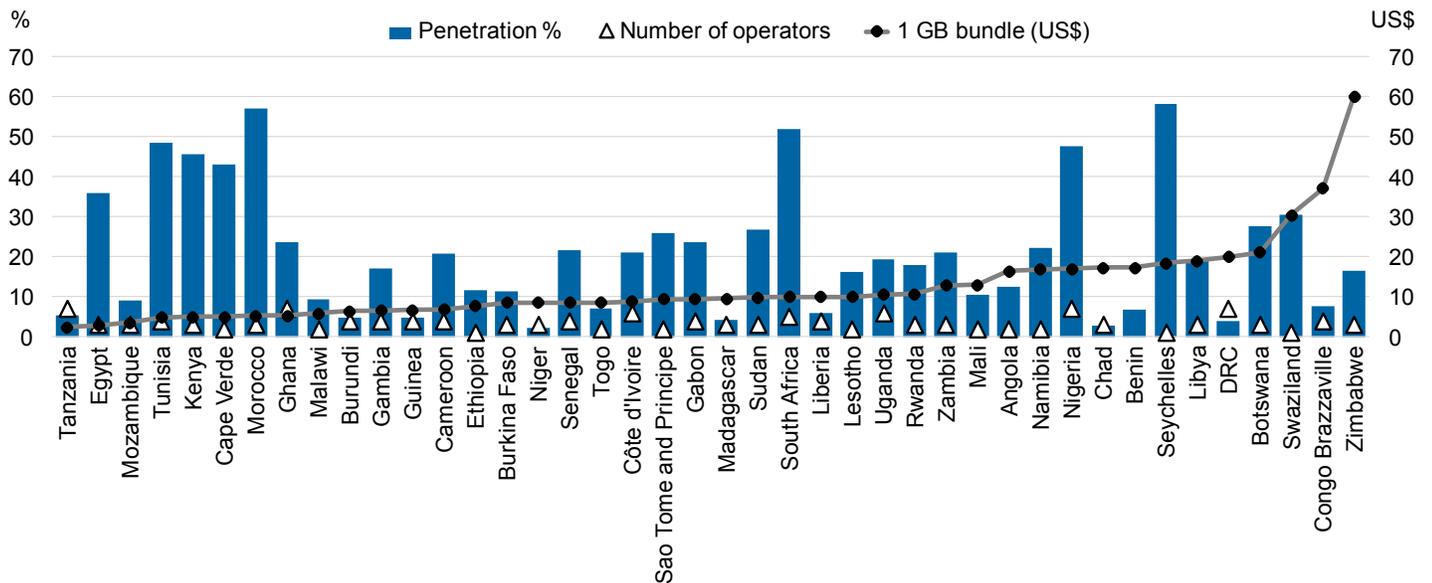
The number of competitors in the market also does not correlate with lowest prices or highest penetration. For example, the Democratic Republic of the Congo (DRC), with seven players in the market, has neither low prices nor good penetration rates. Although prices are relatively high in Nigeria — also with seven players — penetration rates are good. In Tanzania and Ghana, each again with seven players in the market, prices are good but penetration is very low in the former and only average in the latter. GDP per capita seems to correlate better with penetration, though not with prices: Tunisia, South Africa, Mauritius and Seychelles all having high penetration levels and above-average prices.

PRICING IN THE OTT ENVIRONMENT

With mobile markets more competitive, and mobile network operators more opportunistic and innovative than fixed network operators, some — usually late — entrants, have embraced OTT services as data drivers. Entering into innovative complementary relationships with global platform providers, small mobile operators are attracting customers and reducing churn by not charging users to access popular or selected websites. Tariffs and marketing

¹¹ 2012 South African Household and Individual ICT Access and Use Survey, RIA, unpublished data. Information available from author by email.

Figure 2: 1 GB Bundle Price of Dominant Operator Compared to Penetration Rates and Number of Operators in a Market



Source: Developed by RIA from RIA RAMP database and ITU (2015).

innovations such as zero-rating have been challenged by net neutrality advocates despite positive consumer welfare outcomes of such arrangements and their limited practice.

Operators' response to OTT services is to bundle voice, SMS and data into packages that provide OTT-like services. The number of SMS messages included in the bundles is high enough to be unlimited for most users and thus resembles free OTT texting. Mobile Telecommunications Ltd. (MTC) Namibia has been offering these types of bundles for several years in an effort to defend market share and keep new competition out. MTC Namibia's aim for constant average revenue per user (ARPU) and competitive pressure leads not to lower ARPUs but to more bundled value. This strategy is simulating flat-rate pricing for unlimited voice and SMS (Stork et al. 2016).

Operators in 24 African countries offered bundled voice, text and data in 2015.¹² In some cases the operator set the price of the top-up so that it received the desired ARPU to cover its rate of return; in exchange, it provided close to unlimited voice call and text messages. In Namibia and South Africa, dominant and smaller operators adopted bundling as part of their pricing strategies — MTN and Cell C in South Africa, and MTC and Telecom Namibia Mobile in Namibia. In Kenya, it is only smaller operators Airtel and Orange that have adopted bundling as part of their pricing strategies. Safaricom in Kenya has a very strong market position, as well as the M-PESA mobile

money service, to ward off competition. For dominant or effective monopoly operators facing limited competition in their domestic markets, bundled packages provide a stable income stream and are a defensive strategy against OTT players (Stork et al. 2016). (See Figure 3.)

QUALITY OF SERVICE

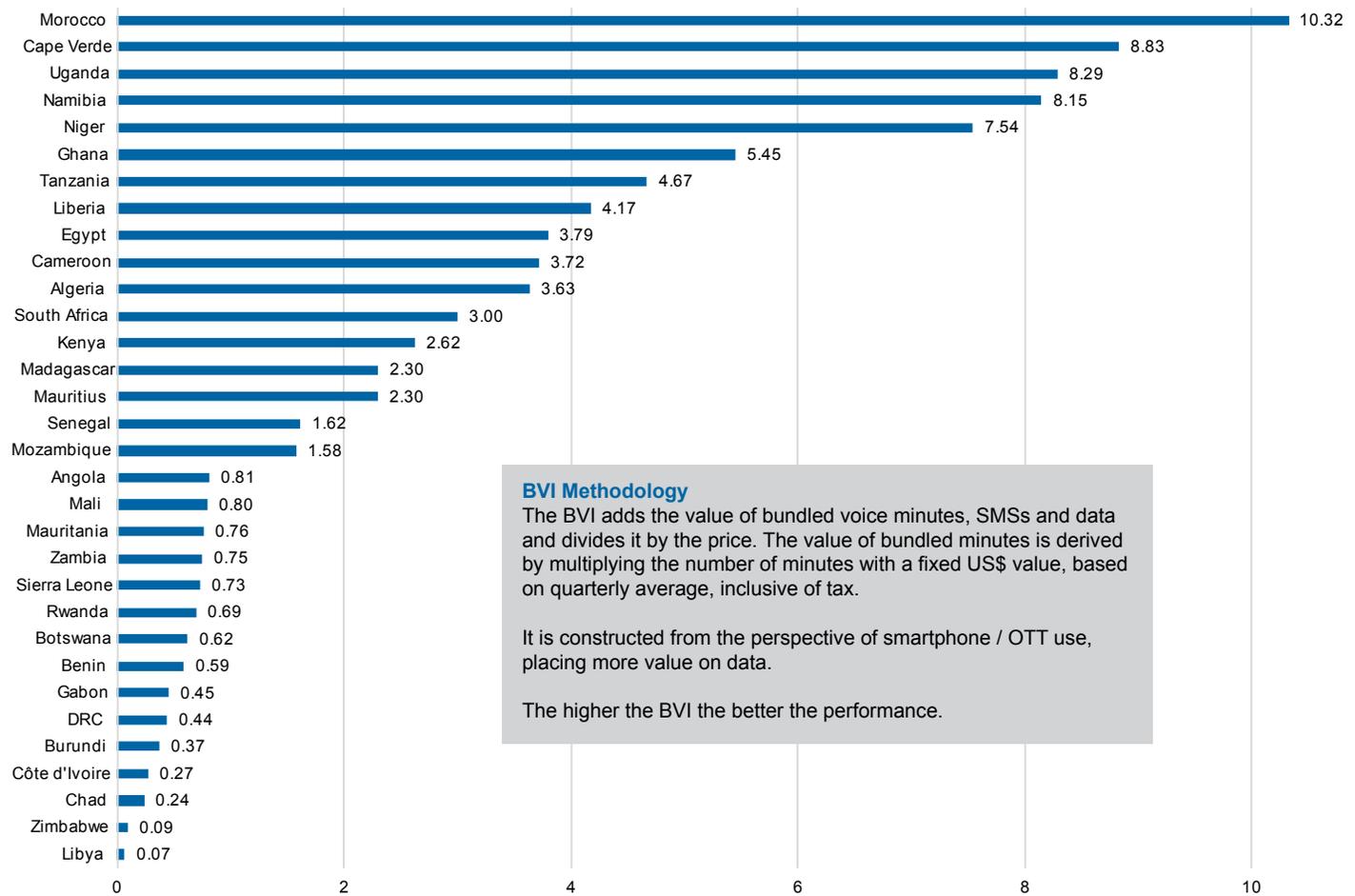
Broadband performance in Africa remains poor. The ability of mobile broadband to respond to growing demand in the access network has provided access to broadband that simply would not have been otherwise available to people for decades. However, failure by regulators to release high-demand spectrum for Long-Term Evolution (LTE) services has left operators little choice but to "refarm" spectrum and use suboptimal spectrum to offer 4G services.

While measurements by speed test aggregator Ookla indicated that South African operators performed relatively well compared to most other African operators in terms of, for example, the RIA Broadband Value for Money Index,¹³ which measures price in relation to quality, South African operators' performance is in the middle range as a result of their high prices. The rapidly increasing number of broadband users and their increasing consumption of data as a result of data-focused business growth strategies are taking their toll on the average overall broadband speed in the country.

¹² See the RAMP portal: www.datafirst.uct.ac.za/dataportal/index.php/catalog/535.

¹³ Ibid.

Figure 3: Bundled Value for Money Index 2016, Quarter Two



Source: RIA RAMP BVI Index.
 Note: BVI = Bundle Value Index.

A study conducted by Marshini Chetty and colleagues (2013) in South Africa on measuring broadband performance revealed that consumers are not getting the speeds that ISPs are promising them. Unlike in more developed economies where ISPs closely match the speeds they promise to deliver to consumers, in South Africa consumer speeds are below those advertised.

DEMAND CONSTRAINTS

Even where there has been significant broadband network extension and affordable Internet access is available, people’s ability to use the Internet or to use it optimally is uneven. This unevenness poses a new inequality challenge for policy makers, since the level of human development in a nation is a key determinant of its informational development (Castells and Himanen 2013).

Empirical evidence from household, individual and informal sector surveys indicates a positive correlation between levels of access to and, more significantly,

use of the Internet and years of education and income (Deen-Swarray, Moyo and Stork 2013). These were, for example, found to be the main determinants of gender disparities in ICT access and use, rather than gender per se (Deen-Swarray et al. 2012). The fact that women might have less access to the Internet, or use it less, is because they are concentrated at the “bottom of the pyramid.” Policy intervention aimed at enhancing public access for the poor — men and women alike — is likely to do more to improve the lot of poor women than policies targeted at women alone. To redress gender-based digital inequality requires wider national policy interventions in the area of human development: getting girls to school and encouraging them to stay there long enough to acquire the skills to find employment or generate income. The level of human development of a nation has therefore become a key determinant of informational development and requires cross-cutting sectoral interventions far beyond the ICT sector alone.

APPROACHES TO NETWORK EXTENSION

From this perspective, the challenges of diminishing digital inequality are far greater than filling gaps in infrastructure coverage. Nevertheless, infrastructural extension is a necessary, if not sufficient, condition to realize digital rights. The high levels of investment required to build broadband networks, together with the complex legal, institutional and human resource requirements to give them effect, have challenged the realization of such rights in most developing countries.

The legacy challenges for broadband strategies are the interrelated problems of inflated prices, the resulting reduced consumption of services, and insufficient investment and innovation. “The first two of these [inflated prices and reduced consumption] can best be understood in terms of static economic effects (i.e., at a given point in time)...[T]he dynamic economic effects associated with the third of these (innovation and investment) is the most difficult to solve...” as it is highly dependent on the specific context and time. (CRASA 2015, 4).

Debates continue, on whether ubiquitous broadband is best achieved by facilities-based competition, or by avoiding infrastructure duplication through the consolidation or building of national open-access broadband networks on which service-based competition can be enabled. The first round of broadband extension strategies, popularized by epistemic communities operating through multilateral agency technical assistance and donor programs such as Open Access, sought to stimulate intramodal competition in the largely monopolistic providers of fixed broadband and, in the absence of intermodal competition in Africa, between television cable companies and telecommunications companies that had driven broadband penetration and innovation in North America.

There is little empirical support for the link between local loop unbundling, bitstream access and new infrastructure, according to supporters of interplatform competition. They contend that there may in fact be adverse investment incentives (Coleago Consulting 2016). Although the evidence in favour of one or the other intervention is particular to the market it is introduced (Bauer and Bohlin 2008), “there is some empirical evidence to suggest that, while intra-modal network competition drove the first wave of broadband that was based on the upgrading of existing copper and cable systems, in the second phase of broadband, where new fibre networks had to be built, the benefits of intra-modal competition fell away or were masked by the impact of inter-platform competition” (CRASA 2016).

To balance the primary objectives of affordable access to high-speed bandwidth with other objectives of enhanced

competition, investment and innovation requires sophisticated policy planning and regulatory execution seldom found in developing country institutions. These trade-offs need to be assessed not only by means of static efficiency measures such as price caps and instrumental competition models (market concentration and integration) but also through dynamic efficiency indicators (complementarity, infrastructure and revenue sharing).

Developed economies with far stronger institutional endowments than available in most developing countries have struggled to create the correct incentives and penalties to balance these policy tensions. The evidence suggests that until regulatory effects are clearer, regulators should forebear. Some experts — Yochai Benkler and colleagues (2010), for example — argue for a greater focus on the sharing of passive infrastructure and channelling of complementary investments. Similarly, Wolfgang Briglauer and Klaus Gugler (2013) and Briglauer, Gugler and Adhurim Haxhimusa (2015) argue for a move away from an asymmetric regulatory paradigm to a more symmetric one that focuses on an industry-coordinating role and enables cooperation models in the actual building and sharing of infrastructure.

A distillation of what needs to be contained in policy to create the conditions for investment and innovation includes:

- a realizable broadband plan with strategies and targets for implementation, monitoring and evaluation;
- open-access regime from data to networks to enable free flows of information for content and applications development and the creation of opportunities for access and to promote competition;
- infrastructure sharing to avoid duplication; public-private interplays to harness all resources for public delivery; state incentives for delivery to underserved areas, or state-funded subsidies on open-access investments; and
- assigning high-demand spectrum for mobile application and exploiting existing spectrum assignment through white space deployment.

On the demand side, measures include strategies to make broadband more affordable through some of these supply-side adjustments, but also strategies to improve e-literacy and e-skills and local content and applications development.

INFRASTRUCTURE SHARING

In some countries, reform policies and licences prevented sharing of infrastructure other than for new entrants by way of roaming for limited periods in order to drive network extension. As regulation moves beyond access

alone and operators start to distinguish themselves more by the services they offer, and as the avoidance of duplicating costly broadband services in developing countries becomes a key imperative, legal and licensing constraints on sharing need to be lifted.

While sharing around costly trenching might be worth mandating to avoid duplication of high-cost services, as well as for environmental reasons, operators are already increasingly moving toward not only passive¹⁴ but also active sharing of infrastructures.

Cost savings are driving such sharing to the benefit of the operators. Sharing of “active infrastructure” such as base stations, antennas, routers and switches is already a phenomenon on the African continent, with operators saving around 40 percent in capital expenditure from base station sharing alone (Body of European Regulators for Electronic Communications [BEREC] 2011).

Strategic drivers and commercial needs are driving core network elements management and control systems business support and are enabling cost reduction and optimization in both capital and operational expenditure.

Infrastructure sharing is particularly driven by universal service obligations to extend services to rural areas that are uneconomic to service independently. However, sharing also facilitates market entry by enabling time-to-market and innovation agility, particularly for resellers and mobile virtual network operators, and also enables new revenue sources for incumbents facing challenges to traditional business models.

OPEN ACCESS AND ENHANCED COMPETITION

The potential of open systems to support economic growth, development and innovation has been increasingly promoted by academic and multilateral agencies alike (Kaplan 2005; Benkler 2006; Smith, Elder and Emdon 2011). “Openness” in public policy has, however, become a catch-all term for various and, often, contradictory, policy objectives and regulatory practices. Perceived as inherently good, the term has been included in a range of policies with unintended outcomes — including inhibiting network investment, squeezing out private investment and creating dominant or monopoly market players (Gillwald, Rademan and Esselaar 2016).

In many African countries, fixed markets are stagnant and appear to offer fewer or the most costly opportunities for lowering barriers to entry, making the more successful mobile networks the focus of open-access strategies.

While a competitive environment requires a regime that guarantees access to public networks at a cost-based price, there is seldom a rationale for mandatory open access of mobile markets that are either competitive or could be made so through open entry into the market.

Kenya and Mexico were among the early adopters of the mandatory open-access model, but have lost some traction as the practical challenges of ensuring its success have unspooled. In both cases, the decision to establish such a network was based on the extreme dominance of the incumbent mobile operator, which had resulted in high prices and a lack of wholesale engagement with smaller players or virtual mobile operators that could at least provide some competition. Though Kenya shares some similarities with those cases, regulatory intervention in Kenya had ensured that the dominant operator there, Safaricom, had nothing like the stranglehold of the dominant operator in Mexico, America Movil. However, these cases make clear that unless dominant operators are centrally involved in these interventions, they fail, as the withdrawal of Safaricom and the collapse of the proposed open-access wireless network show.

The commercial model used by dark fibre companies underpins the open-access models adopted by many of the new undersea cable companies, which broke the monopoly provision of broadband by state incumbents that operated the original undersea cables through club consortia that excluded non-club members, such as SAT-3 along the African West coast from Europe to the East. National transmission prices too have come down as a result of commercial open-access companies in South Africa where the fibre market is competitive. Mobile operators have also provided alternatives to the incumbent operator, Telkom, on main intercity routes, and driven network extension into some secondary cities and regions that are poorly served by the incumbent (*ibid.*). While the metropolitan areas are covered with competing fibre networks, and there is some duplication along the main intercity routes, beyond that there are complementary investments in greenfield builds and the use of competitor networks for redundancy purposes.

PUBLIC-PRIVATE INTERPLAYS

In many African states the public sector is the single largest collective user of ICTs. Commitments to connecting public institutions can leverage private sector investments to meet these public objectives. In South Africa, where there simply is not sufficient state financing available to either fill in the gaps in the backbone and access networks, or build a separate self-standing government network, South Africa’s broadband policy acknowledges the extensiveness of private and public networks. The policy proposed that rather than finance a major capital expenditure, the public sector should pool demand for broadband in order to facilitate the competitive procurement of high-quality

¹⁴ “Passive infrastructure” that can be shared includes towers and masts, trenches, ducts, fibre cables, sewers, water pipes and railway servitudes — and, importantly in Africa, power supply.

broadband for public sector institutions that are not connected. The government would invest in broadband infrastructure through the aggregation of public sector demand and smart procurement of high-capacity network facilities through competitive tender (Republic of South Africa 2013). Through this aggregated government demand, sustainable business cases would be enabled for network operators.

This model leverages much smaller state-operating expenditure, as opposed to large amounts of capital, while creating incentives for private sector investment. Already practised by commercially operated fibre companies in South Africa, the open-access logic of this commercial model is that the operator needs to get as much traffic as possible on its network in order to maximize the return on its investment and reduce its debt in order to raise new financing (Gillwald, Rademan and Esselaar 2016).

A shift from capital expenditure to operating expenditure will optimize the limited budget available from the treasury for broadband. The aggregating of public sector demand can be used to smart-procure competitive tendered services for the public sector, enhancing the viability of public and private operators. In underserved areas, where there is not yet backbone, public sector demand (school clinics, municipalities and public Wi-Fi) can be offered as anchor tenancy to provide an incentive to invest into sub-economic areas. By guaranteeing the demand, private sector players are able to secure the commercial funding needed to roll out infrastructure. Open-access principles, in this context, make business sense because providing wholesale access increases revenues of operators, allowing them to realize their return on investments more quickly and recapitalize their business for further network development (ibid.).

WHOLESALE REGULATION

Developing policies and strategies to overcome these barriers to deliver affordable access to reliable high-speed networks also requires identifying the cost drivers in developing market environment. While data prices are not effectively regulated and not cost-based, there are genuinely higher costs associated with network extension in developing countries, where investment in road and power infrastructure is necessary even before the importation of equipment, under conditions of currency volatility and poor exchange rates. Land masses are generally large, with low population density. Market challenges and infrastructure challenges are further compounded by the asymmetries of information and skills that exist between regulator and operators. National and regional efforts to introduce cost-based access regimes to enable competition or even to understand the need for regulatory forbearance on greenfield investments are notoriously difficult to undertake. Very often, governance systems that are not transparent are matched by the opacity of operators' businesses and costs, and information

essential for public policy or planning or regulation is withheld on competitive confidentiality grounds.

However, there are policy tensions between, on the one hand, creating an environment conducive for investors to build out the largely greenfield backhaul and access networks required in most African countries, and, on the other hand, ensuring that the prices charged for services are cost-based along with effective regulation.

PUBLIC WI-FI AS PART OF AN INTEGRATED UNIVERSAL ACCESS STRATEGY

Universal access remains the primary policy challenge for African countries. Universal service strategies initially focused on the development of fixed networks through dedicated universal service levies, which proved to be largely unsuccessful. Efforts to aggregate demand through the creation of telecentres and other supply-side-driven initiatives either had short-lived success or failed. Some centres that were community-initiated and generally driven on some form of entrepreneurial or commercially sustainable model worked. But with the advent of mobile broadband and smart devices, the price and skills barriers that computer-based Internet access created were increasingly removed, undermining the logic of aggregating access around fixed devices (Stork, Calandro and Gillwald 2013).

Wi-Fi is an inherently disruptive technology that allows a new generation of telecommunications operators to compete with established incumbents in both the fixed and wireless markets. Although many analysts point to the exponential growth of mobile data consumption, Wi-Fi traffic exceeds mobile traffic in countries where comparative studies have been undertaken, including in South Africa (Geerds et al. 2016).

Studies conducted in South Africa on the effects of connection type on mobile data usage show that users might be wary of cellular data usage, preferring Wi-Fi connections for the top five most-used applications. This finding might imply that South African users are cognizant of cellular data usage and take more active measures against using mobile data when not in a Wi-Fi area (Chen, Feamster and Calandro 2016). It seems that users adopt various strategies to optimize mobile data usage, including changing settings to disable automatic software updates and postponing use until connected to Wi-Fi (Mathur, Schlotfeldt and Chetty 2015). These observations all indicate a conscious effort among South African users to conserve data usage when on a cellular connection (Chen, Feamster and Calandro 2016).

Public access to Wi-Fi is emerging as a strategy in Africa to enhance the connectivity for the poor, among others, and enables greater intensity in their usage. This strategy has

been applied with mixed results in many developed and some emerging economies over the past decade.

Exploiting the pervasiveness of the mobile broadband technologies and devices paid for by consumers arguably enables the state to subsidize just the usage portion and collaborate with the users on covering the cost of open-access public Wi-Fi. Certainly, qualitative research confirms the demand and success of such networks, which are becoming innovative consumer strategies to affordably access bandwidth-intensive applications and upgrades (Geerdts et al. 2016).

STRUCTURAL SEPARATION

In the fixed-line market, restructuring has happened in some of the most developed markets. In 2012, a report by the OECD, which reviewed the experience of structural separation 10 years after the adoption of a council recommendation concerning structural separation in regulated industries, showed that structural separation remains a relevant remedy to advance the process of market liberalization and that the areas of application can include vertically integrated industries where only some activities are subject to competitive constraints (OECD 2012). Importantly, while highlighting the benefits of structural separation, the resulting revised recommendation also acknowledges that structural separation might not always bring the economic and public benefits that justify its implementation. Governments should therefore carefully assess the costs and benefits of structural versus behavioural measures, especially in the context of privatization, liberalization or regulatory reform.

MARKET RESTRUCTURING — NEW PLAYERS: THE CASE OF MOZAMBIQUE¹⁵

Mozambique's market restructuring provides an excellent case of overcoming the supply-side challenges of building out essential broadband infrastructure at the national level and, specifically, in more remote rural areas through conditional but supported market entry.

The winning licensee was required to serve the underserved areas in the north of the country before being permitted to enter the lucrative, although already relatively saturated, metropolitan area. The low-cost roll-out and market strategy of the winning third entrant, Movitel, a joint venture between the Viettel Group of Vietnam and Mozambique's SPI, a direct investment company, has led to dramatic competitive outcomes in the Mozambican mobile market.¹⁶

Movitel's success as a late entrant into a duopoly market in the short time since it became operational is unprecedented. Despite stringent licensing requirements that it fulfilled during the rollout of its network in underserved areas, Movitel's low-margin, high-volume business model has been highly effective in Mozambique and a tremendous catalyst for competition.

Movitel launched in 2012 and has focused on its rural supply chain by rolling out 153 shops, 12,600 agents and points of sales, and nearly 4,000 direct-sales staff in the country's rural villages. Movitel's supply chain covers 85 percent of Mozambique's rural population and more than 70 percent of the whole country's population. Movitel nevertheless remains a vulnerable new entrant. Although it has the greatest market share by SIMs sold, it has the smallest average revenue per user in the country. Movitel's low revenues (in comparison to incumbent mCel and, especially, Vodacom) and relatively high investment per subscriber means that it is not yet profitable, and by no means dominant in the market. This position suggests that the positive effect it is having on the market in terms of enhanced access and pricing still needs to be safeguarded by the regulator (Khan and Rademan 2016).

SPECTRUM

In the meantime, the immediate relief provided by wireless and mobile services to bandwidth-starved consumers has resulted in a massive rise in data traffic. Historically dimensioned for low bandwidth voice services, the current capacity of these networks is extremely strained.

And although operators have creatively refarmed existing spectrum in order to offer next-generation spectrum (LTE) access networks, access to this high-speed technology has also been stymied by the lack of access to optimal spectrum on many parts of the continent. The institutional challenges associated with the allocation of spectrum, and the migration of analog terrestrial broadcasting to digital, have meant that service innovation, tax revenues and potential job opportunities have been squandered.

Making efficient use of spectrum to meet this unprecedented demand is vital and the cost of not doing so is high. The negative economic impact of the failure to release high-demand spectrum — roughly assessed by doing a reverse application of the World Bank's *Digital Dividends* study (2016) that links the extension of broadband by 10 percent to a 1.5 percent increase in GDP — has been equated to hundreds of billions of dollars over a 10-year period.

COMPLEX ADAPTIVE REGULATION

New, innovative funding models, like their predecessors, remain dependent on appropriate institutional arrangements, including well-resourced, capable national regulatory agencies that will both provide certainty to

¹⁵ The following section draws upon research conducted by the author for an unpublished report "Mozambique ICT Sector Performance Review," commissioned by the African Development Bank.

¹⁶ Ibid.

investors and regulate new “open” models. Until these structural conditions are created, the possibilities of broadband contributing to development and economic growth will remain limited.

But transparent accountable economic regulation of the sector — using standard static efficiency models that have been used to regulate the liberalized telecommunications sector for the last 30 years — will no longer suffice.

The clash of policy and regulatory cultures, reflected in the defence by traditional telecommunications incumbents of the revenues from OTT platform operators, are in fact driving the demand for data and consequently new revenues for operators. Likewise, the calls for bans on zero-rating of data to access global OTT platforms by late mobile entrants highlight the clash of technical principles of net neutrality applied to the Internet and public policy issues of universality and equality (of access, not quality). When applied to zero-rating as a result of positive pricing discrimination, net neutrality (traditionally applied to ensuring equivalent quality of service to everyone who accesses the Internet, by preventing negative pricing discrimination) affects not only the technical quality of the Internet, but also entry to and use of it. In countries where affordable access is the main factor inhibiting Internet take-up, and where even cost-based prices might be unaffordable to many, zero-rated services may provide access to the Internet that would not otherwise be acquired (see Gillwald et al. 2016).

Caution should be exercised in inhibiting operator and user innovation arising from the very different conditions that exist in developing countries. These systems are able to find ways around bottlenecks in the old infrastructures and institutions. They overcome the lack of coordination between the private sector and the state in terms of investment in infrastructure, demand stimulation and supply of services.

CONCLUSIONS AND RECOMMENDATIONS

Realizing the potential of broadband to deliver on improved livelihoods, economic growth, job creation and innovation requires understanding the linkages between the different elements of the ICT ecosystem within the local political economy: from the structure of the market, to aligning strategies with the institutional endowments of a particular political economy, to mechanisms to stimulate the absorptive capacity of the citizenry, to the global systems of governance that impact on policies of countries and their ability to exercise their sovereignty. (See Table 1.)

Key challenges for African countries that wish to develop their societies and economies and become digitally inclusive and globally competitive are:

- gathering the necessary supply-and-demand data and analysis to enable evidence-based policy, planning and regulation;
- developing an enabling policy and regulatory framework conducive to investment with adequate institutional arrangements and capacity to effectively implement and oversee policy interventions and strategies;
- rationalizing existing state infrastructure on the basis of whether it is in fact an asset or a drain on the country and improving the coordination of infrastructure planning and network extension;
- leveraging private sector investments for public delivery;
- enhancing competition under conditions of constraint and enabling innovation; and
- ensuring affordable access to broadband networks to improve the intensity of use to build the critical mass necessary for broadband to have social and economic impact.

Within this context, there are six broad categories of policy-regulatory recommendations:

- **Participatory policy formulation:** With the dearth of public resources (financial, human, institutional) at the policy level, there is a need to harness local expertise outside of government through consultative public processes.
- **Public-private interplays:** For the same reason, policy makers need to create an enabling environment for the leveraging of private-sector investments that deliver public services and that will create the conditions for competition and innovation.
- **Next-generation regulation:** Future regulation must ensure an even playing field for competition (which can drive demand through pricing and product innovation that is responsive to local needs).
- **Innovation:** It is important to ensure that static regulation of markets on competition grounds does not inhibit positive innovation outcomes, which are best assessed through dynamic efficiency.
- **Demand stimulation:** Policy makers should apply a coordinated demand-stimulation strategy (including ensuring affordable access, reduced input cost for business, e-literacy extension, development of specialist tertiary-level skills and incentives for local content and app development) that will grow the local industry and markets to contribute not only to national economic growth, development and job creation, but also to making countries more globally competitive,

Table 1: Summary of Broadband Strategies to Enhance Digital Equality

STRATEGIES	PURPOSE	INDICATOR
State/Policy		
Consultative policy process to deliver crosscutting multi-sectoral strategy to support digital inclusion	Create enabling environment for digital inclusion through competition, innovation and a secure and trusted digital environment	Policy clarity, timeliness, monitoring and evaluation of targets, including increased access; individual, public and private enterprise; informal sector use; increased electronic transactions and production of content and apps
Institutional Arrangements/Regulatory Framework		
Flexible regulatory framework through assessing dynamic efficiency and online rights and cyber security framework	Enable innovation and competition for consumer welfare in secure and trusted online environment	Autonomy, accountability, transparency, effectiveness of processes, reduced prices, improved quality and greater intensity of use
Ownership/Operation/Interplays		
Leverage private sector investment/skills/technology for public delivery	Fund networks extension, increase efficiency, reduce price	Delivery of services, network extension to uneconomic areas
Infrastructure/Services		
Open access/infrastructure sharing/structural separation	Network extension, avoiding duplication of investments, cost reduction	Penetration up, costs and pricing down, quality up (targets)
Costs and Prices		
Minimize regulatory transactions costs for operators and regulate wholesale pricing in dominant markets	Reduce any unnecessary costs that will be passed on to consumer, maximize market efficiencies	Input costs of operators decrease, retail prices come down
Universal Access		
Install public Wi-Fi at every public sector building — schools, libraries, municipalities, public transport	Stimulate the intensity of use of Internet by providing limited free data to complement private services	Number of public Wi-Fi spots, number of users, bandwidth used, government/public information sites opened
Demand Stimulation		
State provides financial and skills support for content and apps development	Localization and innovation	Increase in development and use of local content in local languages, apps, innovation hubs
Human Development		
Skills development: e-literacy, coders, computer science, engineering, policy and regulatory	Enable access and optimization of Internet for users for well-being and development	Targets for school, university and college throughput; public Wi-Fi champions; “each one teach one” campaigns

Source: Author.

both as investment destinations and as producers of products and solutions for global markets.

- **Universal-access mechanisms:** Policy makers need to review these mechanisms in the context of the increasing availability of Internet-enabled devices and multiple points of public access. A leveraging of these trends to provide citizens with access to public connectivity is suggested (for example, providing free public Wi-Fi access in municipalities, schools, clinics).

The complex, adaptive systems that have emerged very rapidly over the last few years present enormous challenges in mature economies and markets with strong institutions. These challenges are compounded in developing markets with the often fragile institutions found in most developing countries. These markets will only be able to rise to the

challenge if the regulators governing their activity focus on core principles that provide investors with certainty but are adaptive to the dynamic environment in which they are operating. For the same reason they should exercise regulatory forbearance on market developments that might result in innovation. Rather than indiscriminately applying “best practices” designed for very different market and social conditions, policy makers and regulators need to develop alternative strategies that can feasibly be implemented within the context of resource constraint that characterizes African countries.

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