

Research in Brief

A New Remote Community-Owned Wireless Communication Service: Fort Severn First Nation Builds Their Local Cellular System with Keewaytinook Mobile

Susan O'Donnell
University of New Brunswick

George Kakekaspan
Fort Severn First Nation

Brian Beaton
K-Net, Keewaytinook Okimakanak

Brian Walmark
Keewaytinook Okimakanak Research Institute

Raymond Mason
Keewaytinook Mobile

Michael Mak
McMaster University

ABSTRACT Fort Severn First Nation is a remote fly-in community on Hudson Bay. Its lifestyle reflects a deep respect for and connection to the land. The Keewaytinook Okimakanak (KO) Tribal Council has developed the Keewaytinook Mobile (KM) service in remote First Nation communities in Northern Ontario. In November 2009, Fort Severn and KO established the KM service in the community. This study traces the history of KM and its implementation in Fort Severn and describes how and why community members are using the service. The

Susan O'Donnell is Adjunct Professor of Sociology at the University of New Brunswick. Email: susanodo@unb.ca . **George Kakekaspan** is Project Manager for Fort Severn First Nation. Email: georgekakekaspan@knet.ca . **Brian Beaton** is Coordinator of K-Net, Keewaytinook Okimakanak. K-Net. Email: brian.beaton@knet.ca . **Brian Walmark** is Director of the Keewaytinook Okimakanak Research Institute. Email: brian.walmark@knet.ca . **Raymond Mason** is Community Coordinator for Keewaytinook Mobile. Email: raymond.mason@knet.ca . **Michael Mak** is a Research Intern at McMaster University. Email: makamizz@gmail.com .

analysis is based on interviews and discussions with community members during three research visits between March 2010 to March 2011.

KEYWORDS *Wireless; Community Networks; Broadband Networks; Infrastructure; First Nations*

RÉSUMÉ *Fort Severn est une communauté isolée située sur les rives de la baie d'Hudson. Son mode de vie reflète un respect et un attachement profonds pour la terre. Le Conseil tribal Keewaytinook Okimakanak (KO) a développé le service mobile Keewaytinook dans les communautés autochtones reculées du Nord de l'Ontario. En novembre 2009, Fort Severn et KO ont établi ce service dans la communauté. Cette étude retrace l'histoire et la mise en place du service mobile à Fort Severn et décrit comment et pourquoi on y utilise ce service. L'analyse se fonde sur des entrevues et des discussions avec des membres de la communauté menées au cours de trois visites de recherche effectuées entre mars 2010 et mars 2011.*

MOTS CLÉS *Sans fil; Réseaux communautaires; Réseaux à large bande; Infrastructure; Premières Nations*

Introduction

The Washaho Cree First Nation at Fort Severn, a small, remote community in Northern Ontario, introduced the Keewaytinook Mobile (KM) service in late 2009. This article describes how and why community members are using KM and some possibilities for the future of the service. Community informatics theory (Gurstein, 2003) suggests that the introduction of KM into Fort Severn offers the community more capacity for independence and social, cultural, and economic development. Understanding how and why community members are using the KM service, and mobile technologies more generally, is an important first step to understanding how KM can contribute to future development in Fort Severn.

KM can be situated within the larger national mobilization by First Nations to build digital infrastructure and services to meet community needs. McMahon, O'Donnell, Smith, Woodman Simmonds, & Walmark (2010); O'Donnell, Milliken, Chong, & Walmark (2010); and Whiteduck (2010) have described how over the past two decades First Nations across Canada have been actively building a network of telecommunications services. A number of these services are community owned and operated. A new telecommunications service such as KM in a remote northern community is an example of self-determination applied to telecommunications.

The study on which this article is based is to our knowledge the first in Canada to explore how mobile communications can address the needs of remote indigenous communities such as Fort Severn. Fort Severn is a unique coastal environment heavily involved in and dependant on traditional land-based activities such as hunting, trapping, and fishing. The study demonstrates that the land-based lifestyle of this small community has led to specific requirements for the Keewaytinook Mobile service. The extent to which KM can meet these community requirements will determine the future of KM in Fort Severn.

Profile of Fort Severn First Nation

The Washaho Cree Nation at Fort Severn, the most northerly Arctic coastal community

in Ontario, is located on the Severn River, nine kilometres from where it drains into Hudson Bay. Fort Severn is a member of Keewaytinook Okimakanak (a First Nations tribal council) and the Nishnawbe Aski Nation (Treaty 9 area). The current population is approximately 650 status indigenous people, of whom about 400 live on-reserve. The language in the community is Cree. English is spoken by the school-educated people.

Most of the approximately 90 residences in Fort Severn are located on one of several roads near the centre of the community. Even though most of the houses have a comfortable distance between them, the community is quite small, which could explain why residents may choose to use ways of communicating other than a cellphone to connect with each other. Hunting, trapping, and being on the land are central to community life. Almost every household depends on hunting and trapping to supplement household income. The area is very rich in wildlife.

The Severn River freezes in late October and usually breaks up in mid-May. During a short period in the winter, the community is accessible via winter roads from other First Nations communities located several hours' drive in different directions. Year-round, there is a daily flight to and from Sioux Lookout. Once a year, in September, barge services bring in supplies from Moosonee, Ontario. Fort Severn is very isolated and expensive to visit. The flying distance from Toronto to Fort Severn is 1,495 kilometres. A return flight from Toronto and other Canadian cities to Sioux Lookout costs more than \$1,000, and the follow-on return flight to Fort Severn can cost the same, making the total airfare cost about \$2,000.

Fort Severn is a satellite-served community: all digital communications between the community and the outside world pass through one of several satellite dishes in the community. In 2011, the community and its partners developed a "technology showcase" that traces the history of communication and information-sharing in Fort Severn. Their showcase, available on the community website, is a useful background to understanding Keewaytinook Mobile as part of Fort Severn's long history of developing, owning, and using communications technologies: http://fortsevern.firstnation.ca/tech_showcase.

History and overview of Keewaytinook Mobile (KM)

The history of Keewaytinook Mobile (KM) begins with the leadership of the Keewaytinook Okimakanak tribal council (Northern Chiefs); its telecommunications division K-Net, based in Sioux Lookout; and the First Nations communities that own and operate local KM services. KO/K-Net has a long history of developing telecommunications services for and with KO communities as well as other communities in northwestern Ontario, Manitoba, and Québec (Beaton, Fiddler, & Rowlandson, 2004; Carpenter, 2010). This development occurs in the face of extreme challenges on many levels, including geographical and technical challenges, federal policy inaction, and social and organizational restraints (Fiser & Clement, 2009; McMahon et al., 2010; O'Donnell, Perley, Simms, & Hancock, 2009; O'Donnell, Perley, Walmark, Burton, Beaton, & Sark, 2009; O'Donnell et al., 2010).

The idea of Keewaytinook Mobile can be traced to the mid-2000s, when several KO First Nations, including Fort Severn, were discussing with KO/K-Net the possibility of developing a cellphone service in their communities. At that time, none of the First

Nations communities in the region had a cellphone service. There is no regulation in Canada forcing commercial telecommunication companies to provide services in any particular area of the country. They need to have a business case (a proven return on investment) to develop services in rural and remote areas; in general, they are unwilling to expand into remote northern communities without significant public support (McMahon et al., 2010; O'Donnell et al., 2010).

Building a new cellphone service in a remote northern community is a large infrastructure project requiring public and private partners. In March 2007, the Province of Ontario's Northern Ontario Heritage Fund Corporation (NOHFC) announced its interest in piloting a cellular development project in two remote First Nations. KO worked with the federal government—the department then called Indian and Northern Affairs Canada (INAC) and now called Aboriginal Affairs and Northern Development Canada (AANDC)—and NOHFC to secure the required funding and with the KO chiefs to ensure community support for the project. By January 2008, the first towers and telco buildings were purchased and cellular equipment ordered from the supplier, Lemko.

In Fort Severn, the architecture is supported by a 200-foot tower providing a potential 30-kilometre area coverage and range of services to support the community's outdoor lifestyle and short-distance travel. The local area network (LAN) equipment is connected to the Fort Severn/K-Net services C-band satellite-service PoP (point-of-presence) in the community. In Sioux Lookout, the community's IP traffic is routed to Dryden, where the mobile switching centre was established.

In mid-2008, KO/K-Net signed an agreement with a major wireless provider that has an Industry Canada licence for cellular spectrum service across Canada but had yet to offer cell service in any remote community and most rural First Nations communities across Northwestern Ontario. The agreement allowed Keewaytinook Mobile to offer cellphone services using the widely available commercial wireless spectrum. The Dryden Municipal Telephone System (DMTS) is the cellular network partner. The KM prepaid mobile wireless service works on the KM community network and the wider DMTS/KM extended-service calling area. As DMTS expands its service area in Northern Ontario, KM subscribers will benefit from the expanded service area, and as more First Nations communities sign on to KM, the coverage will continue to grow between First Nations.

The basic business model for KM is for clients to purchase prepaid KM phone cards. DMTS provides the cards at a wholesale rate to KM, so KM makes a percentage of revenue on every card sold, which is collected into a common KM fund. The First Nation partner keeps the majority of the revenue to cover their local operating costs. People visiting the community with their GSM phones are able to roam on the KM network because KM has a roaming agreement with DMTS, which has roaming agreements with most of the major telcos. Therefore most GSM phones from other providers work in Fort Severn. KM customers who need to travel outside of the DMTS/KM network region need to purchase either a prepaid service from the local provider or a post-paid cellphone plan to be able to roam in other parts of the country.

The KM model is for participating First Nations communities to own and operate local cellular service providers in co-ordination with KO/K-Net and other users of the

community cellular network. The service could be considered a substitute for landline service. The local service providers administer local sales of the prepaid cards and phones and support technical maintenance. The KO/K-Net team recommends technical infrastructure designs and assists with seeking capital funding. The community-based service providers respond to the unique needs and business philosophy of each community.

Study methodology

The Keewaytinook Mobile service in Fort Severn was switched on in November 2009. Almost four months later, in March 2010, the researchers undertook a study of KM in Fort Severn. The KM study is part of the ongoing VideoCom research project and one component of a larger study on the use of broadband networks and information and communication technologies (ICT) in Fort Severn. The research protocols were developed in collaboration with Keewaytinook Okimakanak and reviewed by the research ethics boards at the University of New Brunswick and the National Research Council.

In total, 42 Fort Severn First Nations community members—20 women and 22 men—were interviewed for this study. All were over 18 years old, and they held a variety of roles and positions, including health workers, teachers, family members and caregivers (e.g., mothers), elders, leaders, band council staff, community workers, part-time workers, hunters, technology support workers, and others. Participants were asked whether they had a cellphone, whether they used a cellphone, and how often they used it for different activities. Finally, they were asked about their use of the Keewaytinook Mobile service and what their perceptions and experiences were with the service. In addition, the KM service representative in the community was interviewed separately to discuss issues arising with the service.

Following the analysis of the interview data, the research team returned to Fort Severn for visits in November 2010 and March 2011. These later visits included discussion with community members about Keewaytinook Mobile, the findings of the initial study, and developments that had occurred over the previous year, including the resolution of some previous concerns.

Study findings

Cellphone ownership and sharing and frequency of use

In March 2010, almost four months after the KM service was switched on in Fort Severn, about 50 community members had purchased KM phones and were buying prepaid phone cards. However, the number of subscribers to the KM service is an unreliable indicator of how many community members are using it, or even how many are using cellphones. In the interviews, 45% of respondents said they owned a cellphone, but only 32% said they used the KM service in Fort Severn. In effect, some community members owned a cellphone but used it in places other than Fort Severn; they had SIM cards from other cellular service providers and used their cellphone on trips to Thunder Bay, Sioux Lookout, or Winnipeg, cities they visited on a regular basis.

In addition, many respondents had decided against owning a cellphone but rather used one they borrowed. The high rate of borrowing cellphones (41% of respondents) was an unexpected finding of the study. Clearly, in Fort Severn First Nation, sharing

cellphones is a very common activity. The wider research in Fort Severn found a general culture of sharing technology in the community—for example, home computers and laptops are widely shared among households. Underlying the sharing culture is the high unemployment rate and correspondingly low household income in the community, suggesting that for many households, technology purchases would be a considerable expense. As well, the small number of people living year-round in Fort Severn—about 400—means that everybody knows each other in the community, which undoubtedly encourages sharing.

Interview participants reported how often they were using cellphones for various tasks. As a baseline, 100% said they used a fixed-line phone to have a conversation either daily or weekly. Fifty-nine percent of respondents were using cellphones regularly (daily or weekly). In response to the question “How often do you use a cellphone anywhere?” 14% said never, 7% yearly, 19% monthly, 39% weekly, and 20% daily.

Voice conversations were the most frequent reason for using a cellphone, with 50% of respondents doing so regularly. However, only 13% used a cellphone daily for conversations. Forty percent used a cellphone for texting on a regular basis, and 20% did so daily. In Fort Severn, therefore, community members using a cellphone every day were texting every day and were texting more often than having voice conversations. The research project only interviewed community members over the age of 18, but several adults interviewed noted that many of the community youth text each other frequently.

Almost all respondents (92%) never used a cellphone for email or to access the Internet—at the time of the study, these features were not supported by the KM service in Fort Severn. The few community members who did use their phone for the Internet used other cellular services to access the Internet when visiting an urban centre. Taking pictures with the cellphone was a regular activity, with 11% doing it daily and 22% weekly. Making videos with the cellphone was less popular, with only 6% doing it daily and another 6% weekly. The fact that users were unable to exchange the photos or videos, because the email and Internet was unsupported, could explain why more cellphone users were not using their devices to make photos and videos.

Reasons for using a cellphone in Fort Severn

The most common reason for using a cellphone was safety and security while outside the community. As mentioned earlier, being out on the land is central to the lives of Fort Severn residents; if they do not go out on the land themselves, a family member will do it for them, to trap, fish, hunt, or harvest firewood. Land-based activities, especially when carried out far from the community, present potential challenges and dangers, such as running out of fuel or having a vehicle break down far from home, running into inclement weather and becoming dangerously cold, or having an accident. There is no emergency (9-1-1) service in Fort Severn, but the cellphone can obviously be used to call someone for help. Satellite phones have been available for many years for this purpose, but they are very expensive and so not widely used.

The following three quotes from different respondents illustrate the safety and security value of the KM cellphones:

"I mainly use it for emergencies when I'm on the land, camping and hunting."

"It's good for sticky situations when you're out there, if you run out of gas, so it's good for that."

"The cellphone service helps for safety too because when somebody goes out in the bush and if they're stuck or if their Ski-Doo breaks down, they'll be able to call in. Because sometimes before, when there was no cellphones, they would just usually walk home and they would take a long walk, like over three hours walking."

Another common reason for using the KM service cited in the interviews was the ease of reaching people without having to go around the community trying to track them down. Similarly, the phone owners were confident people could always reach them. This was especially important for community members with jobs that required them to be reached easily. Along these lines, having a cellphone was good for travelling outside the community; with the cell, they were easily accessible.

A number of participants saw cellphones as having an advantage over landlines. For community members without a home phone or who had difficulty paying the monthly phone bill for their home phone, the KM phone and service is practical and less worry. For some types of calls, the KM service was less expensive than using a home landline. In addition, some respondents liked the convenience of the prepaid phone cards.

Some interview participants said they used cellphones because they were fun: for taking pictures, texting, and the novelty of talking on the phone and connecting with others in a different way. Some participants said cellphones were popular and so being part of the trend was a reason for using them. Finally, another reason cited was contributing to the community economic impact by supporting KM, a local business.

Reasons for deciding against using a cellphone in Fort Severn

Fourteen percent of community members interviewed had decided they could live without using a cellphone. Of these, 42% said the main reason was the perceived or actual cost. Many respondents were clearly misinformed or had incorrect information about the cost of the service. In fact, the local call pricing is equal to or lower than the pay-as-you-go rates offered by the mainstream companies elsewhere in Canada (Rogers, Bell Aliant, Fido, Telus, Virgin Mobile), and the North American long distance rates are lower than all the competitors. What the "too expensive" reason most likely means is that either the person thought a cellphone was incompatible with their lifestyle—i.e., why spend money on a cellphone?—or they simply thought a cellphone was too expensive.

Another common reason for deciding against using the KM service was the limit of the local service range, given the distances travelled from the community for regular outdoor activities. In March 2010, there was widespread confusion among interview participants about how far the range of the KM service extended. By the time of the return research visits, a booster had been installed on the cell tower to improve the local service range. The range of the KM services is meant to be 30 kilometres from the tower, and this is a physical limitation of the cellphone service.

Other reasons respondents gave for deciding against using the KM service were dropped calls, poor or no signal, and the network going down. However, these technical problems identified in the March 2010 interviews seemed to be largely resolved by the time of the researchers' return visits. Finally, some other reasons mentioned included the lack of Internet and email access, the potential dangers of driving vehicles while texting, fears that cellphones can cause cancer, and concerns that a cellphone could be stolen.

A few people said they already had a cellphone plan in another location (Thunder Bay, Winnipeg) and so had decided against getting one in Fort Severn. Some people were simply uninterested in talking on the phone or found unattractive the idea of people being able to reach them all the time ("it's annoying"). Finally, several people believed that cellphones were unnecessary in the small community. Here are some of the comments:

"For a community like Fort Severn, if I want to talk to someone, I just go over to their house. It's just a small community."

"I've already got a land phone. If anybody wants me, they can find me. I don't go anywhere, so what would I need a cellphone for?"

New and future mobile applications—DiabeTEXTs

The introduction of the KM service in Fort Severn opens up new possibilities for applications that could improve communications and services in many different areas. One of these possibilities is health applications. The KO tribal council, as well as Fort Severn and many First Nations communities, are actively seeking new ways to use technologies to improve health and wellness in the communities (Gibson, Coulson, Miles, Kakekakekung, Daniels, & O'Donnell, 2011; Williams, 2010).

DiabeTEXTs is a new initiative by KO Health and K-Net to use cellular technology to provide diabetes education and information to interested community members through SMS texting and other electronic media. Information such as reminders for blood-glucose testing, recommendations for healthy living habits, tips on carbohydrate counting, and community diabetes events can be sent to patients, caregivers, and even teachers.

Community diabetes workers are provided with a cellphone and software to send mass texts to a large number of recipients from their computers. They can also answer patient questions on SMS text directly from the computer as well. This provides the important advantage of mobility—patients simply need to be within a working cellular zone to communicate with their diabetes worker or ask a nurse a question. At the end of each week, community workers submit an online report on the DiabeTEXTs main page about how they have been using the cellphones, what types of messages they have been sending, and feedback about the project (Keewaytinook Okimakanak, 2010).

In November 2010, a year after the introduction of the KM service in Fort Severn, DiabeTEXTs was introduced to the community. Fort Severn, similar to many other First Nations communities across Canada, has a high rate of diabetes. DiabeTEXTs software was set up on the diabetes worker's computer in Fort Severn. The worker was provided with a Nokia cellphone, software, a USB cable, and instructions on use.

Other potential community applications of cellular technology were recognized during this training session, such as community event messaging, anonymous tips for crime prevention, and alcohol and drug abuse support. Future research could evaluate this new service in Fort Severn and identify ways that it and other mobile health applications could meet community needs.

Conclusions and next steps

Keewaytinook Mobile (KM) exists in Fort Severn First Nation because of the leadership shown by KO/K-Net and Fort Severn in developing telecommunication services to meet the community's needs. They worked with federal and provincial government and private-sector service providers to fund, design, and implement the service despite considerable challenges. KM has built solid business relationships with strategic partners that can be leveraged in future development of the service. In early 2011, KO/K-Net received confirmation that the Northern Ontario Heritage Fund Corporation would provide the funding to develop the KM infrastructure in 10 more remote First Nations communities in northwestern Ontario. This will increase the number of First Nation-owned GSM cell systems from the current 7 to 17 in the region.

KM is community based, and Fort Severn manages and operates the KM service locally, working with KO/K-Net and other communities on the KM network to ensure that the service benefits the communities. From this perspective, KM in Fort Severn is an example of self-determination applied to telecommunications. KM is also an example of a community informatics approach to technology development, because KO/K-Net and Fort Severn see the KM service as a tool for increasing the community's capacity for social, cultural, and economic activities.

Keewaytinook Mobile will contribute to economic development in several ways. KM is a community-owned service, with profits from the service staying in the community. Before KM was introduced in Fort Severn, the only option for phone service was landlines leased to Bell Canada. As community members make the switch from their existing Bell service to the new KM service, their spending on phone service will stay in the community and may even create local employment. KM can potentially support local business and traditional economic development by allowing more timely communications and fewer missed calls. KM could also contribute to economic development in Fort Severn through community use of future services and applications that build on the mobile infrastructure. Recently, Fort Severn worked with KO/K-Net to negotiate a lease for rental of the community cell tower to co-locate equipment that will bring \$20K annually in new revenue to the community.

The most recent research visit (March 2011) highlighted that many Fort Severn staff members working on community services delivery are using KM regularly for their work. KM is making it easier for community members to reach community service providers rapidly and for the service providers to reach their clients. This improved communication means that community services can be delivered more efficiently.

A dominant cultural feature of Fort Severn is that the resident families engage in land-based activities for sustenance and for their livelihoods. For many residents, the KM service ensures a sense of safety and security when travelling for short trips outside the community because in the case of emergencies, the cellphone means that help

will be available. However, Fort Severn community members regularly travel outside the 30-kilometre range of the KM service for outdoor activities. The limited range of the service area was a disincentive to use the KM service for many people who regularly travel further out from the community. The limited range of the KM service may become even more of an issue in future as climate change continues to have an impact on the sensitive ecosystem in the area and people travel further from the community for land-based activities.

Finding innovative ways to address this challenge—to somehow extend the limited KM service range so that KM offers some measure of security and safety to community members travelling outside the range—will be a difficult task. There are physical limits to the wireless signals, and building additional cell towers in more remote locations far from community roads and existing infrastructure is too challenging to contemplate at the present time. As alternative power sources and the financial resources become available to create new cell sites on the winter road to neighbouring communities, KO/K-Net plans to address this range issue.

A significant challenge for KM is providing high-speed data services for Fort Severn cellphones. The KM cellphones in Fort Severn support only limited Internet access, and this capability is clearly desired by its users. With limited satellite bandwidth available to support all the community Internet users, mobile data service is unavailable.

Overall, this research has underlined that the future success of Keewaytinook Mobile in Fort Severn will depend on the extent to which it continues to be reliable and affordable, to meet local expectations for standards of service, and to address the safety and security concerns of residents who depend on it when travelling outside the community. KM in Fort Severn is ultimately an example of a community using and shaping a technology to meet its unique context and needs.

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References

- Beaton, Brian, Fiddler, Jesse, & Rowlandson, John. (2004). Living smart in two worlds: Maintaining and protecting First Nation culture for future generations. In M. Moll & L. R. Shade (Eds.), *Seeking convergence in policy and practice: Communications in the public interest* (Vol. 2) (pp. 283-297). Ottawa, ON: Canadian Centre for Policy Alternatives.

- Carpenter, Penny. (2010). Utilizing technologies to promote education and well-being: The Kuhkenah Network (K-Net). In J. P. White, J. Peters, D. Beavon, & P. Dinsdale, (Eds.), *Aboriginal policy research. Vol. VI: Learning, technology and traditions* (pp. 119-127). Toronto, ON: Thompson Educational Publishing.
- Fiser, Adam, & Clement, Andrew. (2009). K-Net and Canadian Aboriginal communities. *IEEE Technology and Society Magazine*, 28(2), 23-33.
- Gibson, K. L., Coulson, H., Miles, R., Kakekakekung, C., Daniels, E., & O'Donnell, S. (2011). Conversations on telemental health: Listening to remote and rural First Nations communities. *Rural and Remote Health* 11, 1656. URL: <http://www.rrh.org.au> [April 1, 2011].
- Gurstein, Michael. (2003). Effective use: A community informatics strategy beyond the Digital Divide. *First Monday*, 8(12). <http://www.firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1107/1027> [April 1, 2011].
- Keewaytinook Okimakanak. (2010). *DiabeTEXTs homepage. K-Net*. URL: <http://www.diabetexts.knet.ca> [December 24, 2010].
- McMahon, Rob, O'Donnell, Susan, Smith, Richard, Woodman Simmonds, Jason, & Walmark, Brian. (2010, December 1). *Putting the 'last-mile' first: Re-framing broadband development in First Nations and Inuit communities*. Vancouver, BC: Centre for Policy Research on Science and Technology (CPROST), Simon Fraser University. URL: <http://www.sfu.ca/cprost/docs/Putting-the-Last-Mile-First-Dec-1-2010.pdf> [April 1, 2011].
- O'Donnell, Susan, Milliken, Mary, Chong, Corinna, & Walmark, Brian. (2010, June 1). *Information and communication technologies (ICT) and remote and rural First Nations communities: An overview*. Presented at the Canadian Communication Association Conference, Montréal, QC, June 1-3.
- O'Donnell, Susan, Perley, Sonja, Simms, Deanne, & Hancock, Brecken Rose. (2009). Video communication roadblocks facing remote indigenous communities. *IEEE Technology & Society Magazine*, 28(2), 16-22.
- O'Donnell, Susan, Perley, Sonja, Walmark, Brian, Burton, Kevin, Beaton, Brian., & Sark, Andrew. (2009). Community-based broadband organizations and video communications in remote and rural First Nations in Canada. In L. Stillman, G. Johanson, & R. French (Eds.), *Communities in action* (pp. 107-119). Newcastle Upon Tyne, UK: Cambridge Scholars Publishing.
- Whiteduck, Tim. (2010). First Nations SchoolNet and the migration of broadband and community-based ICT applications. In J. P. White, J. Peters, D. Beavon, & P. Dinsdale (Eds.), *Aboriginal policy research. Vol. VI: Learning, technology and traditions* (pp. 105-117). Toronto, ON: Thompson Educational Publishing.
- Williams, Donna. (2010). Telehealth/telemedicine services in remote First Nations in Northern Ontario. In J. P. White, J. Peters, D. Beavon, & P. Dinsdale (Eds.), *Aboriginal policy research. Vol. VI: Learning, technology and traditions* (pp. 159-168). Toronto, ON: Thompson Educational Publishing.