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# A "whole-community" approach for sustainable digital infrastructure in remote and Northern First Nations

*Susan O'Donnell & Brian Beaton*

Every community needs public services – health and medical, education, security and safety, roads, water and sewerage and others – to support residents' basic needs and quality of life. In all non-Indigenous communities in the country, provincial, territorial and regional governments are responsible for delivering many of these public services, with local governments having responsibility for roads, local infrastructure, and other local services.

The situation is different in remote and Northern First Nations. There, each local government (chief and council) with support from their regional organizations is responsible for all or almost all these public services; the services are funded through direct payments from the federal government to the community government and their regional representative organizations through treaty or other nation-to-nation agreements. This unique situation presents a challenge for remote and Northern First Nations. It also presents an opportunity: a "whole-community" approach to building digital infrastructure to support many of these services that also offers sustainable access to essential broadband network connections for everyone living in these communities.

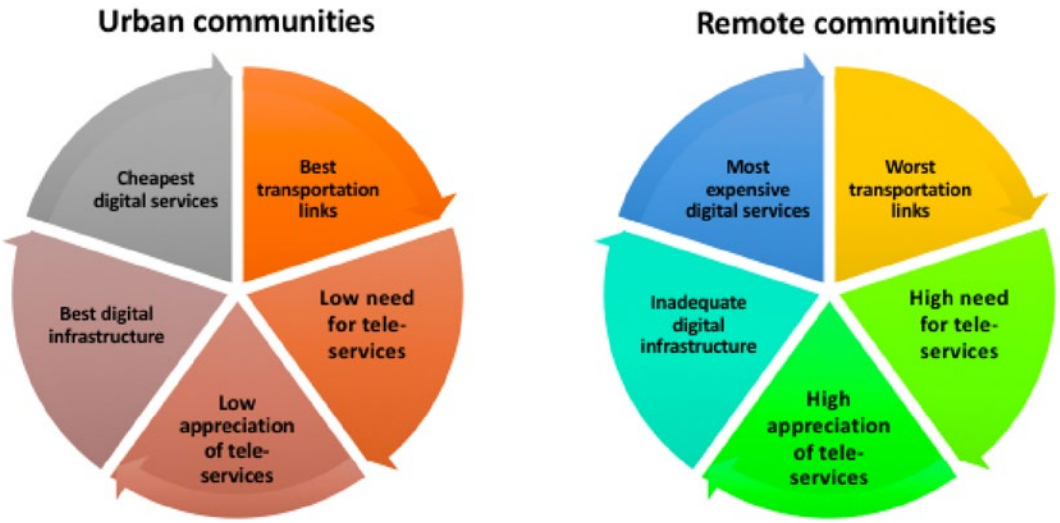
## The paradox of telecommunications for service delivery

Urban communities currently have the best telecommunications infrastructure. In Canada, cities are connected by dense fibre networks. The fibre cabling is usually installed alongside the existing well-developed network of public roadways. In fact, there is often an over-supply of fibre in urban areas: When installing fibre optic cabling, telecommunications companies often include extra capacity, called "dark fibre" because it is not "lit up" for current use.

At the same time, urban communities have the best public services: Cities have hospitals and medical specialists, all levels of schools and a variety of training facilities, and many other public services. Consequently, where the large population density creates a huge demand for high-speed broadband, residents often have a low need and low appreciation for digital broadband services delivery because they can choose to access their services in-person.

In contrast, remote and Northern communities have the same needs for public services but much lower ability for accessing these services in-person: In many of these communities there are no hospitals, high-schools or training facilities. As a result, these communities have a higher need for, and appreciation of, tele-services.

**Diagram 1: The Paradox of Telecommunications**



However – and this is the paradox – small Northern and remote communities also have much more limited telecommunications infrastructure: Connectivity costs are expensive because the roads network that is heavily subsidized in urban areas is limited in remote and Northern regions. Installing fibre cables in remote areas often involves creating new paths through difficult terrain where no roads exist. This challenge, illustrated in Diagram 1, is also an opportunity for remote and Northern communities.

**A whole-community approach to sustainable telecommunications infrastructure**

During extensive research with Indigenous community partners over a 13-year period, our research project, called the First Nations Innovation initiative (FNI), developed an analysis of sustainable telecommunications infrastructure. We call it the "whole-community" approach to digital technologies for community, social and economic development and sustainability. Our approach runs counter to technology adoption models that focus only on "individual" and "household" metrics. Instead we focus on the links between digital technology adoption and community services in small, remote Indigenous communities and the larger network of relationships surrounding the communities. Our understanding is that technology is adopted within a broader ecology of community services and support making it possible for these tools to be available for community members.

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Our approach is guided by a conceptual framework called the e-Community model. As described by Judy Whiteduck of the Assembly of First Nations (AFN) in 2010, this model can be used by First Nations as a strategic planning initiative to establish a broadband-enabled public service in every remote and Northern First Nation community. The e-Community model was first introduced by Keewaytinook Okimakanak's KNET (KO-KNET) services in 2005.

We illustrate our model with a simple diagram to guide policy-makers, researchers, and digital systems designers as they work with Indigenous communities to develop digital infrastructure, applications and programs to support sustainable growth and development. In our approach there are four levels of factors that shape digital technology adoption that need to be considered when designing, developing, operating and sustaining telecommunication networks in remote and Northern Indigenous communities. The four levels are illustrated in Diagram 2.

1. Community members/household: The demand by community residents and households for digital infrastructure is an important consideration; however, this is only one element of the whole-community approach. In 2016, The Canadian Radio-television and Telecommunications Commission (CRTC) recognized the importance of these high-speed connections when it confirmed that broadband Internet is an essential telecommunications service for all Canadians.

2. Community businesses, services, organizations and facilities: The central concept of the whole-community approach is that remote and Northern Indigenous communities and their regional representative organizations are responsible for delivering public services, and that digital broadband networks are required to deliver these services effectively. This approach highlights why community organizations, services, and activities in these communities need to be connected to telecommunications networks. These organizations meet many essential needs, provide sustainable local employment, and support community, social, political and economic development.

Those working in the community health centres, local government offices, schools, public works buildings, airports, water treatment centres, and other community services and buildings are using digital technologies in many different ways to do their work and to communicate with other community members and people further away. The buildings and spaces are places for people to gather and share news, stories and ideas both in person and online. All these places and spaces, which require and use digital technologies, are central to how these technologies are adopted, used and adapted to meet the needs of remote and Northern First Nation communities.

Crucially, in the whole-community approach, the core public services – health centres and schools – are the "anchor tenants" that make the communi-

ty and regional networks sustainable. This is because the digital broadband network infrastructure required to provide telehealth, telemedicine, and distance and digital education activities in communities can be leveraged to make household connectivity affordable. The local fibre or cable loop that connects the community services and other community buildings is also the network that connects residents to the Internet. These local loops, connections and Internet service providers are often owned and operated by the communities.

3. Regional Indigenous owned and operated digital transport infrastructure connecting multiple communities: The use of the technologies and infrastructure for remote First Nations across Canada is often supported by regional Indigenous community intermediary organizations responsible to Indigenous community leadership. These organizations are staffed with technology experts who, over the past two decades, have been keeping the digital telecommunications transport networks operating. Transport networks are the physical broadband networks between and among communities and the connections between the communities and the networks in urban centres. Our FNI research project as well as other researchers have studied how the Indigenous regional intermediary organizations are building and operating these networks. Maintaining adequate funding for these organizations is crucial to the whole-community model.

4. Surrounding lands, waters and space. When planning and developing digital infrastructure in remote and Northern regions, land-based activities of Indigenous communities must be considered in the design, build, and maintenance strategies. Indigenous community members often desire land-based lifestyles that can be supported by digital networks to maintain safety and security while out on lands and waters beyond the borders of the communities themselves. The implication is that wide-area mobile wireless networks are another essential service for Northern communities. The CRTC wrote in their 2016 decision that "Some individuals considered mobile wireless broadband Internet access service essential to their participation in the digital economy and necessary for daily life and business" (CRTC, 2016, paragraph 30).

## Conclusion

This article presents a whole-community approach to designing, building, and supporting sustainable telecommunications infrastructure in remote and Northern communities. The central feature of this approach is that the telecommunications infrastructure for public services in these communities will economically sustain the local cable or fibre loop that can also provide Internet service for residents and other community facilities. The local infrastructure can be owned and operated by the communities themselves in collaboration with their representative regional organizations.

This approach has been successfully used by many remote and Northern Indigenous communities and their regional organizations to create sustainable telecommunications networks. Using these digital networks, the communities are delivering broadband-enabled health, education, safety and security, justice and many other community services,

**Diagram 2: The Whole-Community Approach to Telecommunications**

as well as affordable Internet services for community residents. Success stories highlighting community efforts were published recently by the First Mile Connectivity Consortium (2018) in a book that also describes the more than 90 publications produced by the FNI research project.

We hope the whole-community approach will continue to be used in the future as the primary model for developing telecommunication networks in remote and Northern communities. Making this happen will require continuing engagement by Indigenous organizations in policy and regulatory activities to ensure that funding structures and opportunities are available to support these efforts. The First Mile Connectivity Consortium (FMCC) is a key organization working on these engagement activities. The FMCC website (http://firstmile.ca) contains many resources and much information including FNI research articles and reports about digital technologies and infrastructure. ◉

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*Fort Severn First Nation on Hudson Bay, viewed from the the K-Mobile Cell Tower owned by the community.*