AN EVALUATION OF OPEN ACCESS BROADBAND NETWORKS IN AFRICA:

THE CASES OF NIGERIA AND SOUTH AFRICA

ALISON GILLWALD
FOLA ODUFUWA
BROC RADEMAN
STEVE ESSELAAR

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EXECUTIVE SUMMARY

Despite its policy currency from the open source and open data movements there is little thorough analysis of how open access affects ICT policy outcomes in relation to extending broadband networks in Africa. 'Best practice' checklists from multilateral agencies to civil society identify the inclusion of 'open access networks' as a positive factor in broadband plans. There is very little acknowledgement of policy tensions that can arise from the application of open access in circumstances where investment in network extension is the main policy priority or recognition of the regulatory capacity and sophistication required if it is to be mandated in developing countries. As yet there is little evidence that mandatory open access networks have increased competition in services, decreased pricing and stimulated demand, as intended by various modes of open access regulation.

Moreover, there is a growing body of evidence (Bauer and Bohlin, 2008) from mature markets indicating that the adoption of mandatory open access network strategies may come at the expense of investment and innovation. These trade-offs need to be assessed, not only by means of static efficiency and instrumental competition models classically used to regulate the telecommunications sector, but also through dynamic efficiency models more suited to the rapidly changing and fluid internet environment. Further, the evidence of mandated open access interventions demonstrates the requirement for sophisticated policy planning and regulatory execution that is seldom found in developing countries and has failed in countries with far stronger institutional endowments.

Two of the largest ICT markets in Africa - Nigeria and South Africa - adopted broadband policies and plans in 2013, to much international acclaim. Implementation in these two countries has stalled; both identified open access as an instrument to drive broadband penetration. This policy paper examines international experiences of different policy and regulatory mechanisms to assess open access as a regulatory instrument to enhance competition, drive down backbone and backhaul prices and increase broadband penetration in these countries.

In Nigeria, as in many countries, the wholesale bandwidth market is neither transparent nor as competitive as retail data services. While wholesale fibre is gradually becoming a commodity and prices are coming down, significant market and policy gaps remain. Only about 4% of all the international bandwidth available at Lagos landing stations, presently up to 15.54Tbps in total, is available for distribution nationally. In order to address

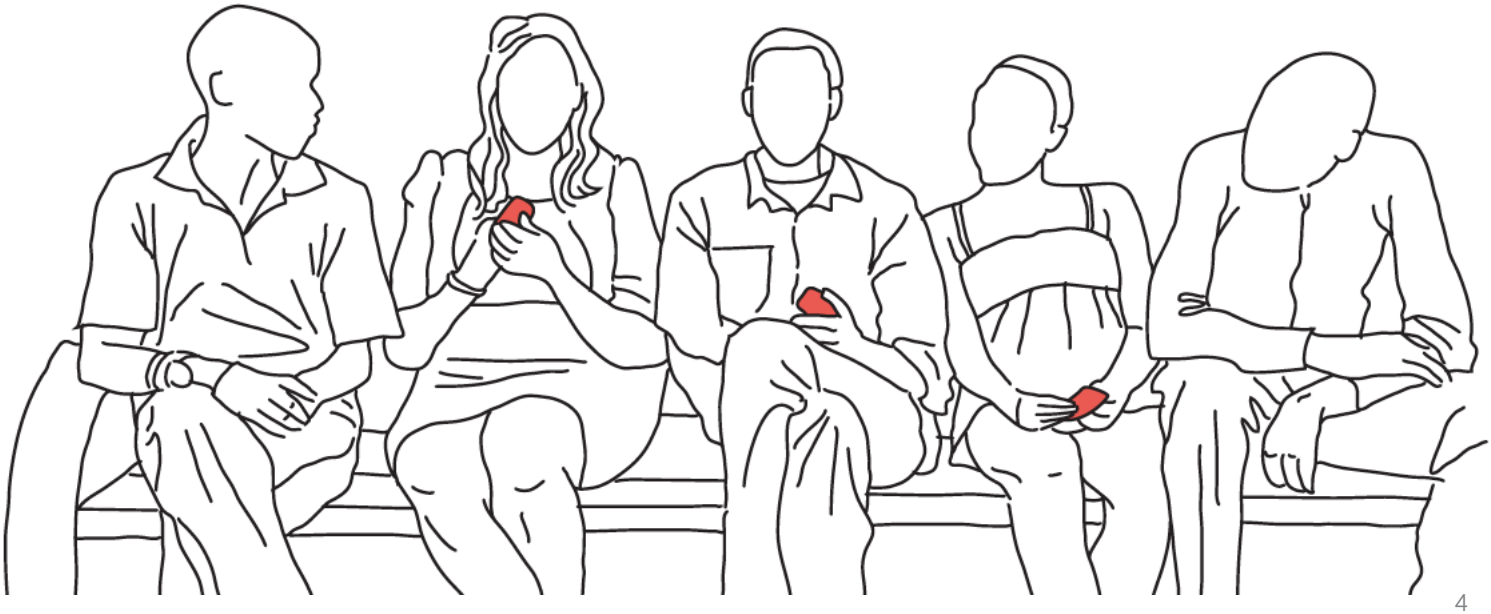
this gap, in 2012 the sector regulator, the Nigerian Communications Commission (NCC) published a paper titled 'Open Access Model for Next Generation Optic Fibre Broadband Network: The Nigerian Model'. (NCC, 2012) In the Open Access Model paper, the NCC outlined plans to build a new national broadband network through the creation of seven new commercial infrastructure companies ('Infracos'), one for each of the six geopolitical zones of the country and Lagos. In 2014, the NCC awarded Infraco licences to MainOne and Bitflux for the Lagos and North Central zones, though neither had commenced operations by mid-2016.

In South Africa, open access is a key principle of the South African broadband policy and plan, SA Connect. The 2013 policy requires the Minister to investigate the potential of open access strategies as a means of expediting the roll-out of high speed connectivity across the country. Despite the National Broadband Advisory Council identifying this as one of the primary tasks arising from the policy, together with the rationalisation of state-owned entities, there has been no formal signal from government to the industry of what form this might take, if any, since the policy was adopted in 2013. At the of writing, the Ministry's intention to create a single open access wireless network, as part of the four-year-long ICT policy review process, became known when the Ministry announced its intention to sue the regulator, the Independent Communications Authority of South Africa (ICASA), in order to prevent it auctioning the high-demand 2.6GHz as well as the 700 and 800MHz digital dividend spectrum. Although ICASA had left 20MHz of spectrum for an open access network, the White Paper indicated that it was the intention of the Ministry to implement an exclusive open access network in all the high demand spectrums. Further, the Ministry declared its intention for all spectrums, including those already assigned to operators, in the longer term to become part of the open access wireless network. The courts ruled in favour of the Ministry in late 2016 and ICASA has indicated its intention to appeal. Commentary indicates that even if this round is won by the Ministry, the regulator will fight the implementation of an exclusive access network and certainly the intention to clawback existing spectrum assignments that might tie up the allocation of prime spectrum, some of which has already been delayed for more than six years.

While the acclaimed broadband plans of the two countries envisaged open access as a key instrument in delivering affordable, high speed broadband services to fulfil their economic and developmental potentials, in neither of the countries has the mandatory open access broadband strategy been successfully implemented within the three years since the plans were passed. Further, the failure to establish functional open access or public ownership models, or to continue to enable

or encourage commercial operators to expand and upgrade their networks and services, has resulted in neither country meeting their ambitious broadband targets.

This evaluation seeks to contribute towards filling the need for evidence-based policy in these countries by examining under what conditions open access networks policy and regulation frameworks can successfully fulfil national public policy objectives of affordable and equitable access to broadband, whilst stimulating investment and innovation.



INTRODUCTION

In order for a modern economy to be globally competitive, today's governments are challenged with raising the necessary investment for next-generation networks (NGNs). The benefits of such networks are well-covered but nevertheless present large policy challenges. Firstly, such networks are incredibly expensive and are beyond the fiscal reach of the national budgets in developing countries. These markets are unfortunately also characterised by a lack of facilities-based competition, which has successfully involved the private sector in funding the development of NGNs. In this context of hindered broadband network delivery, open access has gained widespread and often uncritical acceptance amongst African countries over the last few years (Gillwald, Esselaar and Rademan, 2016).

Smith and Reilly (2013) make the important point that harnessing the power of openness requires structure. This is particularly pertinent to the regulation of open networks, since they are not simply networks that are *not* closed or *un*-regulated (Smith and Reilly 2013:8). Broadband networks require a large amount of investment as they are capital intensive and infrastructure heavy. This means that few players are able to enter the market, which is hence rendered vulnerable to monopolisation; a situation requiring regulation. In order to stimulate investment and/or ownership from other players, alternative incentive models need to be implemented.

It was through the open access models of multilateral and donor organisations, such as the OECD (2013) and the IDRC (2010)[1] that the concept became popular in developing countries. It is important early on to distinguish between the mandatory imposition of open access on dominant networks versus the voluntary adoption of open access by commercial networks that has arisen with the liberalisation of markets.

In the first instance, open access principles of non-discrimination and price transparency are imposed usually on a dominant network that exhibits significant market power[2]. Briglauer *et al* (2013, 2015) find that in the European Union, mandatory wholesale access slowed down the roll-out of fibre-based infrastructure compared to deregulatory (United States) or state-aid approaches (Asian countries). What is more, the assumed benefits of open access, namely, increased competition in services, decreased pricing and stimulated demand are not automatically realised in open access-endorsed ICT systems (Bauer and Bohlin, 2008). Bauer and Bohlin further point out that open access may even come at the expense of investment and innovation. On the other hand, commercial enterprises can voluntarily and openly offer network access and other services to any competitor, based on the commercial imperative of

[1] Smith, M. & Elder, L. (2010). "Open ICT Ecosystems Transforming the Developing World". http://itidjournal.org/itid/article/viewFile/489/214

[2] See OECD discussion paper presented to the African Union in 2010.

maximising network use in order to gain a return on investment as quickly as possible.

To balance the primary objectives of affordable access to high speed bandwidth with objectives of enhanced competition, investment and innovation, requires sophisticated policy planning and regulatory execution seldom found in developing – and even many developed – countries. These trade-offs need to be assessed not only by means of static efficiency, 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. Evidence suggests that until regulatory effects are clearer, regulators should forebear. They should focus instead on infrastructure sharing, channel complementary investments and, as Briglauer and Gugler (2013) and Briglauer *et al* (2015) argue, move to an industry coordinating role and enabling cooperation models.

This coordinating and enabling regulatory role reflects what is happening among operators in the second form of open access occurring voluntarily in many markets through commercial arrangements. A case in point is the mast sharing and outsourcing that is happening in the mobile industry to shift high capex cost to considerably lower opex cost. An arguably even better example of open access is the commercial model of fibre companies that are operating open access business models to optimise traffic on their networks, amortise their investments and secure further loans for further investments in network extension. In South Africa, interestingly, they are also geographically complementing each other's investments, rather than duplicating builds, certainly outside of the main metros.

THE LIMITS OF MANDATORY OPEN ACCESS

After applying open access to fixed markets by means of a wholesale open access network, by structural separation, or by local loop, unbundling has yielded highly uneven results. When applied to wireless networks, there is even less evidence of successful open access application in wireless networks. This is particularly concerning, considering this study looks at markets in sub-Saharan Africa, where the mobile sector dominates fixed-line broadband access. The open access efforts in Mexico and Kenya have not been successful (Gillwald *et al*, 2016).

As an alternative form of open access networks, *voluntary* open access is enjoying initial success but requires a different set of regulatory conditions – ones that create an enabling environment for network investment. This can be done by enforcing standard rights of way across national roads, enabling the

rapid deployment of networks in metropolitan areas, or enabling spectrum sharing (which has been prohibited in some jurisdictions) to drive new network investment. Voluntary open access models are characterised by the following:

- sale of capacity to anyone, and in any time period, to optimise network use and get the necessary returns on investments, thereby securing more loan capital to finance further network extension; and
- wholesale dark fibre or carrier networks, independent and separated from the retail layer (Gillwald *et al*, 2016).

Voluntary open access can also occur when a particular entity pre-empts regulatory transformation and makes the necessary separation of its integrated model in order to compete. The incentive for a commercial entity to offer wholesale network access on open basis comes down to the pursuit of network traffic and demand aggregation, in order to maximise its customer and revenue base.

The need for open access as a regulatory instrument to combat abuse of market dominance, or the market conditions that may make voluntary open access models feasible, is context-specific and its application needs to be considered in relation to the political economy of the country to which it is being applied. This will determine the degree to which an enabling environment for alternative business models can be adopted. In addition to these business models, market structures that might be more successful than big-build projects, which most developing countries have neither the institutional capability nor the financial resources to implement or manage, can also be devised.

The methodology, definition and conceptual framework of this evaluation lean on the South African case of open access networks and open access's effects – if any – on investment, competition, and affordable and equitable access[3]. What is more, this particular study seeks to examine open access in the contexts of the different political economies of Nigeria and South Africa, as well to assess, within the particular market and institutional arrangements, how its principles might be applied successfully at different network levels (with different regulatory instruments), and where it is unlikely to be a useful instrument to do so.

The empirical evidence gathered from secondary sources emphasise the context of the project, examine the potential contribution of open access principles enhancing competition and consumer welfare, as well as the governance and regulatory framework required to enable and enforce openness. High-level interviews with operators, government officials and service provider associations complement the evidence base to provide comprehensive analysis of the evolution of open access in each case.

The overarching research question this evaluation seeks to answer is: Under what conditions can open

[3] Gillwald, A., Esselaar, S. and Rademan, B. (unpublished). "Open access networks: driver or inhibitor of affordable broadband in South Africa". Submitted for publication to Telecom Policy: Special Issue in September 2016.

access network policy and regulation frameworks contribute to the achievement of national public policy objectives of affordable and equitable access to broadband, whilst stimulating investment and innovation?

DEFINITION OF OPEN ACCESS

Despite the rising popularity of open access, there is no single, formal definition that has been adopted by a wide range of institutions, such as the OECD, ITU, NEPAD, BEREC, and the European Commission. There are, nonetheless, two common open access principles amongst all of these organisations in the context of competition regulation: (1) non-discrimination and (2) price transparency. Non-discrimination can be defined as equal or non-discriminatory access to networks and wholesale services, that is, to prevent incumbents from favouring their own upstream or downstream operations over competitors. This projection of market power across market segments, 'vertical foreclosure', undermines competition and tends to result in a reduction in societal welfare (CRASA 2015).

Open access principles may be enshrined in laws and licence conditions, in contracts, or in regulation. Examples of this include wholesale access obligations, or imposed structural or functional separation. A practical definition proposed by Krämer and Schnurr (2014: 7) is used for the purposes of this evaluation:

Open Access regulation refers to the mandated or voluntary provision of access to an upstream resource which must be based on the principle of non-discrimination. The concept may apply to publicly or privately owned access providers that are vertically separated, integrated or represent a cooperative of multiple entities. Open access regulation usually refers to the network layer, but may also be applied to other layers of the telecommunications value-chain.

CONCEPTUAL FRAMEWORK FOR OPEN ACCESS

Drawing on Krämer and Schnurr (2014: 10–11), this conceptual framework (Figure 1) is based on three dimensions derived from the various definitions and characteristics of open access, or bottlenecks that may be addressed by open access. It conceptualises these dimensions into relationships between the market structure, the forms of ownership and the points of access along networks. The most open elements can be visualised at the centre of the triangle (close to or inside the blue box); the more closed elements are on the outside e.g. vertically integrated, publicly owned access networks (Gillwald *et al*, 2016). The blue box specifically represents current variants of voluntary open access models, such as the Seacom example of open undersea cable consortiums, the commercial open access models of national transmission fibre companies, and the open access to a common wholesale carrier network that

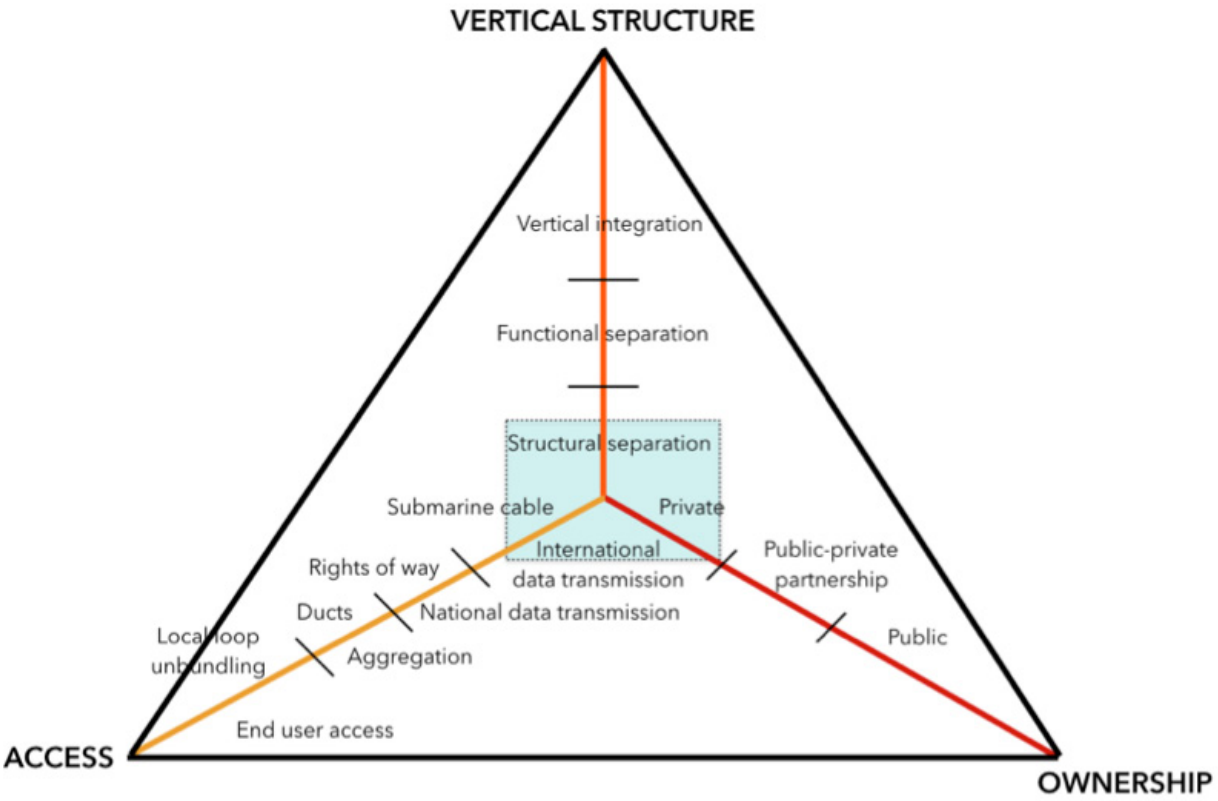


Figure 1: Open access classification framework: market structure (impact on downstream market), ownership (goal of organisation), and access level (quality differentiation)

Source: Adapted from Krämer and Schnurr (2014)

structural separation of the backbone network from the services of an incumbent permits.

The market structure denotes how ownership and management in the network and activities in the services layer are related. The ownership structure denotes the business model as well as the goals of the access provider that vary with the influence/control of the public sector. Access relationships are primarily defined by the market structure and the ownership model, whereas the access level defines the range of the particular relationship.

For clarity, the access relationship or operational praxis of a vertically integrated monopolist required to provide access at a regulated maximum price

and minimum quality at any particular level, say backbone facilities, is likely to be different from that of a private/commercially funded dark fibre company that does not compete downstream with the access seeker – wanting to sell as much capacity as possible and optimise the return on investment.

From this one can identify the bottleneck in the networks as a result of the market structure as well as the ownership and management relations arising from particular business models[4]. The potential of open access strategies can then be assessed in terms of their ability to diminish barriers to market entry and competitive access that would enhance market efficiency and potentially circumvent market failure. Open access should only be considered when there is a clearly identified obstacle to competitive entry or access.

"The access level, finally, indicates at which level of the value chain access is given to downstream competitors. Available access levels depend on the network architecture and may differ across access technologies. Access may also be granted at different geographical locations. The access level defines the degree of control and the potential quality differentiation that the access seeker can achieve"

- Krämer and Schnurr 2014, 6

[4] For the purposes of this evaluation, the different access levels that open access can apply to are categorised as international data transmission, national data transmission and end-user access. The access levels, which can be linked to specific network elements in different markets (including wireless mobile), are purposefully broad but they capture where the bottlenecks, or potential bottlenecks, have been identified. For the purposes of this model, national data transmission includes backbone, backhaul and aggregation networks.

Nigeria

THE CASE OF NIGERIA

- Fola Odufuwa

Four years on, the Infraco model is yet to take off. Consequently, wholesale bandwidth is neither transparent nor as competitive as retail data and is characterised by high-priced offerings. This mixed state, where there appears to be high competition in retail data in contrast to weak competition in wholesale, is having a strong impact on affordable high speed and the regulator seems to be in a quandary as to what specific measures or strategies to adopt to achieve full market efficiency, attract new investments and promote innovation. There is also a significant disconnect as to who should implement the national broadband plan, whether the (now disbanded) presidential committee that created the document, or the regulator, which has developed its own separate broadband initiatives.

It is uncertain whether there is enough regulatory sophistication to initiate and execute complex negotiations as would be required to unlock fresh investment into the sector or take defensive steps (including, possibly, structural separation) to minimise the dominance of larger operators in favour of smaller players, in the light of strong market evidence, suggesting that such interventions would be necessary should open access be achieved.

On the positive side, due to the effect of global pressure and retail demand, wholesale fibre is

gradually becoming a commodity service and prices are coming down; nevertheless significant market and policy gaps remain hindering the overall competitiveness of the sector and the attractiveness of new investments.

CURRENT REGULATIONS AND POLICIES GOVERNING OPEN ACCESS

NCC has a strong market liberalisation agenda and promotes citizen access, high speed broadband penetration, fair competition and technology neutrality. Open access principles appear enshrined in some form in policy statements, laws and regulations including the following:

- Nigerian Communications Act, 2003;
- Nigerian Communications Act – Competition Practices Regulations, 2007;
- Telecommunications Networks Interconnection Regulations, 2003;
- Guidelines for Grant of Access on Federal Highways, Right of Way to Information and Communication Technology Service Providers;
- Guidelines on Collocation and Infrastructure Sharing;
- Legal Guidelines and Technical Specifications for the Installation of Telecoms Masts and Towers; and
- Universal Access and Universal Service Regulations, 2007.

Each license type also contains guidelines, obligations and restrictions that generally tend to favour open principles, though these would need to be reviewed and consolidated. For the moment there are significant policy gaps that affect the effectiveness of wholesale data services in the country. We list a few of these below.

In 2013, the federal government released a National Broadband Plan, which outlined policy direction for the future development of internet and data services across the federation. The Plan was developed by a Presidential Committee on Broadband outside of the NCC and contained references to open access which would be implemented under a new regulatory framework that was to be put in place within a year. As at the time of compiling this evaluation, the two new Infracos are yet to roll out any infrastructure, partly because there is no framework in place. (Nigeria, 2013)

The ambitious document set out a variety of initiatives, targets and strategies to connect Nigerian communities by delivering high speed internet and broadband services throughout the country by 2018. (Nigeria, 2013)

However, to date the National Broadband Plan has not achieved any of its self-imposed targets. Besides, the document did not define what open access is with respect to Nigeria (besides vague references to the need to run the industry on that regime), nor did it contain a description of how the

strategies listed would be funded and implemented to guarantee open access for all.

An example of such a strategy could be a requirement for operators who control wholesale broadband sources (as submarine cable) to be vertically separated from divisions of the same business that resell the same service to enterprises, SOHOs[5] and private individuals. Though a policy of this nature was not discussed, if well-debated, adopted and enforced with features, such as functional or structural separation of integrated operators and price regulation, it will go a long way to creating a level playing field and opening up access to all networks. The latter will help to improve competition, while the former will eliminate the real threat of transfer pricing.

It may be argued that the enforcement of functional separation on private companies may be either unrealistic or difficult. Nevertheless, if there is strong proof that the way some large operators are structured is inhibiting open access and fair competition, and is detrimental to the health of the market, then a regulatory move of this form may be in order.

Transfer pricing requires that the pricing of controlled transactions by companies within a group or market-facing divisions of the same business is consistent with arm's length principle. While the investigation of this was not within the terms of this study, nevertheless there is evidence to suggest that companies offering wholesale bandwidth in Nigeria do not necessarily price this service in a way as to lower the ability of the retail segments of their business from being competitive. In fact, the observed practice is that wholesale divisions of mobile network operators (MNOs) are able to price out retail competitors to the advantage of the group.

The Broadband Plan is now under the management of a 19-member National Broadband Council, a body that is advisory and largely ineffective in implementing a plan of this magnitude.

On the positive side, it should be noted that NCC has for many years been implementing certain open access principles under its competition practices regulations (for instance) through determinations, accounting separation, pricing regulations, etc. In 2013, NCC declared dominant operators in mobile voice (MTN) and wholesale leased lines and transmission capacity sub-segment of this market (MTN and Glo) as a remedy to anti-competitive conducts of both licensees as observed. It is, however, unclear to what extent this separation and the application of other open access principles is being carried out, or whether this particular regulatory move even has any impact on open access.

Having said this, there are enough elements in policy and regulation to show that the country is moving towards, and not away, from open access. For instance, NCC actively promotes infrastructure sharing and co-location and has issued guidelines to help networks in this regard. The Nigerian telecoms industry

[5] Standing for: single-office, home-office.

is gradually transiting from a legacy of infrastructure duplication, which was pronounced at the beginning of the deployment of voice-based networks fifteen years ago, to one of infrastructure sharing targeted at delivering high speed broadband services nationwide. Infrastructure sharing is presently limited to passive, non-core network resources such as towers, building spaces, power sources, and rights of way. There are no guidelines for the sharing of core network resources, though NCC is said to be in the process of developing fresh regulations in this regard (HFNO, 2015).

As discussed in the introduction, there is some evidence suggesting that such regulatory interventions may be more effective in reducing the costs associated with duplication of network, especially where there is low demand, and often as required by universal services obligations, than traditional mandatory open access regulations on new network investments or unbundling of old ones (Briglauer *et al* 2013, 2015). In fact, with the high cost of perpetual upgrades in the mobile market, many operators have entered into voluntary commercial arrangements to share infrastructure and reduce the capex for much lower opex outlays. Operators have also entered into innovative collaborations, with some operators swapping network resources and spare capacity between one another without exchanging cash.

Also, in October 2015 NCC announced the withdrawal of floor price on all data products to deepen the growth and development of data services in Nigeria. Floor price is a ceiling imposed by a regulatory body as a way to control or limit the price that can be charged for a product. This was done to improve competitive practices among market players.

What this means is that MNOs, and indeed internet service providers (ISPs) and other players in the data market segment are free to charge any price for any offering. Though it is too early to gauge how the market will ultimately respond to this regulatory move, the initial feedback retrieved from this consultation is that MNOs see this as a positive development and may likely continue to lower data access and use costs to the benefit of consumers. If this does not happen, NCC says it will restore the floor price the moment any distortion is observed.

COMPETITIVE ENVIRONMENT FOR UPSTREAM SERVICES

International bandwidth

There has been a significant improvement in the number and capacity of submarine connections into the country. Nigeria has about 15TB of submarine fibre cable capacity and the primary sources of wholesale bandwidth available can be found at the Lagos landing ports in Marina and Lekki. These stations host MTN (WACS), Glo (Glo-1), MainOne (MainOne), and the nTEL (SAT3).

Though it is difficult to determine the average capacity utilisation currently available at the submarine

cable companies, the best estimates are that over 90% of this capacity – all of which is domiciled at the Lagos landing port – lies unused (Table 1).

The biggest regulatory challenge at the moment is how to get this massive amount of unused capacity delivered to users across the country through transmission networks. Only about 4% of international bandwidth of the Lagos landing port is presently being distributed within the country. There are several reasons for the low level of capacity utilisation of wholesale bandwidth.

One, though retail demand is growing as mobile networks continue to push low-cost data plan offerings, the penetration of smartphones is only about 30% of the population of mobile owners. Besides, the low level of deployment of high speed technologies, particularly Long-term Evolution (LTE) means that there is a mismatch in customer experience: though wholesale speeds can be very high, retail experience would be very slow.

Two, there are no regulations governing the sale of wholesale capacity, so providers hold supplier power and are able to indulge in arbitrary pricing. Due to this, there is limited competition in wholesale bandwidth provisioning. Wholesale pricing is high and the rate at which prices are being brought down by competition is not presently as aggressive, when compared to retail.

Though there are many private intermediaries between the wholesale and retail segments of the value chain, there are no more than a handful of ISPs in the largest markets. These intermediaries would include resellers (ISPs,) value added service players, integrators, and retailers. The majority of these intermediaries are weak operations and do not have the sales, liquidity or expertise to match GSM networks. In nearly all the states in the country, MNOs are the dominant players in internet services, enterprise and retail markets. To summarise, the biggest factors limiting uptake of wholesale bandwidth are the quality of national transmission infrastructure and relatively weak corporate demand. We discuss these issues in this evaluation, as they affect open access.

As at March 2016, MTN's international bandwidth was sourced from MainOne (1 085Mbps) and SAT-3 (871Mbps – primary link, and 310Mbps – secondary

	SAT-3	MainOne	Glo-1	WACS	ACE	Total
Capacity	340Gbps	4.96Tbps	2.5Tbps	5.12Tbps	5.12Tbps	15.54Tbps
Average utilisation	10%	5%	2%	2%	1%	4%

Table 1: Capacity and utilisation of wholesale bandwidth in Nigeria

Sources: Interviews with heads of business at MainOne, Glo-1, ACE & SAT-3, supplemented with corporate website information.

link). The operator does not disclose whether it uses capacity from the WACS submarine system, in which it has investment rights to 11% of the design capacity of 5.12Tbps. If MTN's bandwidth capacity figures are correct, then the biggest network in Nigeria is presently utilising a mere 0.0128% of total available wholesale bandwidth in the country. This demonstrates the point that there is insufficient distribution of wholesale capacity at a national scale, given, for the purpose of argument, the rising consumption of data by that operator's 60 million subscribers.

The biggest consumers of wholesale bandwidth are MNOs, transmission companies, major resellers, ISPs, and educational institutions, in that order. MainOne is the leading supplier of wholesale bandwidth and, apparently, the most customer-friendly, according to respondents who participated in this study. WACS and ACE lag behind in the market, partly because ACE is a new entrant and appears to be struggling to win business, and WACS has minimal presence, due to issues arising from what is said to be shareholder disagreements. Glo-1 supplies all of Glo's wholesale data needs and provides redundancies to other MNOs. SAT-3 was recently transferred to a private entity by the national government in its privatisation of the fixed telephone company, NITEL, now rebranded nTEL.

Though Glo and MTN both hold shares in Glo-1 (100%) and WACS (11%) respectively, the observed trend does not suggest that either operator has been able to use their ownership of submarine cable infrastructure to exercise market power in a way that directly inhibits competition in either the upstream or downstream segments of the market. Put another way, the biggest factor holding back the openness of the upstream market appears to be pricing transparency due to inadequate regulation and weak corporate demand for wholesale bandwidth.

It is unclear whether Glo (the mobile network) gets a preferential treatment from Glo-1 (the submarine company) because it shares ownership, or whether MTN Nigeria is treated favourably when it buys capacity from WACS in which it has an 11% equity stake. In any case, both Glo and MTN play in the same market space as operators who buy from them, a situation which requires regulatory treatment if the market is to develop efficiently.

Though there is not a monopoly in wholesale data services, there is sufficient evidence from the stakeholder discussions that the Glo/Glo-1 relationship has a strong impact on the downstream sector, as this operator, in particular, is able to offer almost unmatchable prices and promos on its retail data bundles. Presently, mobile consumers are able to buy data at rates that can go as low as N0.01/Kilobyte, depending on the network and bundle. On the one hand, low prices are good for the market, but the reduced ability of other retail networks to compete equally may be an issue that needs to be addressed by the regulator, which has the capacity to do so.

In summary, low utilisation of wholesale bandwidth is a function of relatively high prices, which, in itself, is a result of inadequate distribution infrastructure, weak enterprise demand, and insufficient and reactive upstream sector regulations. Though wholesale providers do not appear to directly discriminate between and against prospective customers, there is evidence of arbitrary pricing, and the structure of the market presently favours those wholesalers who also have massive national distribution infrastructure, especially MTN and Glo. Besides pointing out existing market inefficiencies with respect to wholesale bandwidth provisioning, this evaluation is unable to determine the full extent and impacts of the relationship between the wholesale and retail segments of the market.

According to a recent NCC statement, the regulator is in the process of announcing new guidelines that will set in place a cost-based pricing model to deal with current inefficiencies in the wholesale broadband market (NCC, 2016a). Perhaps this intervention will help to deepen the market and further open access principles across the industry.

DISTRIBUTION INFRASTRUCTURE: FIBRE OPTICS

As previously stated, the biggest challenge in delivering high speed broadband to cities and towns will be the state of the transmission networks, particularly fibre optic connections. The situation with inland fibre installations has improved over the years. There is a growing market shift away from VSAT to fibre or radio solutions and fibre optics, due to pricing and latency considerations. In addition, the wide penetration of mobile data has led to a sharp decline in the sales of VSAT terminals.

Though there is extensive infrastructure able to support the delivery of high speed data across the country, there is a high rate of physical disruption to road fibre installations, which greatly affects the quality of data transmissions. Presently, service delivery between the upstream and downstream data segments is on best-effort basis.

	Inland	Submarine
MTN Group	31 718	6 682
GLO	10 869	9 800
Phase 3	7 000	-
Airtel	4 600	-
Etisalat	4 300	-
Multilinks Telkom	5 789	-
Visafone	43	-
21st Century	5 000	-
ipNX	400	-
TOTAL	**69 719**	**16 482**

Table 2: Deployment of fibre optic cables (kilometres)

Source: NCC (2014), with researcher's adjustments.

The main players in inland fibre installations are MTN, Glo, Phase 3, and to a smaller degree, Airtel and Etisalat. These operators have built national backbone transmission networks based on fibre and radio links with availability all across the country. MTN and Glo are the only mobile operators with submarine cable investments and thus carry their own traffic across the country. They also take wholesale bandwidth from one another and from other carriers, specifically Phase 3, MainOne and nTEL.

Backbone transmission providers, such as Phase 3, Suburban and Galaxy Backbone do not have retail network presence. That may well change in the future if any of these change their corporate focus or business model. MTN continues to enjoy a strong first mover advantage and has the largest share of

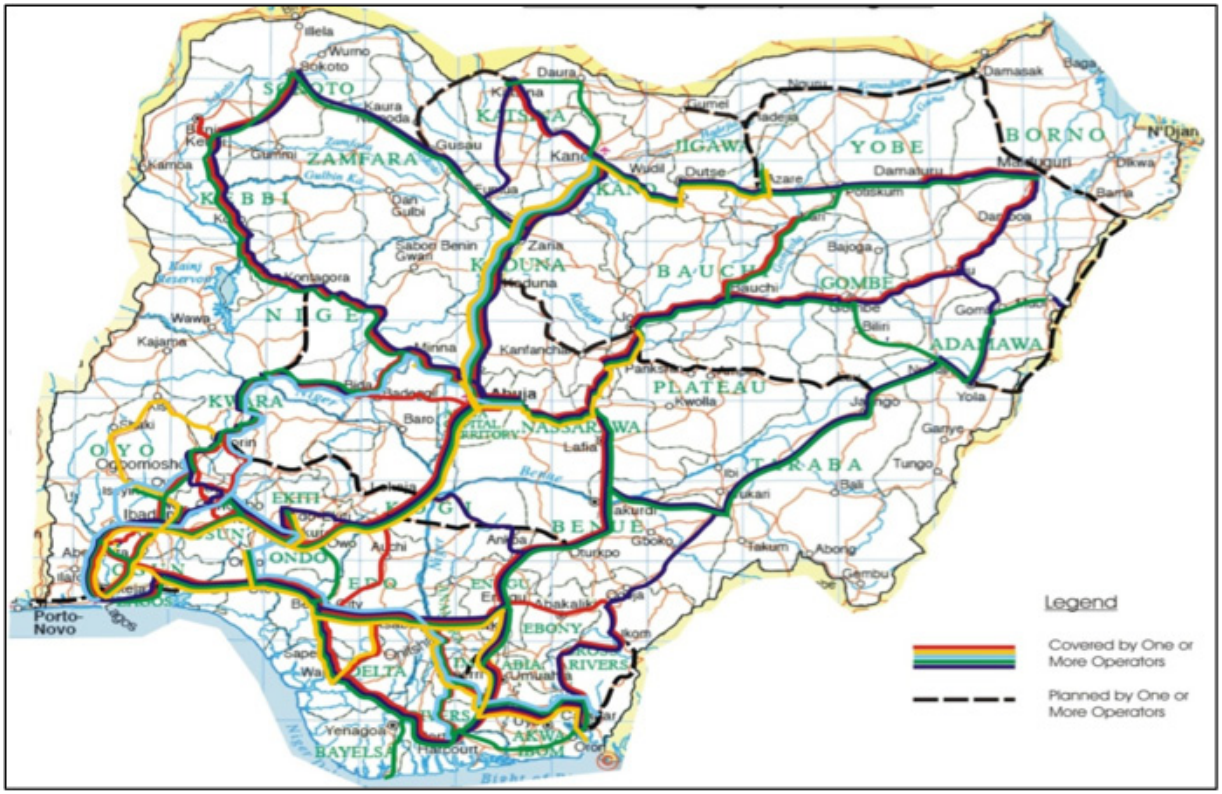


Figure 2: Fibre network coverage of Nigeria

Source: Universal Service Provision Fund (2012).

network assets, transmission resources, physical infrastructure and retail customers.

The national road fibre network is presently a mess as installations continue to suffer from significant downtime arising from frequent and costly damage caused by road construction, acts of terrorism and sabotage, especially by an increasing number of host communities. This sometimes results in a simultaneous loss of network availability to hundreds of base stations nationwide. Construction accidents are now quite frequent because road development is improving in most of the state capitals and secondary towns, after decades of neglect. They occur regularly, with some reports suggesting an average of up to 70 break-ups in fibre installations per month across all networks throughout the country. Networks are unprotected from this situation at present.

In spite of this reality, this study finds that there is good evidence that the four GSM operators have aggressive plans for infrastructure upgrades across the entire country, with renewed emphasis on the north. One operator that participated in this study believes that if the networks implement their respective plans, the majority of the conspicuous transmission gaps will soon be bridged. Figure 2 gives a visual outlook of fibre cable installations across the country.

Due to problems with road fibre, Phase 3's fibre-over-power-lines infrastructure appears to be the most reliable for delivering traffic from a landing port in the south to most cities in the north of the country. Phase 3 operates a 7 000km fibre network that is delivered through aerial deployment on pylons along the country's power transmission corridor. Phase 3 positions itself as a carrier of carriers and is in high demand by operators.

ACCESS NETWORKS

In spite of recent growth in fibre installations, mobile systems are the primary means for carrying retail and enterprise data traffic in Nigeria. Presently there are around 26 000 GSM Base Transmission Station (BTS) towers serving about 149 million active mobile subscriptions. These sites are roughly distributed among the mobile networks as illustrated in Table 3.

As shown in Figure 3, there is a concentration of access networks in the southern cities of the country. The densely populated southern half of the country is well covered, as are the larger cities and towns in the north.

Due to regulatory promotion of infrastructure sharing coupled with the global trend of outsourcing,

	MTN	Airtel	Glo	Etisalat
No. of towers	11 000	7 000	5 000	3 000

Table 3: Distribution of towers among GSM operators in Nigeria

Source: Consultant's estimations based on the stakeholder interviews and secondary information.

the majority of base station sites are now under the management or outright ownership of two major tower sharing companies, IHS Towers (IHS) and American Towers. IHS manages about 15 000 towers and recently secured the Infraco licence for North Central, while American Towers owns about 5 000 towers[6].

IHS and the MNOs are currently aggressively connecting tower locations to fibre optic cables to reduce the dependence on microwave backhauling. This should deepen the national communications infrastructure and may result in improved speeds and range of services that may become available to consumers and enterprises when completed.

At the core of access networks is 2G, which covers 87% of the entire Nigerian population. However, 2G is an old technology that is generally inefficient in the handling and management of voice and data connections on a GSM network. In contrast, 3G is

Figure 3: National coverage of mobile telecommunications in Nigeria

Source: Universal Service Provision Fund (2012).

[6] See corporate websites: www.ihstowers.com/group/countries/nigeria/
www.atcnigeria.ng/en/index.htm

presently only available to half of the population, according to the GSM Association. Based on recent field research carried out for the study, 3G coverage is estimated to stand at about 15–20%, which is mainly in the state capitals, and up to 100% 2G penetration in many towns. As at September 2015, 4G accounted for only 0.15% of mobile data connections in the country. The reliance on older access technologies is at the heart of poor mobile data reliability, which, at the moment, is quite pronounced throughout the country. (GSMA, 2015: 12)

Presently, despite the penetration and spread of mobile sites, there is still a significant data access gap. About 35% of mobile phone owners are not subscribed to a data plan (Table 4). Access gap here refers to the number of mobile subscribers who do not have an active data connection. Due to the great need for access and transmission infrastructure, mobile operators in Nigeria invest up to 40% of their revenues on capital expenditure annually[7], double their South African counterparts.

Though this gap is being gradually reduced by market forces, the number of mobile lines without access, 51.3 million in the third quarter of 2015, means that there is still some way to go. Excluded from this figure are an indeterminable number of mobile users who are able to gain access through personal hotspots and data bundles shared with friends and family members who have an active connection.

If open access will be achieved in Nigeria, the evidence suggests a need for some form of policy intervention to convert the large number of voice-only mobile phone users into data subscribers.

PRICING OF WHOLESALE DATA SERVICES

Wholesale bandwidth is still relatively expensive. Current estimates for wholesale bandwidth range from about USD300/Mbps to USD500/Mbps. Though carriers have generic pricing for wholesale bandwidth, large volumes on the order of several STMs or leased circuits are negotiable. At high

	Dec '12	Dec '13	Dec '14	Sep '15
Total mobile subscribers	109 829 223	124 841 315	136 772 475	148 427 043
Total internet subscribers	30 939 112	64 229 097	76 324 632	97 060 548
Subs without data plan	**78 890 111**	**60 612 218**	**60 447 843**	**51 366 495**
Access gap	**71.8%**	**48.6%**	**44.2%**	**34.6%**

Table 4: Distribution of MNO data plans in Nigeria

Source: Derived from NCC Industry Statistics Data Bank (2016b)[8].

[7] See corporate websites: www.ihstowers.com/group/countries/nigeria/
www.atcnigeria.ng/en/index.htm

[8] For more detail, see: www.ncc.gov.ng/stakeholder/statistics-reports/industry-overview#view-graphs-tables-5.

volumes, beginning from STM-1, wholesale pricing can go as low as USD90–120/Mbps, depending on the service provider, volume and bargaining power, and is available to external customers on a non-discriminatory basis.

Quoted amounts would exclude distribution costs, which would vary by distance, type of transmission technology (fibre, microwave radio or satellite) and right-of-way or spectrum costs. Ex-landing port prices out of Lagos are higher as carriers factor in the cost of distribution per kilometre. The main motivation for the purchase of wholesale bandwidth operators and resellers is network traffic and demand by their own customers.

The biggest expense in data provisioning is the cost of distribution. This cost will be reduced if the submarine cables are extended inland. This seems to be already happening. Via an arrangement with Cameroun Telecoms, MainOne has recently added a new landing station in Kiribi, Cameroun to its national network and the carrier has plans to extend its submarine cable into Escravos (Delta State), Qua Iboe (Akwa Ibom State), Bonny Island (Rivers State) and eventually Port Harcourt (Rivers State). While it is not known when these new extensions – which are all located in the Niger Delta – will be completed, it appears from several credible sources that the Qua Iboe link is already active and in use.

Besides MainOne, ACE and Glo-1 also have plans to extend their submarine cables into Port Harcourt. Again there is no certainty as to when these new landing ports will be commercially available to prospective buyers.

One other factor that affects wholesale data costs is favourable pricing. Wholesale bandwidth is available for purchase in the biggest cities from MNOs or Phase 3. Naturally, these secondary operators would price in last mile distribution into their bandwidth offerings. MNOs buy wholesale bandwidth from submarine cable companies. Carriers that own and operate submarine cables, namely MTN and Glo, would naturally offer the cheapest prices to their own divisions and customers. According to a 2012 NCC determination, MTN and Glo are the dominant operators in the leased lines market segment (E1s and STMs).

On the positive side, MNOs review voice and data pricing policies downwards, from time to time. Pricing strategy is typically designed: (a) to get existing customers to use more data, in order to grow attributable incomes, and (b) to attract new users. Effective mobile data tariffs have declined by almost 60% over the past 12 months.

Though operators publicly share their consumer packages, there is no pricing transparency for wholesale and enterprise offerings. Prices offered to corporate buyers are determined by negotiations and are influenced by how the operator perceives or values the account. The biggest corporate buyers in the largest cities hold strong bargaining positions with service providers, arising from competitive pressure and weak demand for data services by organisations.

Generic MNO bandwidth prices available to corporate buyers is shown in Table 5, though what is finally agreed can vary from one organisation to the other.

Etisalat is the priciest operator in the enterprise market and only just joined the competition for dedicated internet services at the end of 2015. Monthly subscriptions range from a low of NGN130 000 for 2Mbps (MTN) to the high NGN6 199 268 for an STM-1 trunk (Etisalat). Operators apply these amounts generically to both enterprises and resellers without discrimination, so third party resellers have no special advantages, but are usually open to volume negotiations. All the operators frequently undercut their resellers and one another.

Furthermore, it is difficult for any prospect to obtain price quotes without being 'grilled'. Though there is no outright discrimination, price quotes can be arbitrary and widely disparate between one customer and another. Operators also tend to favour related businesses. The high incidence of arbitrary pricing and opaque billing causes some respondents to doubt whether wholesale providers are themselves clear on what their landing cost (or return on investment) is.

According to a recent NCC statement, the regulator is in the process of announcing new guidelines that will set in place a cost-based pricing model that will deal with current inefficiencies in the wholesale broadband market. (NCC, 2016a)

CURRENT HURDLES LIMITING OPEN ACCESS AND MARKET EFFICIENCY

The general consensus of most respondents is that the proposed open access framework undergoing regulatory consideration will not increase the flow

Bandwidth speeds	MTN	Glo	Airtel	Etisalat
2Mbps	130 000	350 000	175 000	280 000
10Mbps	350 250	500 000	625 000	750 000
20Mbps	600 000	834 000	1 000 000	1 450 000
45Mbps (DS3)	1 350 000	1 200 000	1 625 000	3 215 224
155Mbps (STM1)	3 836 000	3 080 000	2 500 000	6 299 268
Connection fee	**650 000**	**300 000**	**350 000**	**740 688**

Table 5: Current pricelist of dedicated data bandwidth

Source: Researcher's interviews with business heads of MTN, Glo, Airtel & Etisalat (2016).

of wholesale bandwidth across the value chain. Respondents are unanimous that the main hurdles to open access are essentially the problems operators face during network roll-out, the biggest of which are: (a) right-of-way challenges, (b) multiple taxation, (c) vandalising of network equipment, and (d) poor public power supply.

These are the drivers and contributors to the cost of rendering services and greatly limit the ability of the market to work in an efficient manner. The main effect of these hurdles can be found in high cost of services, limited dedicated connections and poor quality of service. The pervasiveness of broadband appears to be directly tied to how open the telecoms environment is to solving these problems, and requires pro-active policies, regulatory movement and significant political will. Presently, the NCC appears far too focused on direct policy interventions, rather than on coordinating network roll-out issues (particularly right-of-way and power supply) and generally lowering the overall cost of doing business in order to enhance competition, investments and innovation.

UNFAIR COMPETITION AND DISCRIMINATION PRACTICES

A major problem affecting the current state of the telecoms market in the country, according to respondents, is the high level of unfair competition. Telecoms players are vertically integrated and appear able to push differential pricing in favour of related business to the disadvantage of other licensed operators. This study found that the larger operators tend to offer discriminatory pricing between internal and external customers and that a division of a large operator does secure better pricing for wholesale bandwidth than an external client is able to obtain. MNOs are able to do this due to their size and liquidity. It would also appear that these operators are cross-subsidising weak markets and unprofitable portions of their business. This is not unusual in telecoms. However, what this means is that not all players are able to compete.

One other finding of this study is the sheer number of unlicensed players in the country. At the end of March 2016, NCC commenced enforcement processes against 41 companies offering unauthorised internet and data services to corporations (NCC, 2016c). Many operators in this category deliver lower-priced bandwidth to their clients using free or unlicensed frequencies with the attendant result of high levels of network interference and poor service quality. With this large pool of service providers active in (enterprise) data provisioning outside the regulatory framework, it is clear that there will be significant market distortion as licensed resellers would have no protection.

Excessive competition in parts of the downstream sector, especially among MNOs would naturally impact negatively on other parts of the industry value chain. Though all players have equal access to wholesale

bandwidth, there is evidence of discriminatory practices. The ability of networks with ownership of wholesale operations to indulge in unfair behaviour is, however, muted by the growing role of MainOne as an independent provider of wholesale bandwidth.

On the positive side, there are no express restrictions or limitations on an operator's freedom to price, control or prioritise the type or source of data that it delivers. Though most licence categories impose some generic obligations on service providers, such as roll-out targets, service scope or interconnect rules, nevertheless telecoms operators are required not to show undue preference to or to exercise undue discrimination against any particular person in respect of the provision of a service. This holds, whether it is with respect to pricing, or other terms or conditions as may be applicable, but needs the regulator to actively monitor wholesale pricing and competitive practices – which is not presently the case.

In summary, it can be said that outright discrimination in the upstream sector does not exist. That is, wholesale providers offer generic pricing on a cash-and-carry basis and apply volume discounts for the most part. However, the quest to sell *at-all-cost* means that there is predatory pricing and wholesalers are in a position to undercut (their own) resellers by offering better prices to end-users within the same market. Currently, wholesale prices are relatively high and the rate at which they are being lowered over time does not match retail pricing.

Clearly, there is strong evidence to suggest that the regulator needs to be more proactive in dealing with these (and other) issues that impact on the efficiency of the market. It may be possible that the full implementation of open access principles can help in this regard. Without a strong regulatory framework that enables a level playing field for all licensees, it is likely that smaller players would continue to lose ground and certain segments of the industry will be unattractive for new investments.

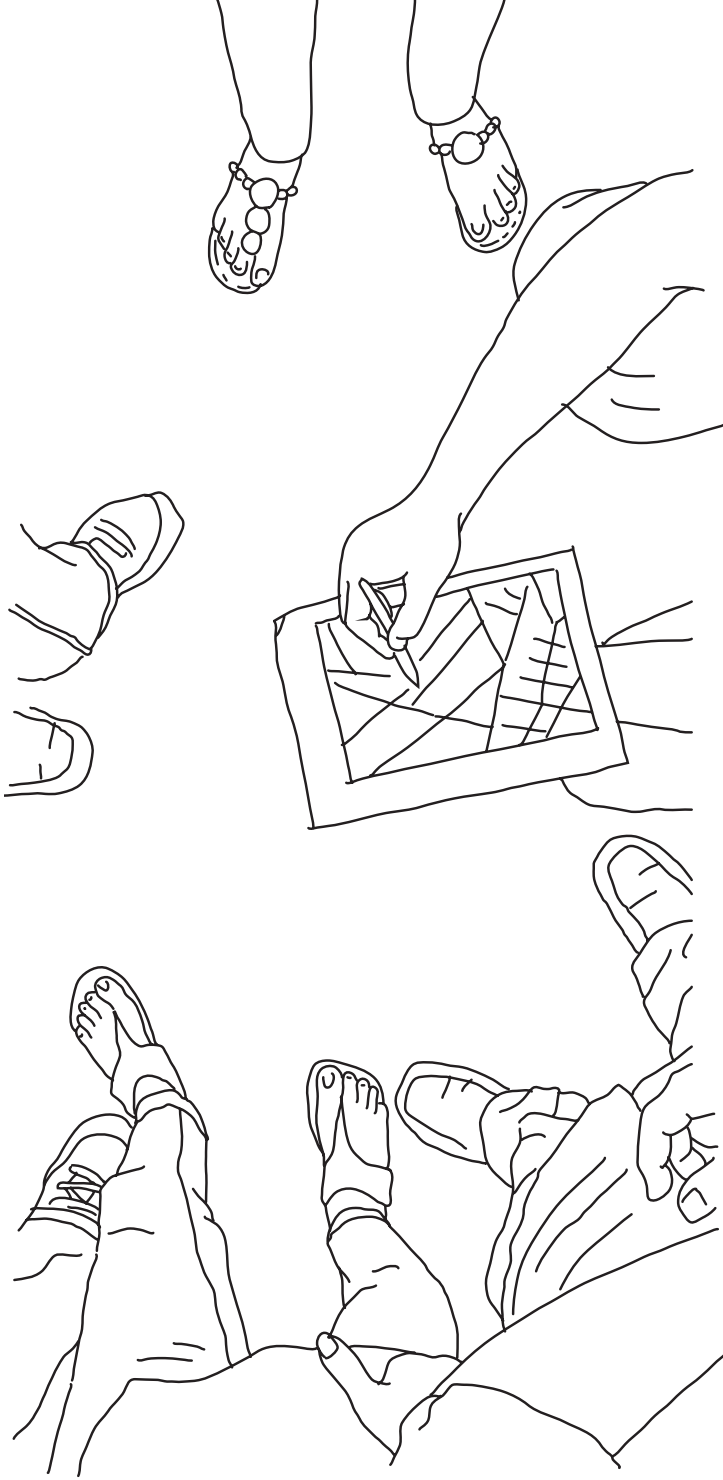
SUMMARY

The development of open access in Nigeria is still at a very early stage. Unfortunately, NCC's Open Access Model initiative seems to have reduced the solution to the market gap between retail and wholesale broadband access to the issuance of new licenses, which ordinarily takes place regardless of whether open access principles are adopted or not.

It is unclear what practical steps the industry regulator wants to take to bring about the massive investment amounts required to build new fibre backbone networks, how existing infrastructure would be mobilised, how the partnership between the state and private investors as envisaged would be organised, and, if it insists on going the Infraco route, how existing network assets would be valued or transferred from existing operators to the new licensees. Furthermore, the insistence on Infraco's mandatory patronage is ambiguous and is probably

in itself a regulatory contradiction. It is also unlikely that two or seven Infraco licenses will suddenly make the entire industry compliant with open access principles.

By reducing open access to the issuance of new licenses the regulator seems to have missed the point. Instead, the focus should have been on developing broad policies and guidelines to address market inefficiencies, particularly those that are quite pronounced in the upstream market, in order to further promote new investments and innovation. Neither MainOne nor Bitflux had commenced their respective Infraco businesses at the time of compiling this evaluation, which probably gives credence to the lack of practicality of this particular form of the Open Access Model.



South Africa

THE CASE OF SOUTH AFRICA

- Alison Gillwald and Broc Rademan

Access regimes can serve to make facilities available that might otherwise have formed bottlenecks to other network operators. The initial telecommunications reforms in the mid-1990s, which helped establish an independent regulatory authority and the liberalisation of markets, introduced the first transparent access regime through interconnection and facilities-leasing guidelines proscribed by the new South African Telecommunications Regulatory Authority (SATRA). This followed the open access approaches in reforming markets all over the world that required public network operators, especially former or existing monopoly facilities providers, to access incumbent bottleneck network facilities under regulated terms and conditions, as well as ensure the ability to interconnect networks. The concept of open access was extended in next-generation regulation, largely in relation to the unbundling of network elements for competitors to operate them independently of the incumbent, and with relation to public investments in greenfield broadband networks where the entire network is operated on open access principles.

As with many other policies, South Africa was quick off the mark in adopting a broadband policy in 2009. However, the draft policy was hurried through the necessary public processes without much adjustment, resulting in an old-style, state-centric, telecom

infrastructure supply-side approach. In 2013, a new broadband policy, which attempted to address some of the shortfalls of the earlier policy was published, called SA Connect. This policy was more responsive to South Africa's National Development Plan (NDP) 2030, laying the ground for an integrated supply and demand side strategy to meet the NDP's goals of:

[...]a dynamic and connected information society and a vibrant knowledge economy that is more inclusive and prosperous. A seamless information infrastructure will be universally available and accessible and will meet the needs of individuals, business and the public sector, providing access to the creation and consumption of a wide range of converted services required for effective economic and social participation – at a cost and quality at least equal to South Africa's main economic peers and competitors. (RSA, 2013: 190)

The policy identifies 'structural constraints' in the sector as something that an open access network could overcome, as well as the satisfaction of pent-up demand for affordable broadband. The regulatory regime will need to ensure that 'access is open to any operator or service provider on a cost-based, including fair rate of return, non-discriminatory basis' (SA Connect 2013: 9). Open access was seen as a policy mechanism to aid 'the regulator [which] by itself had not been able to bring down the prices of underlying infrastructure' (Interview, Roux, CSIR, 2016).

The sharing of resources and infrastructure, including spectrum, is further seen as a responsibility of the regulator to encourage services-based competition in the market. However, the implementation of the plan has stalled. Three years later, the first round target for 2016 of 5Mbps average user speed has not been met (SA Connect 2013: 11).

The lack of progress in implementing SA Connect can be primarily laid at the door of the current government, which, in 2014, separated the former Department of Communication into two – an old-style Department of Telecommunications and Posts, and a Department of Communications. This unravelled a decade of convergence legislation and regulations, leaving critical policy and regulatory actions in limbo.

With no overarching infrastructure plan for communication, public and private networks have developed unevenly and on the basis of very different models. The application of the open access model to South Africa, based on the current status of different elements of the value chain requires supply-side strategies to ensure coordination and integration that will allow for the seamless networks proposed in SA Connect.

MANDATORY OPEN ACCESS IN SOUTH AFRICA

Local loop unbundling and bitstream: The rationale behind local loop unbundling (LLU) is to foster competition and reduce telecommunications costs by eliminating the large investments required for last-mile infrastructure (RIA, 2010). LLU is provided for under the

2006 Electronic Communications Act (ECA) and was to support the entry of the second network operator. Despite Independent Communications Authority of South Africa (ICASA) having identified four possible options for unbundling, there are no regulations in place, but draft regulations for public comment were released on 7 August 2013 (ICASA 2013)[9]. With the copper network relatively limited and the process delayed, it was somewhat overtaken by mobile broadband, which provides access network coverage across the country with 3G and LTE networks.

National broadband wholesale company: The fibre-optic networks of the public train system, Transnet, and the power utility, Eskom, were set aside for the second network operator and were stripped out of the deal in the final moments of the transaction, which formed Broadband Infrao (BBI). Although formally an open access public company wholly owned by the state, BBI provided wholesale bandwidth exclusively to Neotel on a cost-plus basis. However, it is currently in a state of abeyance as '[it] is unable to execute its corporate plans in terms of reaching its statutory mandate because of under-capitalisation' (Interview, Nkhereanye, BBI, 2016).

Functional and structural separation: Wholesale open access networks created through structural separation (sometimes with 'one-build' rules) are generally characterised by high sunk investments that are unfeasibly replicable, and sometimes by restrictive competition that discourages investment.

In 2013, Telkom, which had been partially privatised in 1996, was required by the Competition Commission to functionally separate its activities as part of the remedies imposed after it was found guilty of anticompetitive practices. Following several proposed turn-around strategies, including complete privatisation and re-nationalisation, Telkom voluntarily undertook to separate structurally (Interview, Padayachee, Openserve, 2016).

Telkom's new 'Open Access' wholesale division – Openserve – offers broadband access to internet service providers, including Telkom, on the grounds of 'term' and 'volume'. Additionally, Telkom has decided to peer publicly with other network operators at NAPAfrica and has declared an IPConnect price reduction of up to 57% (MyBroadband, 2016). But the fibre market is growing and the plethora of last-mile fibre-to-the-premises (FTTP) companies is placing pressure on the incumbent. 'There is sufficient competition across the spectrum but it does not just come from one sort of player. With us being the largest player out there, there comes some more [pressure] like this, which compels us to up our game' (Interview, Padayachee, Openserve, 2016).

VOLUNTARY OPEN ACCESS IN SOUTH AFRICA

International data transmission: The competitive provisioning of undersea international bandwidth to the incumbent club consortium that made up the monopoly SAT-3 cable takes the form of open access network providers like Seacom, whose commercial

[9] The increased focus on LLU was reinforced by a complaint lodged by Neotel with ICASA's Complaints and Compliance Committee (CCC) in 2011, over Telkom's refusal to lease its last-mile (i.e. local-loop) and telephone exchanges to Neotel. The CCC ruled in Neotel's favour, stating that Neotel's request was valid in terms of the new facilities leasing regulations issued by ICASA. Telkom, on the other hand, argued that the imminent local loop regulations (non-existent at the time of the CCC ruling) should govern Telkom's copper infrastructure, and not the facilities leasing regulations.

logic is similar to the shared dark fibre national transmission networks described above, or the shared infrastructure consortium that operates the West Africa Cable System (WACS). Competition and the open access logic that seeks to maximise traffic on networks to optimise the return on investments have driven down prices as much as 80% (Interview, Clatterbuck, Seacom, 2016).

While the cost of international bandwidth used to be 80% of ISP input costs, it is now closer to 20% and national transmission, which has reduced far less dramatically, now makes up the significant portion of the cost for smaller ISPs that are not able to enter into mutual peering arrangements (Interviews: Brooks, ISPA, 2009; Clatterbuck, Seacom, 2016).

National data transmission: By the time the 2006 Electronic Communications Act (ECA) became operational as convergence legislation, there had been a significant amount of commercial coordination and complementarity of investments between a number of fibre networks, including: FibreCo; the joint build-out of the multiple-operator backhaul network by Neotel, MTN and Vodacom; and the Neotel and Broadband Infraco networks.

Moreover, when service providers were legally bound to acquire their backbone and backhaul networks from fixed incumbent Telkom, and later waited for the national broadband carrier to roll out its network, Dark Fibre Africa (DFA) started rolling out 8 000km of ducts and fibre in major metros and secondary cities providing wholesale dark fibre on an open access basis (MyBroadband 2014). By this time the mobile operators chose to self-provide their backhaul networks and DFA had rolled out all the major metro and intercity routes. Through this underground infrastructure, any operator with a communications license can run a fibre network.

As noted in the "Structural and functional separation" section above, Telkom voluntarily undertook to separate structurally, giving birth to its open access wholesale division – Openserve. This and other moves have kept Telkom relevant in terms of transmitting national data, but it is coming under pressure from the multitude of commercial fibre companies in South Africa.

Long distance 'inter-city' fibre-optic transmission is provided by a number of competing networks and state-owned companies. Partially state-owned incumbent Telkom's network is the most extensive, at over 50 000km of unduplicated fibre. BBI, which covers the major national routes, is the second most extensive network but is only a fraction of Telkom's. At a time when mobile and other networks and services providers were legally bound to acquire their backbone and backhaul networks from fixed incumbent Telkom, and later waited for the national broadband carrier to roll out its network, Dark Fibre Africa (DFA) started with the rolling out of 8 000km worth of ducts and fibre in major metros and secondary cities, providing wholesale dark fibre

on an open access basis. By this time, the mobile operators chose to self-provide their backhaul networks and DFA had rolled out all the major metro and intercity routes. The high-demand routes between Johannesburg, Cape Town and Durban are complemented by DFA and FibreCo; East London and Musina are serviced by FibreCo and Liquid Telecom respectively.

The co-build by MTN, Neotel and Vodacom competes with FibreCo on the main intercity routes, directing the latter to focus on secondary uncovered routes. As described above, competition in the backbone and backhaul has been driven by the commercial open access models of the dark fibre companies who need high traffic volumes to optimise investments and wholesale pricing. Through this underground infrastructure, any operator with a communications licence can run a fibre optics network.

'[O]wning a piece of infrastructure, which is so important to MTN and Vodacom that they are willing to duplicate, and by giving them that at a lower price-point by sharing it, you are effectively negating the need for them to duplicate. All of that activity lowers the input cost of the infrastructure compared to what it would be if you did not have a more open model (Interview, Hussein, FibreCo, 2016).

In the State of the Nation address in 2015, President Zuma announced that Telkom would be the preferred provider of the ZAR267 million, state-allocated network extensions to all schools, clinics and municipalities, as envisaged in SA Connect. In fact, this was contrary to SA Connect; the policy specifically proposed a more open, competitive mechanism to support the extension of broadband to under-served areas. Telkom estimated that it would require ZAR60 billion to fill the gaps in its broadband and access network and voluntarily increased its network and services separation from functional to structural, positioning it to take on the role as a national open access common carrier[10].

However, during the policy formulation process, Treasury indicated that direct state funding for the amount anticipated by Telkom (reduced at that time to ZAR47 billion) was not available – around ZAR300 million has been made available annually in the medium expenditure framework. Rather than acknowledge the extensiveness of private and public networks, SA Connect proposed a capex outlay: government will invest in broadband infrastructure through the aggregation of public sector demand and smart procurement of high capacity networks through competitive tender. Through this aggregated government demand, sustainable business cases will be enabled for network operators. 'This pooled public demand could be transferred to the open access network if it is established as an anchor tenant, described in the section on Digital Future, to guarantee significant demand for investors and thereby enhance the viability of the network' (SA Connect 2013:39).

Rather than the state subsidising builds that

[10] From a competition point of view, structural separation also prepares it better for the absorption of Infraco, as part of the intended rationalisation of state-owned entities.

> **"If the demand [in a certain area] is largely driven by a public sector requirement to roll out SA Connect and other things because the community is not economically active then rather give [the service provider] the anchor tenancy and [it] will raise the money [...] It could be for an SPV owned 100 percent by the province [...] It would be run according to those project financing principles [that would aggregate demand for high revenue]. "**
>
> *- Interview, Hussein, FibreCo, 2016*

might leave one with a series of random open access links, it is preferable to aggregate public demand and use it to leverage private sector capital and spread investment risk. As the funds available from government are way below what is required to fill the gaps in national broadband coverage, a far more viable model would be that government identifies the public points requiring connection (backbone and access) and that government competitively procures connectivity to those points.

This model leverages much smaller state open expenditure, as opposed to capex producing a much greater incentive for private sector investment. The open access logic of this commercial model, as already practised by DFA and FibreCo, is that the operator needs to get as much traffic as possible on its network in order to maximise return on its investment and reduce its debt.

FibreCo's funding structure consists of a certain number of entrepreneurs who put up a certain amount of equity and then as the management team have to go and pre-sell, design the network, cost it out, contract it, [...] go to customers and sell that upfront, get their commitment to pay us and Seacom [...] to get them to build the network within the timeline, then go to the bank to get the loan. [...] Then manage every part of the value-chain to make sure nothing slips between the cracks. (Interview, Hussein, FibreCo, 2016)

As the acting Director General of the Department of Telecommunications and Postal Services (DTPS) indicated: Commercial fibre '[...]has been one of the most phenomenal developments in the sector, a game changer, that demonstrated that open access networks are viable, unlike what the traditional operators have argued' (Interview, Mjwara, DTPS, 2016).

LAST MILE NETWORK GAPS

Fixed

The real broadband challenge in South Africa lies in the access network where historically the fixed network serviced white communities predominantly in urban areas. The extension of the copper networks through the privatisation of Telkom in the 1990s was a failure

and there were fewer people connected by the end of the extended privatised monopoly than there had been before. As a result, there was not much copper in the access network to upgrade to ADSL. Without any serious competition, it was slow to upgrade services, which ended up being of uneven quality as well as overpriced. Telkom, having staved off Local Loop Unbundling (LLU) when the second network operator was introduced, rendered fixed broadband development in the first decade of the century arduous. Demand stimulation came from the mobile operators who, with the introduction of 3G, were able to provide data at lower cost and better quality than Telkom's ADSL. This prompted Telkom to finally reduce its prices and focus on extending its ADSL customer base to around one million subscribers in 2015.

Possibly fearful of cannibalising its ADSL service and going through a management and leadership crisis following mixed signals from various government administrations on further privatisation of state holdings, Telkom was again slow to invest in fibre. The demand for fibre by business and high-end residential users was snapped up by dark fibre companies and localised providers. Fibre-to-the-premises (FTTP) is now being offered by commercial operators in addition to mobile, fixed wireless and ADSL services, but mostly to the top Living Standard Measure suburbs of large cities.

As OpenServe's CEO notes, the commercial open access models being practised in South Africa currently will not reach uneconomic areas even within metropolitan areas, not to speak of less densly populated, poorer rural areas. Even by offering anchor tenancy as an incentive to extend commercial networks to under-served areas, the network will only reach as far as existing public service demand takes it. Commercial operators believe that with guaranteed government revenue and open access practices that drive local traffic through the networks, costs can be brought down for commercial actors to meet at least some of the pent up demand in rural areas (Interview, Hussein, FibreCo, 2016).

New operators are exploiting the gap left by Telkom and the MNOs in providing fibre to the block or home, especially in high-income areas. These operators voluntarily adopt open access principles, even where there are extensive municipal and commercially closed networks, simply because it makes commercial sense to sell to as many customers as possible. This business strategy has been confirmed to help Vumatel get to the point where it is providing uncapped fibre services to various suburbs in Johannesburg at a cost of R429 per month. (interview, Hawthorne, Acacia Economics, 2016).

Mobile

These fixed broadband business models are being complemented by the MNOs who can help extend the network with their heavy infrastructure investments and expanding revenue. With mobile data taking

responsibility for growing the retail market in SA – 30% year-on-year growth and making up 61% of total retail revenue in 2013 – many are looking to the MNOs to enable further market growth on the back of mobile applications and content (Africa Analysis, 2014).

Achieving this in a context of sufficient competition, whilst avoiding those unintended consequences of delayed investment, requires the allocation of high-demand spectrum and not a mandatory open access wireless regime that siphons spectrum threatening the incentive to invest. It is also dependent on higher tower density, which requires additional investments by MNOs (CRASA 2015).

It is for this reason that an open access wireless network was mooted in the allocation of high-demand spectrum (2.6GHz and digital dividend spectrum in the 700MHz and 800MHz bands). The policy had initially proposed an open access wireless network to make better use of limited spectrum and to bring LTE to rural areas. The Department of Communications in South Africa was advised by an international advisory expert group to hold off mandating the open access wireless network in the policy. As a result, the policy requires that an open access wireless network be investigated as a solution to the coverage and cost of mobile broadband. The responses from high-level interviews to the idea of open access network are very mixed.

What the government of South Africa is contemplating in the meantime is how to oppose the dominance of Vodacom and MTN (76% combined market share), which they believe have not delivered affordable services to the country (without effective regulation) (Interview, Mjwara, DTPS, 2016). The ICT Policy Review was before Cabinet in July 2016, which meant that decisions had not been finalised at the time of writing by the acting Director-General, Joe Mjwara, who said that what had been proposed was an open access regime applicable to all public operators – the next stage of telecommunications reform in the country, which had been set in motion with the separation of network and services licences under the Electronic Communications Act 2005. Mjwara said all public operators would be expected to separate their networks and services voluntarily (as Telkom was doing) so that other operators and service providers could have open access to them. The regulator would be required to oversee this and monitor progress towards voluntary open access, but if operators resisted this, mandatory open access would be imposed on them. This open access regime will apply irrespective of technology, for all segments of the market. Mjwara said the issue of an open access wireless network was still to be decided by Cabinet, but the Ministry had a different view on the desirability and viability of it from various consultants appointed to advise government on the matter, as it was required not only to look at the optimal business case, but other social and economic issues, too.

Mobile operators, nevertheless, believe government has reached a position on open access

in relation to wireless networks: Nkateko Nyoka, Chief Officer of Legal, Regulatory and Risk, Vodacom SA, explains what Vodacom understands the position of government to be:

[Government] has come to the conclusion that government needs to take the country in the direction of a single wholesale network which will be co-owned by government and the operators. So as a starting point, they are saying all available spectrum as of today which has not been allocated will be given to a consortium that is going to construct this network. [...] Government will possibly have a golden share but [...] the troubling part of the proposal is they are saying over time, their expectation is that the spectrum that has already been allocated to operators will have to be moved to that consortium. So over time what is going to happen is, you are never going to have network-based competition, there will only be one common network and this common network is going to be owned by different investors, including government. (Interview, Nyoka, Vodacom SA, 2016)

A successful open access wireless network has yet to be demonstrated. In Kenya and Rwanda, efforts to set up an open access wireless carrier network have collapsed. In Kenya, efforts to set up an open access wireless carrier network have collapsed. The model was dependent on the participation of the dominant operator, Safaricom, which withdrew causing the collapse of the initiative. There were delays in the implementation of the Mexican model and the extensive adjustments required to the constitutional and legal environments have kept the jury out regarding the model's viability. In the public consultation for SA Connect, Vodacom and MTN publicly declared that, if they could not control the spectrum, they would not invest in any consortium, and if the network would be providing low-cost spectrum, they would simply lease spectrum from it and there would be no need to invest further.

Those in favour of open access point to the success of undersea cable consortia in commoditising international bandwidth. Those opposed to such a network argue that the conditions for long-term, relatively static undersea cable investments that lend themselves to contracting are quite different from the agility required by wireless networks.

While this type of strong state intervention and ownership is likely to create disincentives to the massive investments historically made by the mobile operators, there is scope for regulatory intervention to ensure rural areas receive their share of broadband connectivity. If network-based competition is protected in the most lucrative areas of the country, then access to those markets and the relevant spectrum can be used as incentives to servicing poorer areas first. One common practice of this form is the attachment of licence conditions that proscribe the coverage of rural areas prior to the legal network roll-out in plush suburbs and cities. A common network is also possible if constrained to servicing the uneconomic market spaces (Interview, Nyoka, Vodacom SA, 2016).

The absence of coordination and signalling by government to stakeholders, including the regulator, and the regulator to industry, were evident in the long-awaited announcement by the regulator in July 2016 that it was auctioning the high-demand spectrum in the 2.6GHz and 700 and 800MHz bands (the so-called digital dividend spectrum). After withdrawing its last auction process six years ago, on the grounds that it needed to await a policy directive from government, it has decided to proceed now without reference to the spectrum policy government claims it knew was being finalised and was shortly to go before Cabinet for approval (Interview, Mjwara 2016). Not least of all, government has proceeded with legal action to prevent the auction going ahead (Minster of Telecommunications and Post vs ICASA and others, 8 August 2016).

The terms of the auction included a ZAR3 billion reserve price for the two best lots of spectrum, which only the two dominant operators could likely afford. After entering the market in 2001, Cell C has battled to earn the legitimate market place it now holds (21% of market share) (Africa Analysis, 2014). Fierce price competition and resource management has kept it growing in SA but the demands required to compete in such an auction could be too high.

For the operators eyeing the spectrum, the auction requirement that at least three mobile virtual network operators (MVNOs) be accommodated on their networks appeared onerous, and the market was arguably competitive enough without requiring new entrants. This, however, is intended to meet economic empowerment requirements. At the time of writing, the Minister of Telecommunications and Posts had begun legal proceedings to sue the regulator, ICASA. The Acting Director-General of the DTPS, Joe Mjwara, said ICASA had contrived an urgency of the auctioning of spectrum that did not exist and that, following the agreement in 2013, spectrum would not be parcelled out for assignment. The consolidated available bands, including the not-yet-available digital dividend bands – 700MHz and 800MHz bands – would be assigned at the same time, holding back the already available 2.6GHz band, which has been withheld at great cost to the roll-out of LTE services across the country.

Mjwara said this could not be done before the December 2015 World Radiocommunication Conference (WRC-15) and on that basis government had been finalising policy that was before Cabinet and was expected to be approved within a year of the WRC-15. As the spectrum was not yet available, there was no urgency. He said the haste '[...]with which ICASA wants to auction the spectrum puts the vested interests of two or three operators before the national interest, which must take into account constitutional and administrative issues' (Interview, Mjwara, DTPS, 2016). He said the likely outcome of the ICASA auction, if it went ahead, would be the most retrogressive reform the country would ever

have seen – it would simply reinforce the status quo in terms of market dominance and fail to meet empowerment and affordable access objectives.

Whatever the assignment of spectrum, no artificial scarcity should be created to push up the price but there should be sufficient room in each block for operators to evolve their services (a maximum of three licenses instead of the current four). If one of those is to be an open access licence it should have at least one of the current licensees with competitive experience in it, and spectrum trading should be permitted to rectify an inefficient spectrum assignment, with controls on speculation or hoarding. For wholesale ex ante regulation, the impacts on high levels of investment also need to be carefully considered.

METROPOLITAN AND PROVINCIAL NETWORKS

Most of the major municipalities have considerable core network infrastructure, dominated by Telkom's network infrastructure developed over many years, and many municipalities have built their own municipal fibre networks to serve the needs of local government. Although some of these are available to third-party traffic, they are not built on open access principles.

Many have now added public Wi-Fi at major public buildings and some even in public transport. Tshwane (the political capital of South Africa) arguably has the most developed public Wi-Fi. Herotel built and operates the network (as Project Isizwe) with funding from the City of Tshwane – a model different to that of the City of Cape Town, which is dedicated to rolling out a mesh network to fill all the uncovered spaces throughout the city. Another model is the Western Cape's broadband project, which was to have been an open access public-private partnership (PPP). Ultimately the project was awarded through the State Information Technology Agency (SITA) to Neotel. In the tender process, the open access regime the provincial government was seeking to create in order to supply ubiquitous broadband and stimulate investment and innovation in the Western Cape was lost. The contents with this specific aim were withdrawn late in the process. Neotel's extension of their network is nevertheless meeting the technical requirements to connect government and provide wholesale as well as end-user services, but some of the social and economic spin-offs anticipated with the open access PPP have not come to be (Interview, Johnson, Western Cape Government, 2016).

While these metropolitan and provincial developments have improved broadband connectivity and overall city competitiveness in the absence of national policy and implementation, the lack of coordination between national, provincial and local implementation has resulted in the duplication of effort and networks and created a bottleneck in private sector roll-out through protracted bureaucratic processes. While duplication of effort and resources is not first prize, and to be avoided

where possible, it can be a part of a healthy and competitive environment created by regulation to reduce prices and improve access.

This model of subsidisation has not directed the market and its actors to this end, but the competing metro networks have enhanced the capacity of cities and somewhat reduced prices. On the one hand, the absence of such interference could possibly have allowed the market to fill the gaps and duplicate where it was economically attractive to do so – with the associated pockets of connectivity and slightly higher prices – or, regulation could have restricted providers from offering end-user services by only allowing government fibre operators to sell their network access to retailers.

The Council for Scientific and Industrial Research (CSIR) has been providing technical support to the DTPS and to the Presidential Infrastructure Commission for Strategic Infrastructure Project (SIP). Kobus Roux of CSIR describes how the cities were used to try and demonstrate the benefits of bulk-buying capacity, rather than building networks where they are available. He says the view was: 'Let us get some cities connected and try and gear the government to buy in bulk, but in the longer term the conversation still needs to take place regarding how we build the network' (Interview, Roux, CSIR, 2016).

Within metropolitan networks, the process of aggregating demand from government departments has restructured the incentive framework for building networks. While the investment is still massive, it can be off-set by the guarantee of minimum demand, allowing network operators to finance the build based on future income. This model has been transferred from the public sector to the private sector where network operators approach residential suburbs and build FTTx networks based on the guarantee of a minimum number of subscribed households. These networks are generally based on open access principles because the operator needs to recoup their investment as soon as possible.

From this insight, the possibility of open access interference inhibiting access more than the natural market means appears probable. Keeping the market open to competitors encourages more investment and access than enforcing open access principles through political procedures. This finding will be assessed in the next section.

SUMMARY

Wholesale open access networks created through structural separation (sometimes with 'one-build' rules) are generally characterised by high sunk investments unfeasibly replicable, and sometimes restrict competition, discouraging investment.

By the time the 2006 Electronic Communications Act (ECA) became operational, there had been a significant amount of commercial coordination and complementarity of investments between a number of fibre networks, including FibreCo; the joint build-

out of the multiple-operator backhaul network by Neotel, MTN and Vodacom; and the Neotel and Broadband Infraco networks.

At a time when mobile and other networks and service providers were legally bound to acquire their backbone and backhaul networks from fixed incumbent Telkom, and waited for the national broadband carrier to roll out its network, Dark Fibre Africa (DFA) started rolling out 8 000km of ducts and fibre in major metros and secondary cities, providing wholesale dark fibre on an open access basis. By this time, the mobile operators chose to self-provide their backhaul networks and DFA had rolled out all the major metro and intercity routes. Through this underground infrastructure, any operator with a communications licence can run a fibre optics network.

The gap in the fibre market left by Telkom and MNOs has sufficient demand to incentivise voluntary open access adoption by newcomers. This strategy is supported by the competitive need to provide services to as many customers as possible, as evidenced by Vumatel's success.

The national integrated ICT policy white paper was finally released in October 2016, after considerable delay. The paper mandates an open access, wholesale wireless network with exclusive rights to high-demand spectrum (RSA, 2016: 91-92). This is intended to break the stranglehold of the dominant mobile cellular operators and allow for the entry of new players into the telecommunications market. Government also intends to recall all spectrum previously awarded to mobile operators (RSA, 2016).

The policy claims that such open and shared networks, through service-based competition, produce high-quality and innovative products at affordable rates and drive broadband into under-served areas.

There are a number of concerns that arise from a monopoly open access wireless network, but the fundamental question is whether open access networks in and of themselves produce these positive outcomes — and if this pertains to wireless networks, where it has seldom been applied. This raises a number of other concerns including the lack of evidence to support the creation of an exclusive open access network; whether there is the institutional capacity and sophistication to set up a viable model; if the mobile market is sufficiently uncompetitive and dominance in the mobile market severe enough to justify the restructuring of the market; and in the absence of such dominance being determined by ICASA through the required legal processes, if the state is not opening up itself and the regulator, who is mandated to licence a consortium to operate the network, to protracted legal challenges.

Even without legal review, there are concerns that the process to establish the network will further delay

the release of the high-demand 2,6GHz spectrum band, the release of which has already been delayed by more than five years. Operators need urgent access to this band to evolve their businesses cost effectively to meet the pent-up demand for data. Other concerns relate to the opportunity cost of such delays, not only for the sector but the national economy at a time the kind of stimulation this would provide is most required.

Arguably of greater concern is the intention by government to recall spectrum already allocated to mobile operators and the negative impact of this on the credibility of the state commitments and on investment in this sector when the country is facing a possible downgrade by rating agencies.

Other concerns relate to the feasibility of the open access network itself, the nature of the consortium to manage the network and the creation of the necessary incentives for the significant investment required to underpin service-based competition. Let us consider some of these concerns.

As indicated in this evalutation, despite the policy currency of open access in ICT policy, there is little evidence to support the claim that open access networks ensure public policy outcomes of increased competition in services, improved efficiency, decreased prices, high quality and universal service. The state-owned open access wholesale broadband company, Broadband Infraco, set up with these objectives in 2007, has not realised any of them.

In fact, a growing body of evidence from mature markets indicates that the adoption of certain mandatory open access network strategies that may produce some of these outcomes — for example improve prices or access to ICT — but this may come at the expense of other critical objectives such as investment and innovation.

Furthermore, while there may be some examples of successful open access fixed networks, voluntary and mandated exclusive wireless open access networks as proposed in the new policy have not yet been implemented successfully anywhere in the world.

Mexico and Kenya are cited as markets where open access has been identified as a remedy for extreme dominance, and where mobile is the predominant form of access to broadband. But efforts to implement open access wireless networks for high-demand spectrum to increase competition in these markets have not been successful. In the case of Kenya, the dominant and significantly state-owned, operator was able to extract itself from the open access network, rendering it unviable. In Mexico, the extensive constitutional and institutional adjustments to enforce the open access network (the digital dividend 700MHz band only) has resulted in a legal and regulatory maze that has delayed the process for years. The project now appears to be unravelling.

Although the South African market is concentrated, it does not share the extreme

dominance found in either of those countries (over 75% at the time). Nor does the dominance of either Vodacom, with nearly 50% mobile market, and MTN, with more than 30%, extend across the fixed and mobile markets. With four players in the market, a mobile virtual network operator and several niche MVNOs, it could be made more competitive and better directed towards public policy goals if regulated effectively.

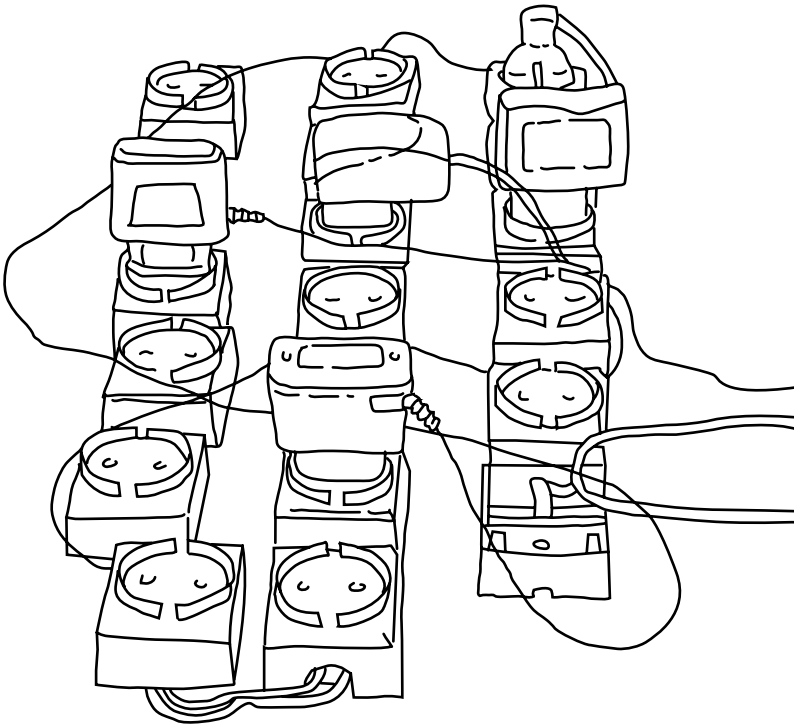
Access to mobile facilities, possibly even accessing the access point name gateway, would allow independent data services to run on top of the mobile network and regulated internet protocol transit costs could contribute to the competitiveness of the sector. But in South African law, as it currently stands, this regulatory intervention can only happen after ICASA has undertaken a market review in order to ascertain bottlenecks and dominance. This aligns with competition law and practice internationally, where open access is mandated only as a remedy in monopoly markets or when abuse of dominance is demonstrable. The failure of ICASA to do so on the basis of two resource-intensive market reviews undertaken in 2008 and 2013 is what has permitted operators to act with regulatory impunity and has resulted in the lack of competitiveness of the market and the search for other mechanisms by government to achieve national policy objectives.

Although mobile operators might not have met certain public policy objectives, they have been highly successful from a network investment and coverage perspective, bringing about the mobile revolution that has brought communications to masses of people in the country and across the continent for the first time. The primary challenge for government in ensuring the feasibility of an open access wireless network is the development of an incentive strategy that will replace the billions of rand of investment — more than R10 billion each in the case of Vodacom and MTN this year alone — that is responsible for delivering services to South Africans. Though prices are high and undoubtedly require more effective wholesale regulation, competitive investment in infrastructure is responsible for the pervasiveness of mobile networks in Africa.

The policy *does* identify the investment incentive of reduced spectrum fees for the open access network. These are significant cost drivers for operators, but it is a premium they are prepared to pay for control of the spectrum — it is the core of the business. Even at cost, spectrum an operator cannot deploy competitively may not be worth investing in at all. And if there is no control of spectrum and it can be cheaply sourced from the open access network, what is the incentive to invest in the network?

And then there is the vehicle for the open access network itself. The policy mandates the regulator to license a consortium based on successful undersea cable consortia, such as WACS, as well as the open

access model on which Seacom is operated. The differences lie in the fact that there are competing cable companies and it is this that has driven down international bandwidth prices. Undersea cables are typically operated as consortia of experienced, deep-pocketed operators, which reach a once-off, 25-year agreement on an end-to-end cable investment, with possibly dozens or hundreds of wholesale customers at most. A mobile wireless network is dynamic, operating in a fast-changing, highly competitive environment with millions of customers.



CONCLUSIONS

NIGERIA

The Nigerian telecommunications industry is moving, albeit slowly, in the direction of open access. Though retail prices are declining and data services are improving noticeably, wholesale bandwidth is still expensive and there is a need for market intervention by the regulator to improve the quality of upstream competition. The fact that wholesale providers of bulk bandwidth are able to play in the retail mobile data market and potentially stifle competition in this market is not as great a threat as it appears. The biggest constraints to open access are political in nature, particularly those relating to how operators can obtain and secure right-of-way in an inexpensive way and without all the challenges they currently face with government and local communities.

The NCC clearly believes in open access and says it is benchmarking against Malaysia, Singapore and Australia, though it is unclear why these specific countries have been selected. While there is no single document that consolidates regulatory principles, the regulator actively promotes and encourages the open access principles of pricing transparency and non-discrimination. A greater push in this direction will depend on the regulator's understanding of what market and competitive gaps need to be addressed, as well as the outcomes it seeks to achieve.

The current evidence suggests that market players in wholesale bandwidth provisioning do not appear ready to open network access to downstream competitors in a fair and reasonable way, except through regulatory remedies. Regulatory intervention is usually necessary when markets are not efficient as far as stakeholders and consumers are concerned. Whatever regulatory steps would be taken to improve the openness of the upstream market cannot be divorced from the government's spectrum strategies, which are presently ineffective, as there are many unlicensed intermediaries active within the downstream markets.

SOUTH AFRICA

Without radical reform to the sectoral institutional arrangements, ICASA is not institutionally capable of managing and overseeing the implementation of open access principles in the ICT market. Far less complex interconnection and facilities-leasing regulations, market reviews to establish dominance, and pricing reviews have not been successfully regulated. More than two years after SA Connect there has been no development in national broadband roll-out.

Various open access models adopted by undersea cable companies have driven up bandwidth capacity on the continent and dramatically reduced wholesale prices, making the cost of national IP transit a greater

cost for service providers than international bandwidth. National transmission prices, too, have come down as a result of commercial open access companies, such as DFA and FibreCo having created competitive options to Telkom on main intercity routes, and driven network extension into some secondary cities and under-served regions. These commercial open access companies have no need of mandatory open access as the business model requires they get as much traffic on their network to ensure quick return on investment that enable them to raise further capital. It could be made a requirement that the services be provided on an open access basis; but under the current regime, the non-open access provider as a public operator would be required to provide access on fair and non-discriminatory terms, anyway.

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 under-served areas, where there is no backbone yet, public sector demand (school clinics, municipalities and public Wi-Fi) can be offered as anchor tenancy to incentivise investment in sub-economic areas. By guaranteeing the demand, private sector players are able to secure the funding needed to roll out infrastructure. Open access principles, in this context, make business sense because providing wholesale access increases revenue.

With only one million ADSL subscribers and the fibre market nascent, together with the failure by the regulator to introduce LLU, the access network is predominantly serviced by the mobile operators. Mobile operators have invested heavily in the wireless networks, in addition to building their own fibre backhaul networks. This has dramatically driven mobile broadband uptake but prices remain relatively high. Operators have also been unable to access LTE spectrum necessary for the development of their businesses in the data intensive era they are moving into. The recent announcement by the regulator to assign the high-demand spectrum in the 2.6GHz and digital dividend bands has nevertheless been opposed by the Ministry of Telecommunications and Postal Services, which has sued ICASA to prevent the auction proceeding. Moreover, it has subsequently become evident that the intention of the Ministry's White Paper is to use all available spectrum for a single wholesale open access wireless network, which would severely compromise the incentive to invest.

As the cost to the South African economy of not realising this spectrum is high, a less risky and still public-interest approach would be to auction the spectrum with roll-out conditions that require certain areas be serviced before the spectrum can be used in the more lucrative markets. This model has worked successfully in environments as diverse as Sweden and Mozambique.

As discussed above, the complexities of these are extreme and require sophisticated understanding of the mobile market. The unintended consequences and

potential policy and regulatory failure being observed in Mexico, Kenya and Rwanda (all with far less competitive and concentrated markets than South Africa) are a caution to policymakers and regulators.

And then there is the anxiety about whether there is the institutional capacity and sophistication to oversee the complexity of creating a viable single, open access network. The absence of state coordination in relation to spectrum, first with the digital television migration mess and then the five-year-long ministerial delay in issuing a policy directive on the release of high-demand spectrum — which has now resulted in a legal standoff with the regulator — is a big worry.

Even with the intended rationalisation of the regulator into a specialised economic sector regulator, as proposed in the new policy, there is little to suggest that this necessary administrative buttressing will make such a process work.

FINAL REMARKS[11]

This study reveals how the popularity of applying mandatory open access to networks derives primarily from open access regulation in the European Union, multilateral agencies, as well as development bank reform programmes, and has not transformed easily into fixed broadband network extension in Nigeria and South Africa, nor open access wireless network extension. One significant difficulty with open access implementation is that of the necessary stakeholder buy-in. In liberalised markets the concern is with buy-in because consortium models, in addition to structural/functional separation, jeopardise the incentive to invest. South Africa's mobile market adds to this evidence with the Vodacom-MTN duopoly clearly making the case for accessing wholesale networks downstream to save costs, rather than investing in a shared pool.

Building on the above point, proactively regulating the market (albeit not necessarily in an ex ante fashion but more in a timely and considered manner) with apt appreciation of the market's bottlenecks and exhibitions of dominance is preferred to holistic sectoral overhaul. The principles of price transparency and non-discrimination are indeed far-reaching and ought to be practised by all wholesale providers under a system of open access regulation but it is up to the independent and well-informed regulator to know why, where and how the unique strengths of an ICT market can be preserved (sometimes through forbearance) and how its weaknesses can be overcome with strong and strategically targeted action. Looking at the case of Nigeria, for example, open access does not reach its potential by unnecessarily changing the licensing regime when it is rather the means of providing right-of-way at the local level that is holding back fair and equal access. Nigeria's adoption of open access has not been clearly codified and implemented, and has

[11] *Some of this research has been incorporated by Alison Gillwald into a chapter written for a book by Smith, M. and Seward, R. (forthcoming) titled Open Development 2, MIT Press: Cambridge. Some of the research for that book has informed this chapter.*

not brought down wholesale and retail prices in the ICT sector. Improved regulatory clarity and strength is required for full implement – qualitites that may be lacking in the NCC.

The same can be said of spectrum allocation in South Africa. Withholding spectrum in the name of open access implementation does not create the intended market fairness and competition. This is instead turning open access upside down, since accessing quality mobile networks would be improved by simply auctioning the spectrum in the first place. Additionally, in order to meet national coverage objectives, licensing conditions could be used to incentivise coverage of uneconomic areas by proven and capitalised operators, as opposed to hoping for competition and investment forces to align and supply broadband services through a consortium or another unproven model. This would place too much on open access's mandate, especially since markets with more regulatory strength and maturity have failed.

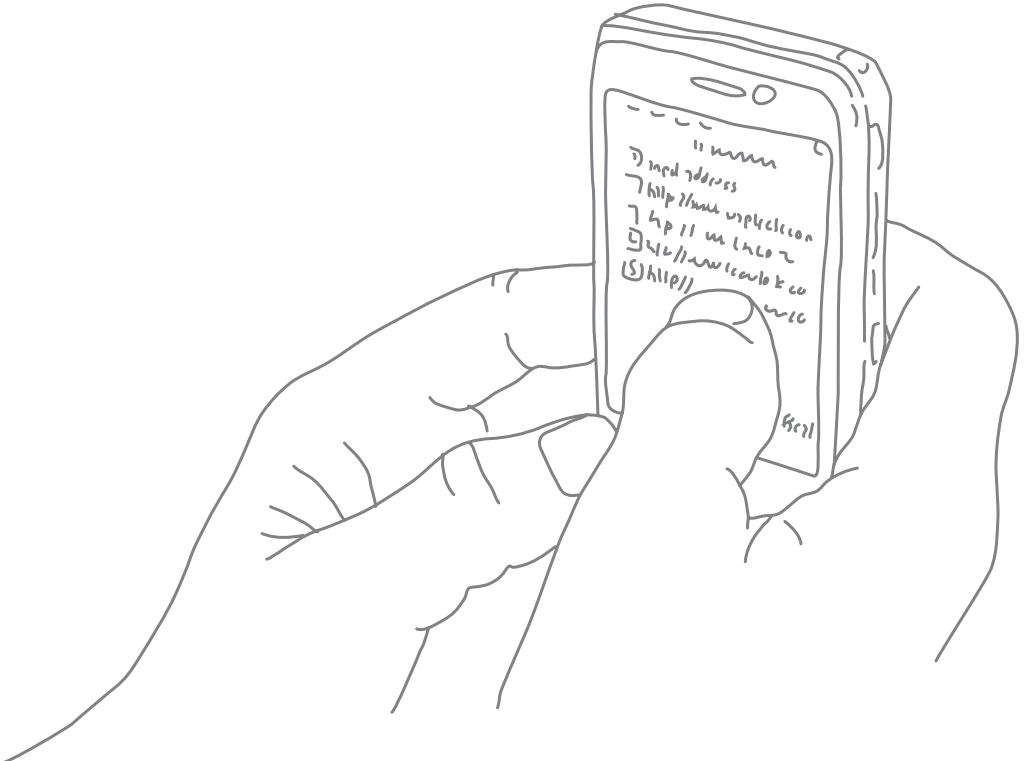
Open access cannot provide an overarching framework for achieving affordable universal service; and as a concept still in refinement, it should continue to be debated and considered on a case-by-case basis. Given the right conditions, some states may yet make openness work for them, provided they accurately account for what the market needs and what it can handle – both from public and private stakeholders.

Both the NCC in Nigeria and ICASA in South Africa have failed their respective sectors in numerous ways. Nevertheless, the broadband sector in South Africa has discovered a way of adopting open access principles voluntarily. The fixed wholesale market is budding with competitive operators who, thanks to the financial pressure of capitalisation, have a self-induced need to aggregate as much demand as quickly as possible. This means that the likes of DFA, FibreCo and Vumatel, have no choice but to offer transparent and non-discriminatory pricing to fixed-network operators and internet service providers. As an indirect result of this, the competitive pressure in the national data transmission market has compelled Telkom to review its strategy in the market and adopt an open access model. It has undergone a voluntary structural separation of wholesale and retail divisions that it hopes will overcome some of the negative perceptions of it in the market, associated with its anti-competitive behaviour.

Naturally, this model creates incentivises inter-city roll-out as well as urban expansion but, in addition to the odd duplication of networks, demand (or the lack thereof) will eventually prevent further expansion into less-profitable and difficult-to-reach areas. This need not become an automatic problem for the once automatically advantageous open access regulatory regime. Instead, the same model can be induced with aggregated public demand in such areas: if anchor tenancy is offered

to those willing to extend infrastructure and have their investments paid off over a slightly longer period of time. This would allow them the chance to reach those areas for the first time.

In the context of limited capacity and resources, alternative approaches are needed that leverage private capital and skills, reduce regulatory risk, and use large public sector demand for broadband as an incentive for private sector investment. Thus, like many other popular policy concepts, open access can be used to produce positive outcomes, but requires knowledge of the political economic conditions under which it would work best, if at all.



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LIST OF INTERVIEWEES

SOUTH AFRICA

Byron Clatterbuck
CEO
Seacom

Ryan Hawthorne
Economist
Acacia Economics

Arif Hussein
CEO
Fibreco

Jo-Ann Johnson
Deputy Director-General
Western Cape Government
– Department of Economic Development and Tourism

Joe Mjwara
Acting Director-General
Department of Telecommunications and Postal Services (DTPS)

Phatang Nkhereanye
Regulatory Affairs and Broadband Infraco
Government Relations Manager

Nkateko Nyoka
Chief Officer of Legal, Regulatory and Risk
Vodacom SA

Pranesh Padayachee
Chief of Sales and Marketing
Openserve

Herman Pretorius

Kerron Edmunson
Regulatory Affairs
CellC

Graham Mackinnon

Kobus Roux
Researcher
Maraka Institute: CSIR

NIGERIA

Yemi Tanimomo
Product Specialist
MainOne

Dipo, Femi, and Akintola
Sales Team
Glo-1/Glo Broad Access

Barr Kola Fayemi
Legal Adviser
Vodacom (WACS submarine cable)

Funmi Omoliki
Market Analyst
nTEL (SAT3 submarine cable)

Wande Adalemo
Former CEO
Oxygen Broadband

Munachim Nnukwu
Compliance Officer
Nigerian Communications Commission

Olusola Teniola
President
Association of Telecommunications Companies (ATCON)

Gbenga Adebayo
Chairman
Association of Licensed Telecommunications Operators (ALTON)

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