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Telecommunications

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Key points

- Although open data relies upon connectivity, the telecoms sector has been overlooked as an area of focus for open data initiatives.

- Good practices exist for open data in telecommunications from providing details of cell towers and spectrum allocation to publishing pricing data; however, these good practices are not yet widely adopted.

- Open data enabled transparency for telecommunications network infrastructures and pricing could spur innovation, improve accountability, and help track the social impact of investments in connectivity.

Introduction

The value of being connected to a communication network is steadily rising. More than a decade ago, researchers established that simple proximity to a communication network was directly correlated[1] to a reduction in the probability of dying from malaria. Today, with smartphones delivering powerful generic services like group and personal messaging and more specific apps aimed at critical sectors like education, agriculture, and health, communication networks are approaching the status of essential infrastructure for a modern economy.

And yet, mobile subscriber growth is slowing[2] as current mobile network operators struggle to find viability in markets with subsistence-level incomes and/or sparsely populated regions. Attempts to address this problem through universal service strategies/funds have met with limited success.

This presents a conundrum for policy-makers and regulators where value continues to accrue to those with affordable access to communication infrastructure, while the unconnected fall further and further behind by simply staying in the same place. Those who most desperately need support are cut off from access to opportunity, to social and health safety nets, to education,

to information that can improve lives, and to platforms to demand change. It is ironic, or perhaps tragic, that the voices of the unconnected are not heard on this issue for the very reason that they are unconnected.

In order to address this issue, fresh thinking is required. Previously, solving connectivity challenges could only be tackled by entire governments investing vast resources in state-owned networks. The mobile phone revolution opened the door to private sector investment in telecommunications, and new business models like pay-as-you-go services have extended sustainable communication services further than anyone could have imagined. However, becoming a mobile network operator still involves millions of dollars, creating a high barrier to market entry.

There are a number of factors that suggest that the telecommunications landscape is shifting once again.

- The value chain of telecommunications networks is becoming disaggregated. Previously, in order to enter a market, an operator needed to invest in international, national, middle mile, and last mile infrastructure. Now, we are beginning to see competition in each of those segments.

- The spread of fibre optic infrastructure, both undersea and terrestrial, is changing the access market. While there is no question that fibre optic networks are increasing the ability of existing operators to deliver broadband, those same networks are opening up possibilities for new players who now can deliver more targeted, localised, and affordable solutions to unserved populations.

- Changes in last mile technology are opening up new possibilities. The spread of WiFi as an access technology is empowering commercial, government, and community access initiatives to offer local services. Dynamic spectrum technology also shows promise as an alternative access technology.

- Finally, the meteoric growth of access and mass manufacturing has brought down the cost of access technologies to the point where they are within the reach of small-scale operators. Low-cost solar-powered open source GSM (Global System for Mobile Communications) base stations can be deployed for a fraction of the cost models of existing mobile network operators.

All of these changes represent genuine cause for optimism that it is possible to sustainably connect everyone on the planet. However, in order for that to happen, changes in access policy and regulation are required. And those changes need to be informed by accurate data on existing telecommunication infrastructure and its use. This includes data on the extent and uptake of fibre optic networks, towers used by mobile operators, broadcasters, and ISPs, as well as the wireless spectrum assignments that are assigned to operators. The pricing of wholesale networks is also an important data point, especially from the point of view of regional benchmarking.

To date, public access to any of the above information has been through communication regulators who collect some or all of this information from licensed operators. Some of this

information may be passed on to the public through the regulator's website. In some cases, the operators themselves may release portions of this information. What is evident from an examination of the websites of communication regulators is that there is no consistency as to what information is made publicly available and how detailed that information is.

In the early days of mobile networks (and fibre networks), there was not that much emphasis on accurate mapping of network infrastructure, partially because operators were expanding so rapidly at the time. Now, as subscriber growth is slowing and the challenge of providing affordable access in more difficult regions becomes more evident, it is essential to have more accurate information on the state of network growth and the resources in use.

It is also essential that this data be made available to the public as open data. There are several reasons for this.

- Since a wider range of actors from community networks to wireless ISPs to municipalities have the potential to address access gaps in a sustainable manner, we need public access to telecom infrastructure data in order to open the doors to collective, community, and entrepreneurial approaches to infrastructure deployment. Open data on telecommunications infrastructure would enable the identification of infrastructure gaps and opportunities.

- Transparency is essential in any industry where hundreds of millions of dollars are invested by both private and public sector organisations. Public data will provide an important reality check.

- There is an ongoing need for comparative analysis. Telecommunications infrastructure varies dramatically from country to country and within countries, yet there is very little comparison of physical infrastructure, spectrum assignments, and backhaul costs. Having common public standards for telecommunications data will enable these comparisons and help to identify outliers both good and bad.

- Telecommunications infrastructure is enabling the profound social and economic impact that we see as a result of the spread of voice and data networks. The opportunity to compare telecommunications infrastructure development with other social and economic indicators represents a significant opportunity to understand more about their impact.

The open data movement in government has been growing for over a decade. It contributes to more accountable and democratic institutions, and is one way that governments can meet their obligation to provide access to information. The open data principle of providing timely, accessible, complete, affordable, and non-discriminatory access to data is ideal for the telecommunications sector, which stands to benefit with respect to both transparency and innovation. While blanket approaches to open data in government have not always been successful, there is substantial evidence to suggest that more targeted, bottom-up approaches can have very positive outcomes. Some examples include OpenSpending's work on government finance, Publish What You Pay's work on extractive industries, and work on transport data by organisations such as London Transport.

The rest of this chapter looks at specific aspects of the telecommunications sector and attempts to show why transparency is essential for it. Further, it demonstrates that good practices do exist for open data in telecommunications but they are not widespread. Promoting open telecommunications data is not about doing something new, but rather about normalising the examples of good behaviour that already exist and aligning with the principles of the open data movement.

The potential of open data

Fibre

The spread of undersea fibre optic cables around Africa since 2009, followed closely by the rapid spread of terrestrial fibre optic infrastructure, is nothing short of a revolution. It has spread far faster than anyone would have imagined possible. There are perhaps only two or three countries in Africa that do not have a national fibre optic backbone currently. Many countries have several. Fibre optic networks are the deep water ports of the internet; they enable orders of magnitude greater broadband capacity than any other kind of access technology and at very low latency. For terrestrial networks in particular, the capacity of this infrastructure is so great that it is effectively a non-rival resource: access for one service provider does not diminish opportunity for other providers.

However, operators are often reluctant to share information about their fibre networks. This reluctance betrays an apprehension that it may somehow compromise their competitive edge, but, in many cases, operators have simply not considered the issue from a strategic perspective. While the majority of operators decline to publish detailed information about their fibre networks, their response stands in stark contrast to companies like Dark Fibre Africa[3] in South Africa, and regional operator, Liquid Telecom,[4] who readily publish maps of their fibre networks. Dark Fibre Africa stands out in the detail and ease-of-use of their maps.

Taking this information from the narrow group of stakeholders within which it resides and opening it up to public input and discussion as open data can have multiple benefits. For example, a small rural municipality might determine from a public fibre map that it is in their interest to invest in 50 kilometres of fibre network to connect to a nearby network. A province or state might determine that their region is suffering due to a lack of fibre infrastructure investment. A school or a hospital could fundraise for better access if they can show that a fibre optic cable is within a reasonable distance. From a national strategic perspective, fibre optic infrastructure is now comparable in terms of importance with other basic infrastructure like roads, railways, and bridges. The public needs to be aware of its existence in order to identify opportunities to connect to it and to identify gaps where more investment is needed. Making this data public can also be good for operators who can use the scope of their investment in fibre infrastructure to market their services.

Spectrum

Once the end of the fibre network is reached, it is wireless technologies that typically deliver the last mile of connectivity to citizens. Wireless technologies are dependent on national regulatory authorities that grant specific permission to use any given set of radio frequencies. To become a wireless network operator, a licence to operate radio equipment within a given set of frequencies is typically required. The exceptions to this are the industrial, scientific, and medical (ISM) bands, or licence-exempt bands (used by technologies like WiFi, Bluetooth, etc.), which do not require a specific licence. Twenty years ago, when mobile networks were just getting off the ground and most of the internet was carried over copper wires, obtaining a spectrum licence was effectively a simple administrative process. Now that demand for wireless spectrum has significantly increased, spectrum licences have become valuable assets that are often sold at auction for millions of dollars.

It is essential that the public has access to information about which organisations have been assigned a given frequency band, that is, given a licence to operate in a given frequency and on what terms that licence has been granted. A few national regulators publish this information on their websites, but most do not. In Africa, Nigeria stands out for their diligence in publishing spectrum assignments.[5] Kenya and South Africa are also relatively good; however, not only do most national regulators not publish this information but some will also refuse a public request for this information.

Why is public access to information on spectrum assignments important? Because there are often opportunities to take better advantage of existing spectrum availability. In Mexico, a non-profit[6] is using low-cost GSM technologies to deliver affordable access[7] in the state of Oaxaca. The Mexican regulator has set aside a small amount of GSM spectrum specifically to enable rural access. This inspiring model deserves to be replicated elsewhere; however, without publicly available information on spectrum assignments, it is a challenge to understand where those opportunities are available.

Towers

Public access to data on mobile tower locations is also essential. Why? In terms of understanding who has network coverage, we currently must rely on mobile network operator coverage maps. Mobile network operators do not have the best incentives to be completely rigorous in ensuring the accuracy of their network maps. As it becomes more strategically important to connect every citizen, it becomes equally essential to understand exactly who does and who does not have network coverage. The simplest way to validate network coverage claims is to know where the towers are, which operators are on them, and what technologies (i.e. 2G, 3G, LTE) they are using on that tower.

A common push back to this suggestion is that publishing tower information would compromise the security of the networks. In fact, tower locations are already reasonably well-known. First, they are easily visible to the naked eye, therefore, not hard to locate. Second, many, if not most of them, can be identified through online services like OpenCellID[8] or Mozilla's Location Service.[9] These two resources are invaluable, but a limitation of their crowd-sourced

approach is that they depend on someone (who has their software installed on their phone) being near a tower in order to detect it. To date, this approach has been successful in picking up a large percentage of the towers in many countries; however, the more remote towers (where populations are sparse) tend not to get picked up by these services. It is exactly in these more remote areas (where operators have the least incentive to provide coverage) that we want to know more about access conditions. Therefore, having open data on public tower locations would be extremely valuable from the point of view of mapping the unserved, and in terms of identifying opportunities for new business models to provide services.

Like fibre maps and spectrum charts, good practices already exist with regard to tower information. The Canadian government publishes open data via a Comma Separated Value (CSV) file[10] with the location of every tower in Canada together with information about the operator(s) on the tower, as well as the type of equipment, power output, antenna orientation, etc. This is all you would need to build a comprehensive map of towers across Canada, and indeed someone has done so. Steven Nikkel has imported that data into an online map that provides a detailed picture of mobile infrastructure in Canada.[11] This is essential information for the average citizen trying to choose a service provider in any region outside of a major urban centre, where coverage varies significantly between operators. There is no reason not to do this sort of mapping everywhere, but it will be necessary to explode a few myths and change the norms around publishing tower data.

It is not just the Canadian government that has seen the value of publishing tower data. In India, veteran operator, Airtel, has published a new website, Open Network,[12] where all of their towers for both 2G and 4G networks are mapped. They also identify where towers are being upgraded and where they are still needed. The website goes by the slogan "Because you have a lot to say. And we have nothing to hide". This is strong evidence to illustrate how transparency, far from being a liability, can actually be a powerful tool for marketing. This is the first instance of a commercial operator publishing tower location data.

Backhaul pricing

Demand for broadband is increasing exponentially in Africa with the result that backhaul networks are fast becoming the critical bottleneck in affordable access to broadband. As noted previously, there is a lot of fibre across Africa, but the cost of terrestrial fibre networks is often so high that it makes operator expansion impractical. This is not a problem if you happen to own the fibre (as many incumbent operators do), but it can be a significant obstacle for new operators. This is not a simple challenge to address, but a step in the right direction would be to introduce more transparency through open data on network backhaul pricing. The cost per Mbps varies dramatically across regions. Regulators may be unaware of how their country stacks up in terms of national backhaul pricing. A little transparency would go a long way. This is not to suggest that operators must reveal their business agreements, only their basic rate card. Among other things, this would have the result of establishing a ceiling for costs.

Once again, some good practices do exist. The regulator in Botswana (BOCRA) publishes a public rate card[13] on access to the national fibre optic backbone. Granted this is a state-owned network, which removes the complication of negotiating with the private sector, but even if we

just succeeded with state-owned networks, it would be a big leap forward. The practice of publishing backhaul and interconnection pricing is more common in West Africa thanks to a directive in 2006 from the West African Economic and Monetary Union (UEMOA),[14] the West African regional economic community.

Conclusion

Affordable access to communication is now such a valuable social and economic enabler that it is no longer appropriate to talk about strategies that connect "most" of the population. We need strategies that can embrace all levels of society and all regions. Fortunately, market and technological trends have created new possibilities for the development of affordable access solutions; however, in order to have a meaningful conversation about those options, we need better data on current telecommunications network development. Governments across the world have seen the potential of open data to increase both transparency and innovation in specific sectors and to better meet the needs of their citizens. Open data policies contribute to more efficient and accountable governance, and facilitate the enjoyment of human rights. Telecommunications has been overlooked as a sector to which open data policies might be applied. This is not a question of massive change for either regulators or operators, but is more of a case of socialising and normalising the good practices that already exist for making telecommunications data public, whether fibre, spectrum, towers, or pricing.

To counteract the inertia of the status quo, a coalition of civil society and research organisations is needed. This group can come up with a simple, convincing campaign to get policy-makers, regulators, and operators to see the value of open telecommunications data with an initial set of data standards, descriptors, and tools that can help early adopters to start opening their data.

Further reading

Song, S. Open telecom data – moving forward. *Many Possibilities*, 25 May. https://manypossibilities.net/2018/05/open-telecom-data-moving-forward/. Note that this article was the basis for this chapter.

About the author

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Endnotes

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4   https://www.liquidtelecom.com/about-us/network-map.html

5   See, for example, https://www.ncc.gov.ng/docman-main/spectrum-frequency-allocation-tables/756-frequency-assignments-900mhz/file

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