WITS SCHOOL OF GOVERNANCE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SA Future Economy

Digital Infrastructure

The role of public-private partnerships in mitigating the digital divide

Gracelin Baskaran

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Key Recommendations

1. ***Use public subsidies to incentivize digital inclusion while strategically encouraging competition***

   Global experience has shown that in areas where returns on digital infrastructure investments may be lower (compared to high-income, densely crowded areas), alternative forms of financing have been used to prevent these areas from becoming digitally excluded. One such instrument is direct subsidies to build digital infrastructure. But the allocation of subsidies must be carefully managed to prevent an adverse effect on the incentives of private firms to invest.

2. ***Undertake a mapping of service, infrastructure, demand and investments.***

   Data is the cornerstone of creating a competitive, digitally inclusive country. A comprehensive mapping of the various components – infrastructure, availability of broadband services, demand and planned investments – is critical to enabling efficient public and private sector decision-making. Globally, mapping is often done as a joint public-private effort, with national authorities overseeing the collection and dissemination of data, which is largely gathered by the private sector.

3. ***Utilize residential/business Wi-Fi sharing: create a system in which customers can share a portion of their home Wi-Fi bandwidth in exchange for free access on shared broadband connections while they are on the move.***

   This approach offers an incentive to increase fixed line bandwidth and reduce reliance on mobile data . In this model, fixed bandwidth customers can share a portion of their home Wi-Fi bandwidth in exchange for free access on shared broadband connections in other locations h domestically and in other countries. A separate Wi-Fi signal is created for the part of the broadband connection that will be shared with other customers, which ensures a safe home network for the individual customer. Users do not just get internet at their homes but also while on the move by sharing with other users.

Newlands is a beautiful, lush suburb of Cape Town. It sits at the foot of Table Mountain and boasts both the stunning Kirstenbosch National Botanical Gardens and Newlands Forest. The last South African census found that 83 percent of residents have internet access. A twenty-six minute drive from there sits Enkanini, an informal settlement in the township of Khayelitsha. Here, just 23 percent of residents reported having internet access. These examples are not isolated – the areas with the lowest reported internet access near Cape town were townships such as Nyanga, Khayelitsha, Gugulethu, and Philippi, with less than 25 percent of residents having access to internet. In contrast, upmarket areas such as Rondebosch, Rosebank and Blouberg Rise were amongst the most connected, with over 80 percent of residents having internet access. This is the "digital divide." The term refers to the gaps in information and communication technology (ICT), that threatens those who lack access.

The reality is that the digital divide, like other infrastructure gaps, is deeply reflective of the systematic and embedded nature of inequality in South Africa. The digital divide is an infrastructure gap that deepens the inequality between townships and suburbs in several key ways: (i) human capital development, by limiting education and training opportunities; (ii) income and social mobility, by suppressing growth of micro, small and medium enterprises (MSMEs); (iii) competition, research shows that in South Africa, the introduction of high speed high internet was associated with a significant increase in net firm entry; and (iv) employment, as high speed internet access increases firm entry, productivity and exports, and has been show to increase employment, particularly in higher-skill occupations (Hjort and Poulsen 2019)

Covid-19 has emphasized the importance of bridging the divide. Digital infrastructure has played a critical role in enabling governments, businesses, and society to continue operating amidst social distancing and lockdown requirements. The regulator released additional spectrum to operators to help them keep up with the increase in data that resulted from the lockdown. Digital campaigns have played an important role in raising awareness and mobilizing people. During the months of lockdown orders, there was a rapid and sustained increase in data traffic. For example, internet exchange points in Cape Town, Johannesburg, and Durban showed an increase of 30 percent in internet traffic at the onset of the lockdown (World Bank 2020:95). South Africa is still experiencing higher internet traffic, at around 45-48 percent above the pre-lockdown period (ibid). But as South Africa turns an eye towards economic and financial recovery, tapping into two of the other two pillars—digital skills and digital financial services—is important to strengthen overall resilience of individuals and household.

The expansion of the digital economy is a core part of the Government of South Africa's Covid-19 economic reconstruction and recovery plan given its scope to enable all types of economic activity by "reducing businesses costs, enabling better government service provision, increasing productivity, encouraging innovation, reducing unemployment, and providing the poor with access to productive opportunities." The Reconstruction and Recovery Plan highlights the significant potential of the digital economy for unlocking inclusive growth. Key actions planned by the Government of South

Africa to promote a competitive, digitally inclusive environment in the Reconstruction and Recovery Plan include: (i) Releasing high demand spectrum to individual Electronic Communication Network Services (iECNS) license holders by December 2020; (ii) Licensing iECNS for the Wireless Open Access Network (WOAN) and ensuring that licensing of spectrum is set aside for new entrants; (iii) expediting digital migration by March 2021 and (iv) providing learners and workers with tools and training to be ale to learn and work online (GoSA 2020, 31-32).

The process of bridging the digital divide between townships and suburbs is inextricably linked to facilitating inclusive economic growth and facilitating job creation. The World Bank estimates that 38 percent of South Africa's working age-age population, and 60 percent of the unemployed, reside in townships and informal settlements (World Bank 2014). This paper focuses on expansion of digital infrastructure. It does this by (a) examining how other countries have created an environment which offers universal broadband access and promotes competition through a combination of private investments and state subsidies; (ii) looks at how different countries have utilized Wi-fi sharing infrastructure to reduce reliance on mobile data and increase benefits of fixed line bandwidth. This paper offers three recommendation to reducing the digital divide through an expansion of infrastructure.

Infrastructure

A report by the World Economic Forum asks an important question: "Who is responsible for developing the digital infrastructure that society now counts on to support the exponentially growing traffic that uses it?". I believe the answer is tucked into a five-year old paper. The Development Committee[1] (2015) paper 'Billions to Trillions: Transforming Development Finance,' highlighted that the Sustainable Development Goals marked a shift from needing billions of dollars in official development assistance, to needing trillions. And while the largest supply of development resources remained domestic public spending, the greatest area for expansion was unlocking the transformative potential of the private sector. However, sole private sector solutions are not always feasible, particularly in places where demand may be low and initial capital investments high. Acknowledging that there is significant heterogeneity in the commercial viability of townships—and no 'one-size-fits-all' solution—this section explores alternative financing and infrastructure setups. .

Fixed line bandwidth

In recent years, reducing the cost of mobile data has been a key avenue for bridging the digital divide. For example, in 2019, the Competition Commission announced several measures to provide relief to low-income clients: Vodacom and MTN were required to reduce tariff levels and align their headline pre-paid sub-500 MB, 30-day prices with similar post-paid packages, and all operators were mandated to offer "lifeline packages" of daily free data to ensure access on a continuous basis, regardless of income level, and all mobile operators were mandated to adopt a zero-rating of content from educational institutions and public benefit organizations within three months.

[1] Prepared jointly by the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the European Investment Bank, the Inter-American Development Bank, the International Monetary Fund, and the World Bank Group

Still, there was a gap. According to an analysis of worldwide data costs published earlier this year by Cable.co.uk, the average price of 1 GB in SA is R88. These prices ranked South Africa at 148 out of 228 countries for mobile data prices (228 being the most expensive?). Much of Sub-Saharan Africa was priced cheaper than South Africa, including Tanzania (23rd), Kenya (41st) and Nigeria (58th). And the poor are often priced out of connectivity given that at present, about 95 percent of all internet connections are through mobile networks (Paul Budde 2019).

But the digital divide is still strong. And research by Hawthorne and Grzybowski (2019) suggests mobile networks are not enough to bridge the digital divide in South Africa. The alternative—fixed line bandwidth—remains very limited. In South Africa, only 10 percent of households report having access to the internet at home, compared to nearly 50 percent across developing countries. A recent study of multiple African countries shows that the expansion of fixed broadband internet has enabled more rapid job creation and overall economic activity (Hjort and Poulsen 2019). Fixed-line bandwidth has several key benefits. First, it has substantially lower prices per unit, given that it's usually offered on an uncapped basis and can have multiple devices/users per connection. And second, in the Covid-19 pandemic era, it enables working and studying from home, which for most, has become part of the new norm.

Although fibre costs have come down, it is still expensive: The International Finance Corporation estimates that 1 km of fiber on the continent costs $30,000. Africa still needs 500,000 km of cable to achieve full connectivity, which would cost $15 billion. The rollout of optical fiber for high speed broadband has traditionally been viewed as being viable in densely populated, high-income areas. As a result, a key challenge is digital inclusivity is supporting the roll out in historically excluded areas while preserving private incentives to invest.

Recommendation 1: Use public subsidies to incentivize digital inclusion while strategically encouraging competition

The Government of South Africa's Economic Reconstruction and Recovery Plan notes that "Necessary interventions will be made in order to increase broadband connectivity" (GoSA, 2020). But it does not detail what these interventions will look like, and how broadband will be made available in areas that may be less commercially attractive to the private sector. Global experience has shown us that in areas where returns on investment may be lower (compared to high-income, densely crowded areas), alternative forms of financing have been used to prevent these areas from becoming digitally excluded. This includes direct subsidies (EU, US, and Chile), indirect subsidies, such as lower interest rates or tax breaks (Japan), public private partnerships (Mexico) and publicly built networks (Australia) (OECD 2014b).

The allocation of subsidies must be carefully managed to prevent an adverse effect on the incentives of private firms to invest. For example, if the government provides an operator with a subsidy to build infrastructure where one has already been deployed with private financing, thus reducing the value of the initial investment.

We can learn from how other jurisdictions have handled subsidies to promote digital inclusion while encouraging competition and protecting private sector investments. The European Union broadband guidelines outline three types of geographical areas and what types of subsidies they can receive (highlighted in table 1). The color-coded zonal model (black, white and gray) is a useful conceptual instrument to differentiate areas where no infrastructure exists (white); where only one infrastructure is in place (grey); and where more than one network operator is present (black). The white zones require a public intervention to support common interest and therefor state subsidies are sensible. Grey zones require a more detailed assessment, given limited competition. If there is only a single infrastructure-based operator, but multiple active retail providers using this infrastructure network, the area is still categorized as grey. And black zones are assumed to have no market failure given that broadband services are provided under competitive conditions. This zonal classification requires countries to take into account existing infrastructure as well as tangible investment plans by telecommunications operators to deploy networks in the short to medium term. The subsidy provision varies - white zones are eligible for a government subsidy, grey zones are only eligible under specific circumstances, and black zones are ineligible (Dieter and Neumann 2013; OECD 2014b; World Bank 2019).

An analysis by the World Bank (2019) shows that the connectivity gap is often the greatest in grey areas, where neither state aid nor private investment is feasible. These areas usually lack the highest quality infrastructure and often do not have sufficient competition to drive an upgrading of the infrastructure. Additionally, fiber broadband projects in grey areas are often marked by a perceived risk of weak consumer uptake given that these areas already have internet access, often through mobile connectivity. Cost and risk sharing models are important to encourage the deployment of ultrafast broadband and make grey areas more attractive investment destinations. This necessitates regular re-evaluations of support mechanisms to grey zones, to ensure the intricate balance of high quality broadband access and encouraging private investments. These models can include risk sharing with operators and aggregating demand at the user level.

Additionally, the EU's broadband guidelines outline the distortions that broadband subsidies can roll out to reduce competition, including a requirement that subsidies be granted via an open tender process (to ensure public funds are technologically neutral and choose the most efficient and cost effective means of providing connectivity), technolo

Table 1: EU Subsidy Model

Geographical category	Characteristics	Government subsidy allowed?
White	Areas where no broadband services are available and where network expansion by private investors is not expected for at least 3 years	Yes
Grey	Areas where one network operator is present, and another network is unlikely to be developed in the near future. State support in grey areas is justified if no affordable or adequate services are offered to satisfy the needs of citizens or business users and if there are no less distortive measures available (including ex ante regulation) to reach the same goals	Yes, but only under specific circumstances
Black	Areas where at least two broadband network operators are active.	No

Source: OECD (2014b)

In South Africa, there is limited scope for subsidy support given fiscal constraints. However, it is important to note that the zonal approach allows subsidies to be efficiently used, as not all townships will be in the white and grey zones. For example, townships such as Mitchells Plain and Soweto have moved from white to black over the last few years, as Yet others are still in a solidly white zone and would benefit greatly from state subsidies. Thus, given the Government's acknowledgement of the need for 'necessary interventions' to increase broadband connectively in the Covid-19 Economic Reconstruction and Recovery Plan, subsidies could be a facilitating instrument, particularly where Broadband Infraco, the licensed state-owned enterprise, cannot correct market failures. Although Broadband Infraco provides long distance national and international connectivity to licensed private sector partners, the digital divide shows that there are significant areas without sufficient digital infrastructure and where subsidies to the private sector could be advantageous.

Recommendation 2: Undertake a mapping of service, infrastructure, demand and investments.

Data is the cornerstone of creating a competitive, digitally inclusive country. A comprehensive mapping of the various components – infrastructure, availability of broadband services, demand and planned investments – is critical to enabling efficient public and private sector decision-making.

Globally, mapping is often done as a joint public-private effort, with national authorities overseeing the collection and dissemination of data, which is largely gathered by the private sector. Although all four types of mapping are important, most European member states focused on the service and infrastructure mapping. Both mappings can be disseminated through static or interactive maps for public use as well as through more restricted formats (European Commission, 2020). Still, the demand and investment mappings are critical for planning investments and identifying areas of market failure for state aid. This is particularly true in South Africa, where many areas still lack fixed line bandwidth.

Table 2: Mapping activities that can assist with creating a competitive, digitally inclusive economy

Mapping[2]	***Objective***	***Details***
Infrastructure mapping	*Areas where no broadband services are available and where network expansion by private investors is not expected for at least 3 years*	*The telecommunication infrastructure owner should be mandated to ensure data contribution.* *Telecommunications firms should be the data source, collecting information on location and route, infrastructure type, current use and contact point. Exact points and lines are required in terms of spatial resolution.*
Service mapping	*System that gathers, analyses and presents information on the supply of broadband services available in a geographical area. This system offers insight on the current state of broadband availability to assist with decision making*	*Service mapping should focus on collecting information on supplier name, type of technology, upstream and downstream bandwidth, data volume usage, quality of service and uptake.* *Data delivery of addresses covered is best approach for fixed networks. For wireless networks, aggregation and approximation is appropriate.* *Preferred data formats are geodata (vector) and data with spatial reference. The approach enables a range of data supply options including email, upload server, and data entry via a web portal and web services*

[2]*Both, service and infrastructure mapping can use different dissemination formats, including static or interactive maps for the public as well as more restricted mechanisms.*

Demand mapping	*Focuses on collecting information on the demand for broadband services. This should include two facets of demand: mapping based on future needs and mapping based on quality of services.*	*Demand mapping is important for identifying areas under review for state subsidies (using the zonal classifications above). Information should include level of demand, willingness to pay, and required technical characteristics, while also identifying market failures and areas for improvement (for example, if there is demand in white areas or unsatisfied demand in grey areas).*
Investment/financing mapping	*Collects information on financing sources and instruments for broadband funding. This mapping takes into account private or funded investments on a regional level and tracks efficiency of past, current and future investments in broadband infrastructure.*	*The mapping should be divided into funded and private investments.*

Source; European Commission (2020).

Recommendation 3: Utilize residential/business Wi-Fi sharing: create a system in which customers can share a portion of their home Wi-Fi bandwidth in exchange for free access on shared broadband connections while they are on the move.

Fixed broadband operators have partnered with the world's largest Wi-Fi network, Fon, to offer customers access to Wi-Fi hot spots globally. Essentially, fixed bandwidth customers can share a portion of their home Wi-Fi bandwidth in exchange for free access on shared broadband connections on the Fon network both domestically and in other countries. A separate Wi-Fi signal is created for the part of the broadband connection that will be shared with other customers, which ensures a safe home network for the individual customer. Examples of this include fixed broadband operators such as Belgacom (Belgium), BT (United Kingdom), Deutsche Telekom (Germany), KPN (Netherlands), SFR (France), and Softbank (Japan), all of whom have partnered with Fon to make Wi-Fi access points that automatically share capacity with other subscribers. Fon has over 23 million hotspots on its network now (OECD 2014a).

South Africa is the first country on the continent to use the Fon model of residential/business wi-fi sharing. In 2014, MWEB has announced an exclusive partnership with Fon. The deal gave

MWEB ADSL customers with a Fon-enabled router the opportunity to join the larger Wi-Fi sharing network. At present, only MWEB customers are eligible. Hotspots are largely limited to Pretoria, Johannesburg, Cape Town and Durban.

This model can incentivize uptake of fixed line bandwidth. Users do not just get internet at their homes but also while on the move by sharing with other users. It also reduces the reliance on costly mobile data and data usage costs, as it is free to connect at all of the access points. Replicating this model with other operators may be a key opportunity in South Africa, as it offers an alternate to free public Wi-Fi that is often unreliable with little incentive to maintain. Take the City of Tshwane approach, in which residents across the city are able to access the internet from hot spots. The daily limit has been increased from 500 MB to 1 GB, at speeds of up to 15 Mbps. While the model does ensure that all residents, irrespective of income level, can access the internet, there have been many challenges. In June 2018, Isizwe, the private firm contracted to run and maintain Tshwane's free wi-fi network, ended the partnership. The City became solely responsible for the network. After the contract ended, users began experiencing many connectivity issues. By 2019, many Wi-Fi hotspots had been down for over a year. The City then appointed Ulwembu to restore connectivity. During this time, entrepreneurs, students and parents took to Twitter to demonstrate their frustration. In November 2018, one user tweeted, "As entrepreneurs, not having #TshwaneWifi widely available really affects our bottom line negatively. I really don't know when will geopolitics on Ekangala/ Ekandustria end [and] usher progress."

Ulwembu Business Services has recently been appointed as the service partner in delivering TshWi-Fi, with a mandate of maintaining and restoring TshWi-FI to city residents and expanding its free public Wi-Fi services across its seven regions. In 2019, former mayor Stevens Mokgalapa promised that the City would improve free WiFi hotspots to combat connectivity challenges and improve people's access to information in over 1000 hotspots in Tshwane.

Although free, long disruptions to access can have an adverse effect on education, business, and overall productivity. Offering a paid residential/business Wi-Fi sharing model can offer a cost-effective solution, as customers do not pay more to use the access points and can be significantly cheaper than relying on mobile data.

Conclusion

This paper has presented three key recommendations for reducing the digital divide between townships and suburbs and harnessing digital solutions in the Covid-19 economic recovery phase. First, it suggests using public subsidies to incentivize digital inclusion and while strategically incentivizing competition. Given that the Government is fiscally constrained along with substantial heterogeneities in the commercial viability of various townships, this model can offer a more efficient approach to subsidy support. Second, it suggests undertaking a mapping of service, infrastructure demand and investments to ensure that there is sufficient data to enable efficient public and private sector decision-making. And third, it suggests utilizing residential/business Wi-Fi sharing and creating

a system in which customers can share a portion of their home Wi-Fi bandwidth in exchange for free access on shared broadband connections, while they are on the move. This model can incentivize uptake of fixed line bandwidth and reduces the reliance on costly mobile data, as it is free connect at all of the access points. Given the Government's prioritization of expanding broadband connectivity, this paper advocates for a coordinated public-private effort to bridge divide.

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WITS SCHOOL OF GOVERNANCE
UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

GET IN TOUCH:

(011) 717 3567
kemantha.govender1@wits.ac.za
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