Digital Divides in Canada's Northern Indigenous Communities:

Supports and Barriers to Digital Adoption

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Abstract

My research explores digital divides and digital adoption in Canada's Northern communities. I highlight the implications that settler colonialism, government policies and industry hold for digital adoption initiatives underway in communities in the Northwest Territories (NWT) of Canada. I look at themes around digital adoption that surfaced from semi-structured interviews done with six Participants – key informants involved in Northern technology development – in this research. To interpret interview data, I use a holistic framework, the "whole community" approach to digital adoption (O'Donnell et al. 2016). The importance of self-determination, empowerment, community involvement, youth, training and the First Mile approach to digital technology adoption are some of the themes found in the data analysis. I use the three levels of the Whole Community framework to organize this discussion, separating it into: Community Members, Community Organizations, and Infrastructure. Based on my research, I propose adding a fourth level to the model, Policy and Funding, and include it my data analysis.

Keywords: digital adoption, digital divide, Northern broadband, whole community, Indigenous digital technology, self-determination, Ownership Control Access and Possession (OCAP®)[1].

[1] The First Nations Information and Governance Centre received registered trademark status for the OCAP® principles in 2015. For more information on why this is important and what it means see http://fnigc.ca/news/ocaptm-now-ocapr-understanding-new-trademark-status.html

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Chapter I: Introduction

In the 21st century, most members of society take their access to and ability to use digital Information Communications Technologies (ICT) for granted. We do not consider the infrastructure allowing us to use ICTs for vital services in the forms of e-government, e-health, and education. In urban areas we take for granted the speed available at a low cost for use. However, in rural and remote areas of this vast landscape, there are many communities that are not connected to these infrastructures, and have always been or have become the have-nots in the digital age (Compaine, 2001; Sevron, 2008). The concept of inequalities in access to digital information, computers and connectivity has been around for decades. This issue is framed in a few different ways: as gaps, inequalities, division between 'haves and have nots', or digital divides. Generally, these terms refer to the gap that exists between those that have access to digital technology and those that do not. The term has evolved over the decades, as has the technology – now it is not access alone, but also other factors including the type of access (broadband has become the standard), the capacity to use the technology, education and cultural needs (Sevron, 2008).

Early work on the digital divide by Van Dijk and Hacker (2003) describes it as the gap that exists between countries, regions, and individuals in terms of access to ICT. For this research, I am focusing on the digital divide as it pertains to broadband technology. Van Dijk and Hacker (2003) elaborate on the early definition by expanding it to four areas of access: lack of access, lack of possession, lack of experience, and lack of opportunity.

In this research I use the broader definition provided by Servon (2008), which includes the need for training, capacity and content, not just access, to support the adoption of digital ICT. More recently, Michael Haight, Anabel Quan-Haase & Bradley Corbett (2014) discuss the

second digital divide, which they describe as a person's ability to perform tasks effectively in a digital environment. To examine this issue, they concentrate on the demographic factors that influence access, activity, and social networking usage.

O'Donnell et al. (2016) have compiled a seminal work on the issues of digital technology adoption in the Canadian North, giving a comprehensive overview of research in this area to date, approaches and models of digital adoption. They identify many factors contributing to the issues of digital exclusion in Northern Canada, which go beyond the scope of this research. The research I put forward focuses on the factors influencing digital adoption in communities in Northern Canada, specifically the NWT. When researching populations from the NWT, it is important to also understand and acknowledge the history of settler colonialism (Wolfe, 1999; 2006), with over half of the population of the NWT identifying as Indigenous in the 2011 Canadian Census (Arriagada, 2016). Communities are pursuing their right for self-determination and there can be a perception of technology as another form of colonialism – and/or of self-determination.

Another way of looking at digital divides is through levels of ownership and control of digital infrastructures and services by user groups and communities. For example, Fiser (2010) explores the digital divide in Indigenous communities in Northern Canada by looking at various access management models. He finds the social enterprise model rates second to the third party commercial model when looking at ownership and occurrence, but that the social enterprise model offers broader benefits to the community. Parsons and Hick (2008), Hudson (2014), McMahon (2014a; 2014b), Middleton and Ellison (2008), Perley and O'Donnell (2006) and Warschauer (2012) all discuss the need to consider both the social and economic aspects of

development when working on the implementation and integration of digital ICT and broadband networks by communities.

The different ways of framing the 'digital divides' have implications for policy solutions. Historically, the policy around digital technology has focused on urban centres and connectivity; now that these centres are connected, policies need to be revisited to more accurately match the requirements of remote communities that are not connected and have different needs. Creating and enabling an environment of supportive policy and regulation, as highlighted by McMahon (2014b), could allow for more community ownership and control over how digital technology is brought into and used by the community. The change in requirements from urban centres to remote communities highlights the need to change the policy lens, from one solely focused on access and the physical infrastructure, to a broader focus on the policies around creating digital ICT infrastructure projects that address the different regional community needs within social and economic development initiatives. It is important to be aware of the colonial aspects of the digital divide, not only in how it came to be, but also in how we move forward to bridge it. Bridging the gap therefore involves empowering the communities, supporting self-determination, and engaging with the realities and impacts of settler colonialism (McMahon, 2014a). Parsons and Hick (2008) argue that the agenda should then become one of analyzing digital exclusion, and the way in which policy can influence digital inclusion in programs.

Through participation in a panel discussion conducted at the University of Alberta "Bridging the Gap: Community Engagement, Content, And Connectivity in the North" in April 2017 (Corbett, Fabian, Lanouette, McMahon & Shiri, 2017), I was able to build a list of Participants for follow-up, semi-structured interviews. I also conducted an extensive literature review of both primary and grey literature on the topic of digital adoption and digital technology

development in the Northwest Territories. Using the whole community approach to digital technology adoption as outlined by O'Donnell et al. (2016) as a framework to analyze my data, I highlighted themes around digital adoption in the NWT.

This study is situated in recent developments around the newly installed Mackenzie Valley Fibre Link (MVFL) in the NWT. The Government of the Northwest Territories (GNWT) used a public-private partnership model (P3) for the MVFL project. The MVFL had two main aims: to improve connectivity to Northern communities and to provide economic opportunities, in particular by supporting the transfer of data from the Inuvik Satellite station to the south (Aumond, 2014). The project created a 1,154 km long backhaul backbone infrastructure (https://mvflproject.com/), traversing a challenging landscape with varied environmental and geographic conditions from the southern McGill Lake in the sub-arctic region to the polar arctic in Inuvik, crossing major river systems, permafrost and fire prone areas. The final section of MVFL was completed in 2017, creating a point of presence in six communities in the Mackenzie Valley and Beaufort Delta (See Appendix A). The MVFL provides communities an opportunity to adapt and consume digital technology, and be the producers and owners/managers of it. For this opportunity to be maximized, the right education, training and ownership opportunities must be in place.

This research was conducted to address the following primary research questions:

- What factors influence digital adoption in the Northwest Territories?
- How can policy solutions address digital adoption in the Northwest Territories?

The interview data from the Participants supported much of the literature that suggests we need to change how we implement digital technology in the North; this involves policies, funding and building local capacity as well as deploying the technology itself. A bottom up

approach to policy discussions and infrastructure development would support the communities in creating their own digital technology initiatives as opposed to the current top-down approach that can inadvertently continue a colonial framework and hinder sustainable adoption of digital technology. Indigenous culture plays a significant role in the North, and concerns over how digital technology may affect cultural practices and Indigenous languages were mentioned. The Participants mentioned such barriers as: poverty, housing, substance abuse and capacity, which were also prominent in the literature. There were also several factors highlighted as solutions and beneficial aspects to digital adoption by communities. The solutions included: training, knowledge sharing and partnerships, youth empowerment, community inclusion at the onset of development planning and the notion of 'gateway' uses of digital ICTs to ease the communities into adoption such as; safety, health, and language applications. The importance of culturally relevant content and the ability to create such content were also highlighted, not only for the benefits of preserving culture, but also for the potential to help enable self-determination and empowerment.

Chapter 2: Literature Review

I am exploring the literature through the lens of my research question: What factors influence digital adoption in the Northwest Territories? Using digital adoption as a framework, I was able to build a foundation of knowledge around the issues and identify important themes that surfaced from the literature. The review allowed for a comparison of methodologies and frameworks in the broad research areas of Indigenous perspectives, ICTs, the digital divide and policy. My exploration of the literature led me to use semi-structured interviews, content analysis and the whole community digital technology adoption approach as a framework for my primary data collection and analysis. I will explain the process I used to develop this focus, and the importance of these themes, in the following Literature Review Methods section.

Literature Review: Methods

Many studies, including those done by Whiteduck, Beaton, Burton, & O'Donnell (2012), Imatiuk (2011), McMahon(2014b), McMahon, O'Donnell, Smith, Woodman Simmonds & Walmark (2010), and Whiteduck, Beaton, Burton & O'Donnell (2012) have found that when communities drive the conversation and process of building technology and infrastructure, the information it brings and the digital technology networks it creates can become catalysts for self-governance, self-determination and increased social-economic status. For this literature review, I used the concept of digital adoption as an overarching topic, but narrowed it down to focus on its effect in Northern Canada's Indigenous communities. In this context it becomes important to also look at the state of settler colonialism, the resilience and ingenuity in Indigenous communities as well as the economic and policy influences contributing to the ongoing divide challenge (Beaton & Campbell, 2013; McMahon, 2014a).

Search strategy and eligibility criteria. I used a combination of peer reviewed literature and grey literature for this review. I found I needed to incorporate grey literature because much of the information on the topic is found in government documents, community consultation publications, community reports and municipal documents. As well, looking at this literature supports one of my research focus areas, government policy on Northern connectivity. Using the University of Alberta digital databases and the EBSCO host search platform, I was able to search multiple databases and easily tweak the search terms. Some of the most relevant databases I used were: Academic Search Complete, Communication & Mass Media Complete, JSTOR and SCOPUS.

In addition to the library databases, I used Google Scholar for searching and drawing on the references cited in the literature. I found using the Google Web browser allowed for a broader search and also helped find grey literature that was not readily available in the library catalogue or Google Scholar. The types of documents found in the browser search included: community consultations, community reports, even some government reports were easier to find using a Google Web search first. The broader searches also included research done with a broader geographic, socio-economic and socio-technological scope.

For documents pertaining to infrastructure projects in the NWT I searched the Mackenzie Valley Land and Water Board online public registry (http://www.mvlwb.ca/Registry.aspx#), focusing on documents referencing broadband and the Mackenzie Valley Fibre Link (MVFL).

Using keywords and phrases with a Boolean search strategy to help focus the searches, I was able to find over one hundred articles. Some of the search terms used were: 'digital divide', 'self-determination and technology', 'digital adoption', 'ICT and Northern and Canada', 'digital inclusion and remote' and 'CRTC and North and broadband'. I used exclusion criteria to focus

on the most pertinent literature, looking at geographic area of the study, preferring a Canadian focus. However, if the topic was closely aligned with my questions, but focused on an Indigenous community outside of Canada, I still retained the article. If the focus was on technology in Indigenous communities but not related to telecommunications, broadband or the digital divide the article was ranked lower; if the focus was the digital divide but targeting socio-economic factors in non-indigenous communities it was ranked lower.

To track the documents from my searches I created a matrix in Microsoft Excel® as well as additional worksheets. The matrix has fields allowing me to assign a ranking to each source, add themes, methodologies used, recommendations for future work, input into Endnote (a reference management software tool) and the measurement used. I created additional worksheets with a numeric link to the matrix citation; the worksheets captured quotations, additional sources to look up, keywords and notes. I chose to use Endnote as my reference management software. Endnote allowed me to easily organize my sources, attach PDFs, make notes as well as easily export the reference lists. During the earlier process of completing an annotated bibliography on the same topic, I created categories in Endnote and assigned articles to the economics, governance, policy, self-determination, Indigenous lens, inclusion and digital divide categories.

The categories are not independent of each other, there are trade-offs and balances that can influence the inputs and/or outcomes of ICT in the North. For instance, you will find that economic issues have a negative impact by influencing settler colonialism and making the cost of infrastructure development prohibitive to communities, but potential economic growth can also have a positive impact by bringing broadband to the North if communities are included and potentially increasing socio-economic growth with jobs and export influencing self-determination goals. Each theme threads its way through the others highlighting the complex

issues surrounding this topic. Although I have broken the themes apart, there is an overlap and dependencies within them. I start with settler colonialism as an orienting theoretical framework, because it gives a historical and present day understanding of the communities in the regions I am interested in. I follow with: Self-determination, the digital divide, policy, economy and the current state of broadband in Canada.

Literature Review: Discussion

Armenta, Serrano, Cabrera, and Conte (2012) describe the various stages of understanding the digital divide concept: the first is the basic access of the 'have and have-nots', the second stage, also described by DiMaggio and Hargittai (2001); (Servon, 2002) incorporates more socioeconomic indicators and regulatory factors. The third stage expands even further to the realization that the digital divide goes beyond technological issues, but includes human development factors as well. Armenta et al. (2012) found that grass root participation, community leadership and human development were indicators of successful projects reducing digital exclusion.

Settler colonialism. The context of the digital divide in the North can be understood in both temporal and spatial histories. The impact of settler colonization on Indigenous cultures across Canada over centuries, as discussed in Berkes and Ross (2013), Dei, Hall and Rosenberg (2000), Grande (2015) and Nadasdy (2005), has had implications on language, trust, respect, power dynamics, loss of culture, loss of identity and loss of knowledge. These issues each in themselves have grave consequences for Indigenous and non-Indigenous peoples of Canada. Several studies done on government policies and settler colonialism by Indigenous scholars such as Marie Battiste (2011), Pamela Palmater (2011), and Taiaiake Alfred (2009) have been instrumental in understanding these issues from an Indigenous lens.

It is important to make a distinction between colonialism and settler colonialism as they differ. While much of the literature refers to colonialism, in this research I want to emphasize the theory of settler colonialism. Beaton and Campbell (2013), Veracini (2011) and Wolfe (1999, 2006) describe colonization as a term of past happenings where colonizers came to profit and left a territory; settler colonialism, however, imparts the idea of the ongoing and present state. Settlers do not rely on colonial subjects for labour, but they still control lands, culture, governance, education and health. Settler colonialism, as described by Wolfe (1999, 2006), can be understood to have the objective of elimination and absorption of Indigenous peoples into the settler society.

According to Nadasdy (2005), in recent years there has been an increase in the politicization of Indigenous peoples and a climate of "enlightened" race relations where the government and state institutions are working to restructure their relationship with Indigenous populations. The efforts in Canada to develop a way to more fully and fairly recognize Indigenous peoples, their lived history and culture can be found in the Royal Commission on Aboriginal Peoples (Dussault & Erasmus, 1996) and the Truth and Reconciliation Commissions reports (2015). To build bridges with these communities we need to understand the barriers that exist and find ways to remove them. However, Nadasdy (2005) points out that the mechanisms being used to do so, such as land claims, consultation and co-management systems, can be a mixed blessing because the process itself comes from a dominant system and one using a governance structure that is not part of the Indigenous system, but is being imposed on it.

This reasoning has also been employed by technology development scholars. For example, McMahon (2014a) points out that digital technology development in Indigenous communities, which are often led by government institutions and industries, are imposed through

frameworks and regulations that come from a colonizing lens. Beaton, Burnard, Linden, and O'Donnell (2015), McMahon, Philpot, O'Donnell, Beaton, Whiteduck, Burton and Gurstein (2014b), Schnarch (2004), and Whiteduck et al. (2012) further discuss the concept of settler colonialism in Canada and the principles of Ownership, Control, Access, and Possession (OCAP®) with regards to digital data and technologies. OCAP® was originally a theory developed by First Nations to apply self-determination to research (Schnarch, 2004). These authors also explore the resilience of communities and the positive impact ICT can have in building self-determination. OCAP®

Self –Determination. Digital technology can offer another tool for building self-determination in communities, through empowering and enabling communities to take ownership and control of the ICTs in their own community. Several authors have highlighted the need for self-determination. For example, Kakekaspan, O'Donnell, Beaton, Walmark, and Gibson (2014), as well as Beaton et al. (2015), discuss the confrontation between Indigenous peoples and the government over land rights, treaty rights, natural resources and the impact of the United Nations Report (Anaya, 2014), which highlighted the poor socio-economic conditions of Indigenous peoples in Canada.

Beaton and Campbell (2013), McMahon (2014b), and Philpot, Beaton, and Whiteduck (2013) discuss the role broadband technologies can play in self-determination when communities maintain control over their own infrastructure. Work being done by the First Nations Innovation Project and First Mile Connectivity Consortium (http://firsile.ca/about/) in Canada is a model for other researchers, communities and governments in working with and for Indigenous communities and technology implementation. The work the research and policy advocacy group is doing has long-term goals with community participation central to the project. Collectively

they have contributed to over seventy publications and numerous policy and regulatory proceedings, and built an extensive website. Some of the research done includes work by Beaton and Carpenter (2015) looking at Participatory Action Research (PAR) strategies involving the Keewaytinook Okimakanak Research Institute and First Nations. McMahon, Hudson, and Fabian (2014a) outline the work done by the First Mile Connectivity Consortium, K'atl'odeeche First Nation and the Eeyou Communication Network during the June 2013 regulatory hearings on digital infrastructure in the North. The focus of the groups in this hearing was on supporting access, affordability and infrastructure development for the communities. They highlighted the need for residents of the communities to be involved not only as consumers of services but also as producers. McMahon, LaHache, and Whiteduck (2015b) and McMahon, Chasle, and Whiteduck (2015a) discuss community informatics and researcher-Indigenous relations, self-determination and resurgence using digital data management strategies in the Kahnawà:ke First Nation. Community informatics theory highlights that the community itself needs to have the capacity to learn, use and need the technology for it to be successfully adopted, that the technology alone is not enough (O'Donnell et al., 2016).

Roth (2014) points out that the resilience and self-determination of Indigenous peoples have challenged the federal government and are pushing policies to acknowledge the access to broadband as an essential service and the realization of the socio-cultural and socio-economic impacts of technology in the North. McMahon (2014a, 2014b) and McMahon et al. (2015b) argue that Indigenous nations are practicing a form of 'digital self-determination' because of the widespread use of digital networks for governance, economic development, and the delivery of services to make decisions that can shift those holding the power, the Indigenous communities or the state governments.

Similar research and findings are also occurring in New Zealand and Australia, which have similar histories of settler-Indigenous relations as Canada. This research offers additional insight and complements the work being done in Canada. Greenwood, Te Aika, and Davis (2010) explore the history of colonialism and the push throughout history for self-determination in New Zealand. Using three case studies the authors highlight the knowledge system and values of the Maori and how they influenced the success of digital technologies in serving the needs of their communities. Similar to the findings of the First Mile Connectivity Consortium, the innovation and resilience of the communities led the way to successful management of their own technologies. Featherstone (2013) uses Participatory Action Research (PAR) to work with communities in Western Australia and highlights programs that the Ngaanyatjarra Media has delivered to the Yarnangu people. The ICT programs were implemented taking a community approach to ensure uptake, understanding and use. Featherstone's work also mentions the importance of youth uptake, which is something to consider in the Canadian North with a high youth population (Statistics Canada, 2011). Kalla (2016) working on digital inclusion as a tool for empowerment, is focused on India and highlights the importance of youth as well, giving strategies similar to those found in the Canadian research in regards to OCAP® and self-determination, Kalla's work focuses on Indigenous community inclusion, building competency, access to technology and to connectivity.

Policy and the current state. According to Dillan Theckedath (May, 2016), an analyst with the Canadian Library of Parliament, broadband access has become an integral component of Canada's infrastructure. He points out, however, that the increase in the speeds being offered may also be contributing to a new kind of digital availability gap between Canadians living in urban areas and those in rural and remote communities. Broadband networks have become a vital

part of the infrastructure by providing better e-commerce platforms, giving better rates to consumers, creating academic platforms allowing for more accessibility and distance learning, medical and health services, entertainment services, and social media services that help connect and mobilize citizens (Federation of Canadian Municipalities).

Michael Haight, Anabel Quan-Haase & Bradley Corbett (2014) discuss the digital divide as a person's ability to perform tasks effectively in a digital environment. They concentrate on the demographic factors that influence access, activity, and social networking usage like inequalities with income, age and level of education. All of these factors are implicated by the policies governing broadband in Indigenous communities in the North. The Canadian Radio-television and Telecommunications Commission (CRTC; 2016c) report to Innovation Science Economic Development Canada (ISED) on its Innovation Agenda recommended the inclusion of digital literacy in their funding. The ISED Connect to Innovate program focuses mainly on infrastructure, the backbone technology and partially on the 'last mile' connections (Government of Canada, Connect to Innovate), rather than on improving the ability to use the infrastructure.

Chen and Wellman (2005) point out the lack of standards in measuring the reporting on connectivity, the unit of measure being individuals, subscribers, households, communities, youth versus adults or multilevel jurisdictional units. The lack of standards can be seen in CRTC reporting (2015, 2016d): information on the North, often it is lumped under 'North' with no jurisdictional breakdown and the source of the data is not always comparable to the sources used in reporting elsewhere in Canada. Another issue with the lack of standards in measurement is highlighted by Dolničar, Prevodnik, and Vehovar (2014). They focused on the inability to compare studies due to the lack of standards, and they also make suggestions on a proper standards protocol. Throughout the reports from the CRTC data is contributed by the few large

companies providing services in Canada, much of the analysis is broken into individual southern provinces and 'the North' and often Northern Canada is not even included (CRTC, 2015(p.24), 2016d (p. 62)). The high rate of connectivity reported, especially at the higher speeds is in reference mostly to urban centres or Southern Canada, excluding mobile and satellite technology. Being aware of the inconsistencies of how the information is reported is important when we start to look at targets being set and the current state of connectivity in Northern and rural areas. The CRTC initiated a program to help address and identify the issues of connectivity in partnership with SamKnows (2015), using volunteer households to measure internet connectivity speeds of Internet Service Providers (ISPs) and comparing the actual speed to the advertised. The final report was made public in September 2016 and was dependent on volunteers. The study deployed 4,808 data collection boxes (p. 7), but the data again needed to be analyzed, rolled up to a larger geographic area lumping rural and remote with urban users (p. 14).

In Canada, the CRTC, as a telecommunications regulator, sets the terms of broadband service and infrastructure across the country – particularly in areas where public subsidies are used. In the Telecom Regulatory Policy CRTC 2016-496 (CRTC, 2016a), the CRTC sets forth a new path for connectivity, one of the objectives highlights the disparity experienced by rural and remote Canadians in terms of speed, capacity, quality, and price (p.1). This report also sets out the criteria to measure the success of the updated universal service objective, stating that subscribers to fixed broadband internet access should have speeds of a least 50 megabits per second (Mbps) for download and 10 Mbps for upload (p.2). The current broadband speed targets were set by the CRTC in the Telecom Regulatory Policy 2011-291 (CRTC, 2011), stating that all Canadians should have access to broadband service speeds of at least 5 Mbps downstream and 1 Mbps upstream by the end of 2015 (CRTC, 2016b). This report also acknowledges the need for

other stakeholder groups to make these targets possible and to establish a funding mechanism for access to the new target speeds.

Despite these requirements, digital divides remain a challenge in the North. The Pan-Northern report on broadband and Canada's digital divide (Public Policy Forum, 2014), the National Aboriginal Economic Development Board (NAEDB) recommendations (January 2016) and Haight et al. (2014) all highlight the issue of private sector development in the South due to population base, geography and the challenges in the North with a low widely dispersed population. The Pan-Northern report (NDMF, 2013), the Arctic Communications Infrastructure Assessment Report (Imatuik Inc., 2011) and the Federation of Canadian Municipalities report on Rural broadband (2016) all focus on the issues and necessity of bringing broadband to the North. These reports also highlight some of the socio-economic issues that need to be addressed.

Through the telecom Notice of Consultation 2015-134 (CRTC, 2016b, p.5) a diverse stakeholder group participated in the proceedings including: Indigenous groups, post-secondary institutions, ISPs, non-profit organizations, as well as several other individuals and stakeholders, including representation from the North and rural areas of Canada (p.5). The Consultation also included a public hearing in April of 2016, where the panel highlighted the need for a national broadband strategy with all Canadians offering input. The panel also stressed the importance of closing the connectivity gaps through assessment of both the gaps and who should work to close them. (p.6). The proceedings focused on fixed and mobile wireless broadband internet access, the Panel acknowledged that in today's society "[b]roadband internet access services are vital to Canada's economic, social, democratic, and cultural fabric." (p.7). The findings of the CRTC proceedings from the above report were submitted to the Government of Canada's Innovation Agenda as requested by the Minister of Innovation, Science and Economic Development (ISED)

in October 2016. ISED is the Ministry that implements the policies and, as the findings of the panel suggest, may set the same priorities as ISED (CRTC, 2016c).

Rajabiun and Middleton (2013) discuss the impacts of Canada's policies on the lack of progress to expand network development and the implications that has had within Canada and internationally. McNally and Torsow (2014) recommend that if the Government of Canada wants to ensure rural Canada can access the next generation of wireless technology, than it needs to stop the reliance on market forces dictating broadband deployment and instead create a national plan. The Government of the Northwest Territories in their *Final Argument Telecom Public Notice 2015-134* (GNWT, May 2016), which was a submission to the CRTC about broadband standards in the North, also highlight the lack of a national plan as an issue and they conclude the Notice with the comment that "Now is the chance to create a transparent process based on all Canadians needs with a shared responsibility to address the issues around broadband" (GNWT, 2016 p.3). The chair of the CRTC, Jean-Pierre Blais, is quoted in the media (Dobby, 2016) supporting the idea of a national plan. Rajabiun and Middleton (2013) discuss the role that both federal and provincial governments play in Canada with regard to broadband programs, giving details on various subsidy and grant programs across the nation as well as highlighting the lack of federal motivation on policy changes and the need for provincial and municipal governments to step in.

The CRTC Telecom Regulatory Policy 2016-496 seems to be on the correct path in addressing the above concerns, declaring broadband internet a basic telecommunications service (CRTC, 2016a), Jean-Pierre Blais is quoted as saying "Today's decision signals a fundamental shift in our regulations for basic services from voice-related issues to broadband-related issues" (Kupfer, Dec 2016).

Community economy of broadband. Longford (2008) focuses on the relationship of ICT and civic participation, looking at specific community networks and how they implemented digital inclusion policies by providing training, creating opportunities for effective use, promoting information sharing, community involvement and social development. The author uses both a literature review and several case studies from the Canadian Research Alliance for Community Innovation and Networking (CRACIN). Longford contributes to the literature by looking more broadly at the implications of ICT on participation and civic engagement, which led to a more focused work on Indigenous communities and the unique issues they face around inclusion, adoption and socio-economics.

The Canadian Chamber of Commerce report (September 2011) highlights several different investment models used in Canada for broadband infrastructure. These include cases with First Nations Social enterprise organizations like K-Net, which is also featured in several of the First Nations Innovations publications (First Mile Connectivity Consortium), public and private partnerships (P3) models, Alberta's Supernet, O-Net in Alberta, which is a community-owned internet service provider described by Pant and Odame (2016). The Canadian Council for Public-Private Partnerships (CCPPP, 2016) in their federal budget submission uses the example of the MVFL as a successful P3 project, recommending that every major infrastructure project funded with federal money requires fibre to be laid during the course of construction, enabling all Canadians to have access to connections. They also provide recommendations on empowering Indigenous communities with various funding strategies to help build infrastructure to create a better socio-economic situation that is based on the need, not population, which seems to support the scholarly findings highlighted in the previous section on tools for self-determination.

Fiser (2010), as highlighted in a prior discussion of understanding the digital divide, explores the national connectivity and management models in Canada: third party commercial, Indigenous commercial, First Nations authority, and Indigenous social enterprise. He found the third party commercial and Indigenous social enterprise to be significant, but he also highlights that geographic and related socio-economic conditions will most likely present challenges for Indigenous access.

The CRTC 2016 Community Monitoring Report (CRTC, 2016d) compares household income to broadband cost between 2013 and 2014, showing that the lowest income group had experienced the largest increase in prices (2016d, p.42). In the CRTC report to the ISED Innovation Agenda program the authors highlight the need for a multi-faceted approach including a wide range of stakeholders and community organizations in tackling the affordability problem (CRTC, 2016c).

Gaps and issues. Chen and Wellman (2005) identify several gaps in the digital divide literature, some of which are around the supply side, content and connection for users of diverse socio-economic and cultural backgrounds. The authors also highlight the lack of standard measurements to be able to compare studies. Many studies are unclear about where the data is coming from. For example, Communication Management Inc. (August 20, 2015) broadly discuss the digital divide, but fail to present the target audience and the data is solely from the Southern and mostly urban centres of Canada. Dolničar et al. (2014) as well as Chen and Wellman (2005) bring up the lack of measurement standards and the inability to truly compare many studies.

There is also a gap in existing research on Indigenous communities in Northern Canada – in particular the Northern Territories. Though I have highlighted the First Nations Innovation

Initiative, there is potentially a lot more research that could be done especially on the developments of the MVFL, the Yukon Dempster fibre line and the potential Arctic Ocean line.

Conclusion and Key Findings from Literature Review

Literature highlights that digital adoption in the North is a complicated matter not only involving the lack of access to technology, but broader social issues of settler colonialism, lack of policy, socio-economic uncertainty, geographic impediments and small populations. However, even with all of these potential barriers, communities are finding ways to be innovative, maintaining resilience, using broadband as a means of empowerment, and promoting resurgence in self-determination. Several scholars, both Indigenous and non-Indigenous, are facilitating knowledge exchange by including the communities in their work and promoting the concepts of OCAP® in the context of technology development in the North.

For broadband to be successful in the remote communities of the North, the model of deployment is going to have to involve partnerships with the communities themselves. Using a method that is bottom up, with communities driving the initiatives will be important to sustainable development and adoption of digital technology. Broadband through the principles set out in OCAP® can be a tool for self-determination, as well as a means of improving socio-economic, cultural and technological aspects of life in the North. With the federal government lagging in commitment up until the CRTC 2016-496 telecom Policy, regional and municipal governments have been playing key roles in bringing broadband to communities. Moving forward with Indigenous communities, federal and non-federal programs and projects need to keep in mind the impacts of coming from a settler colonial position and adjust their policies and funding structures likewise. This might involve, for example, creating a policy structure where Indigenous Peoples can have input and compete to provide services on equal footing. Another

support might be using techniques such as community informatics and a whole community approach in assessing and deploying digital technology inclusion and adoption in Northern communities. Other ideas included creating a national broadband strategy or stepping away from market competition as a means of bridging geographic digital divides in remote/small population communities. I explore these issues in my interviews with key informants who are involved in broadband development in the NWT, using them to inform my questions.

Chapter 3: Research Design and Methods

The factors influencing digital adoption in the North of Canada vary depending on the region of focus, at what stage of access a community may be at and the governance structures used for implementation from planning through construction, content and ownership. This research was exploratory, with the aim of understanding the issues impacting digital adoption in the Northwest Territories from the perspective of people who are live, work or are involved in digital technology in the North. This exploratory research utilized an inductive qualitative methodology using a Grounded Theory approach to analyze interview data.

Following the guidelines for working with Northern communities set up by the Aurora Research Institute (ARI), community organizations were directly contacted to find out about possible interest in participation. A researcher at the University of Alberta that works in the NWT introduced me to the meeting coordinator for The Sahtu Regional Resource and Monitoring board, and I was invited to participate in their next call and outline the work I wanted to do. This led to talking to a few community members to get further insight on contacts. I had also previously met members of the Gwich'in Renewable Resource Board and Gwich'in Tribal Council and solicited possible interest and involvement from them. I was also able to talk to the Participants of the Bridging the Gap digital panel and the community experts at the discussion about possible participation in my research.

Both the University of Alberta Research Ethics & Management Office (REMO) and ARI required formal applications for ethics approval due to the geographic focus of the research in the NWT and the involvement of human subjects in interviews. ARI requires all research conducted in the NWT to go through an approval process (see Appendix C for University of Alberta and Appendix D for ARI). Interviews with the research Participants could not be started

until the REMO application was approved and the Participants from the NWT could not be interviewed until the ARI license was approved by communities in the region of the research.

On April 20, 2017 I attended a one-day panel discussion, "Bridging the Gap: Community Engagement, Content, And Connectivity in the North" (Corbett et al., 2017), at the University of Alberta to gain a broader understanding of digital adoption and connectivity in Northern Canada. The recording of this event was one of my primary data sources. I listened to it and transcribed it, and then used the transcribed data to outline broad themes and concerns raised for Northern projects and communities. The event also supported recruitment of Participants for semi-structured interviews. The Participants on the panel all had some level of understanding of digital connectivity issues in the North. I recruited several of the panel Participants for follow-up interviews, to learn more about the comments made during the event. I also recruited two other community members from the NWT region who have expertise in digital connectivity. I conducted semi-structured interviews with 6 individuals to learn about their recommendations and concerns about digital technology development in the North.

The primary inclusion criteria for interviewing the Participants were that they needed to identify with at least one of the following: knowledge of digital technology in remote communities, residing in the Northwest Territories for over ten years, working for Indigenous organizations that use or promote digital technology, or involvement with digital technology infrastructure in the NWT.

Participation was voluntary; Participants had the right to refuse to participate in this study. Participants were able to decline answering any questions they did not wish to answer. Participants were also given the option to withdraw at any time without any negative consequences to their relationship with the University of Alberta. In the event that they decided

to withdraw data already provided to the study, they were given the deadline of July 21st to inform me in writing for the data to be removed.

The data was collected using semi-structured interviews with six key informants chosen for their expertise and involvement in broadband development in the NWT. The interviews were set up over email, conducted over the phone, and were recorded for later transcription. This type of interview fit well with the exploratory nature of the research. It allowed the interviewees to talk in more of a conversational manner about the questions and, to some degree, go off on a tangent without being tied to a formal structure (Merriam, 2014; Fylan, 2005). The conversational approach was important in gaining trust and building a rapport with the interviewees. It is also a better format for getting to the 'whys' of a situation and for learning about the Participants' experiences, as well as being more flexible with individual Participants with a particular focus or interest in the topic. Seven open–ended questions were used with accompanying probing questions for more detailed response if needed (see Appendix E Interview guide). The order of questions depended somewhat on the natural progression of the conversation. If a Participant started answering a question without it being asked, they were not cut off and this question was not formally asked. One Participant had requested to avoid specific questions on infrastructure due to the conflict of interest concerns.

I talked to the interviewees about the consent form and given options of anonymity, future participation and an option to withdraw their data at a specified date (see Appendix F for letter of consent). To ensure confidentiality, the information identifying the Participants was removed after transcription; their contact information was kept if a Participant wanted to be further involved or receive updates on the work.

Table 1.

Summary of the interview Participants' experience with the Northern digital technology.

Participants	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**
Self-identified as Indigenous		**x**	**x**	**x**		
Consultant- Broadband	**x**		**x**	**x**	**x**	
Worked/s for Community Organization or Partnership	**x**	**x**	**x**	**x**		**x**
Broadband Expertise	**x**		**x**	**x**	**x**	**x**
Lived in the North >10 years		**x**	**x**	**x**	**x**	**x**
Participated in Digital Panel	**x**		**x**	**x**	**x**	

To transcribe the data from the audio recordings, InqScribe® software was used. Using the methodology from Ose (2016), both Microsoft Word 2010 and Microsoft Excel 2010 were used in the coding process (see Appendix B). Coding itself was done using guidance from both Saldaña (2009) and Merriam (2014). The process of open, axial, and selective coding analysis was used (Corbin & Strauss, 1990). The interviews were transcribed in whole on the day of the interview and the digital recordings were stored on an encrypted server until final analysis was complete.

To analyze the interview data, I drew on themes from the panel discussion and my literature review. I applied the theoretical framework of the whole community approach to digital technology adoption (O'Donnell et al, 2016) to my interview data. For the analysis, I found I

needed to add an additional level for 'Community Inclusion in Policy and Infrastructure Development' that I found was missing when looking at the data from the interviews.

All interview transcripts will be identified through a code that the research team can link to the interviews; this link will be kept secure and never revealed outside the research team. The original recordings of the interviews will be destroyed after written transcripts are created. All documents will be identified only by code number and stored on a password-protected computer. The data will be destroyed five years following the completion of the project, after which all electronic and paper documents containing any information will be respectively deleted and shredded. The Participants were given information to contact the researcher to request publicly available documents about this research that are published.

Analysis

The data was analyzed using a process of open, axial and selective coding. The first phase created over 140 distinct codes, these were collapsed into axial themes which were then collapsed and used in the whole community approach to digital technology adoption. The transcriptions will be kept for five years on the encrypted server and the recordings will be deleted upon submission of the final paper.

The analysis process involves taking the collected data, in case of interview transcripts, the data is a text, and reducing the content to meaningful groupings in an effort to find understanding by coding the data. The process from transcription to final compilation into categories is outlined in the appendices (Appendix B). The process outlined by Ose (2016, p. 149) uses ten steps to get from data collection through analyzing the data (Table 2). This process maintains the integrity of the data allowing it to be recreated in its original state, contributing to the reliability and quality of the analysis.

Ideally, the transcripts or broad categorizations would have been shared with the interviewees, but the time constraints did not allow me to arrange for this.

Table 2.

Data process from transcription to analysis. (Ose, 2016)

The method includes the following 10 steps:
1. Collect the data.
2. Transcribe the audio files.
3. Transfer the text from Word to Excel.
4. Prepare the Excel document for coding.
5. Code in Excel.
6. Prepare the coded interviews for sorting.
7. Sort the data.
8. Transfer quotes and references from Excel to Word.
9. Sort the text into a logical structure based on the coding.
10. Analyze the data.

Step ten in the Ose (2016) methods above builds the next chapter, Findings. In Findings, the data is analyzed within the framework of the whole community approach to digital adoption (O'Donnell et al., 2016) using the themes found in the data around the research question:

- What factors influence digital adoption in the Northwest Territories?
- How can policy solutions address digital adoption in the Northwest Territories?

Chapter 4: Findings

The Northwest Territories is a geographically and culturally diverse landscape with remote communities having fairly low populations compared to Southern areas of Canada. With the recent declaration from the CRTC for a universal service obligation (CRTC, 2016c), and the completion of the Mackenzie Valley Fibre Link in 2017, issues around digital inclusion need to be part of long-term planning for local communities, the Northwest Territorial Government and the Federal Government of Canada. In this context, my research was guided by the following research questions:

- What factors influence digital adoption in the Northwest Territories?
- How can policy solutions address digital adoption in the Northwest Territories?

The terminology used by Participants could at times be intertwined and confusing. Terms such as 'connectivity' could mean connectivity to the broadband infrastructure or increased human connectivity due to having access. 'Capacity' at times refers to human capacity in the community, technical capacity to use the technology or the actual capacity of the technology itself – bandwidth or speed. For this reason, I will try to be specific in the terms used and how they fit in the discussion of digital inclusion.

The resulting categories or themes that arose from the data fit the framework of the whole community digital technology adoption approach (Figure 1; O'Donnell et al., 2016). The whole community framework encompasses three levels of digital technology adoption. The foundation level is the infrastructure supporting community adoption level, the next level is the community services and organization factors that enable adoption and the third level are the community members and the household factors that influence the ability for digital technology adoption. Through my research, I found a need to add a fourth level consisting of Policy and Funding supporting the foundational level of Infrastructure. The categories that surfaced from the six

interviews are laid out in Figure 1 under each of the framework levels. Topics that were brought forward in the interviews and went beyond the whole community digital technology adoption approach were around policy and funding and the need for communities to be in control of the digital technology development, before the infrastructure is implemented.

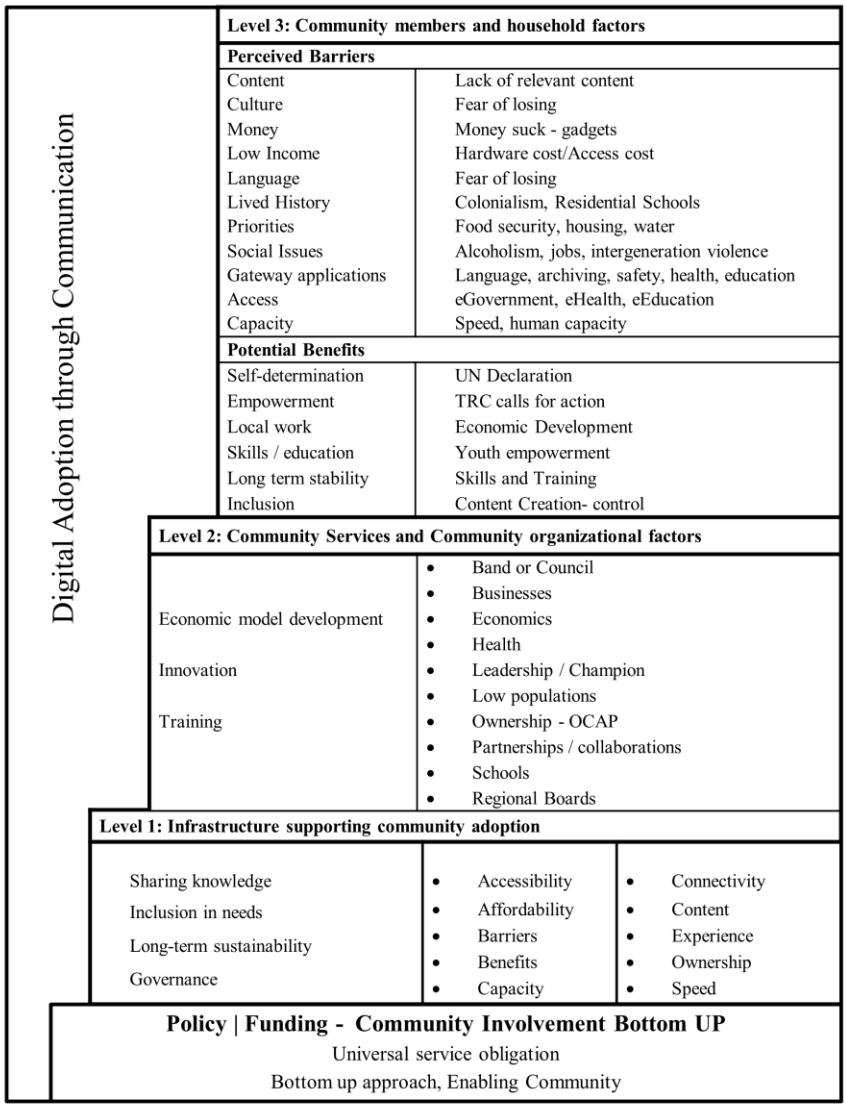

Figure 1**.** Data categories drawn from interviews reflected within the whole community framework (O'Donnell et al, 2016). Foundation level is added to the original framework based on this research**.**

Policy & Funding --From the Bottom-up starting with the top

The Participants highlighted the need for policy and funding changes when working in the Northern communities. They stressed that the communities need to be included in the conversation around digital technology implementation and the need to provide funding to communities for more than just infrastructure. The Federal Government has in the past year moved in a direction to address some of these concerns, though it is still too early in the process to see how successful the approach will be.

Several of the Participants commented that often officials from the Federal Government working on programs did not seem to realize the need for a different approach in the North and how it differs from urban centres in the South. Missing the importance Northerners put on long-term relationships, those projects are not finite, but on-going and should not be treated like a list of tasks to be checked off. Participant 1 stated:

> I had to reiterate this in Ottawa and spend a couple of years explaining that this is not a project – there is no start date and end date, it is an ongoing access issue. It took me years to explain this and it is probably still not understood in Ottawa. (Participant 1)

Participant 5 similarly states: "Sometimes the federal government is like 'we just need this or that for the auditors'" (Participant 5). The Participants mentioned this ambivalence could partially be due to their colleagues being used to projects in urban centres or areas not geographically isolated; areas not so heavily influenced by socio-cultural and economic constraints with low populations and a long history of settler colonial impact.

With the announcement in December 2016 of the universal service obligation (CRTC, 2016c), increasing the basic service for Canadians to broadband capacity, there is now a foundational regulation for Canadian consumers and producers of digital technology to build

from. The universal service obligation sets the groundwork for new funding structures and a broader stakeholder base for projects to be successful, as stated by Participant 6: "I think they have a direct interest [in communities]. I'm not sure if it was the CRTC or someone else in the Canadian government that said all Canadians should have the same access" (Participant 6). Implementing digital technology projects in the North does require multiple levels of planning, from funding to long-term sustainability, ownership and adoption strategies. Four of the Participants mentioned the new universal service obligation and with that in mind discussed how all or certain levels of government should be involved in digital inclusion in the North. All Participants felt there should be participation at the community member level. Participant 1 suggested that starting at the local council level of governance would help development progress more efficiently: "I think the biggest thing you want to talk about is public access to governance and internal access and how it is going to be public, start at Council meetings and being able to do them virtually" (Participant 1).

Five of the Participants felt there were strategies at each level: federal, territorial, municipal, band or council, depending on the governance structure of the region. Participant 6 reflected on this and made some interesting points, which I'll quote at length:

> I think as the senior government, Canada should be providing programs to meet their stated commitments and programs, meaning probably financial assistance and such, to meet their stated commitment of equal access. I think the territorial government should be looking to go from there to provide territorial wide resources to allow each community to receive that standard of service. And then I think it's …from there I would almost say it's either left to the private sector, or municipal or First Band Government to see if they want to do something. I would think government responsibility for getting the quality service

> to the community and then from there it can be however it best works in the community. (Participant 6)

The need for communication between involved stakeholders throughout the levels of the whole community framework (Figure 1) was mentioned by all Participants. Existing communication was described as lacking between those making the decisions (Government or industry) and stakeholders (community members, organizations). Another issue with communication that was mentioned was the lack of communicating what content is available, the need to help train and enable community members to use the digital technology: "You can put whatever you want on the web, but unless you put a big flashing light on it for them, they are never going to see it" (Participant 4).

Several of the Participants highlighted the need for some of the funds to go directly to communities for broadband needs: infrastructure, working in partnerships or training and skills development, as well as building content. The ability for the communities to control how the funds are used contributes to the principles of OCAP®. It realizes that each region or community may have different needs, partnerships and access to internal skilled businesses or individuals. Participant 1 reflected on prior broadband projects in the North where money was given directly to the community and the organization running the program allowed the community to decide how to best use the funds and what business model to adopt: a P3 model, external, or internal. The importance of the community deciding how to spend the money allowed for more ownership over the projects by the community and led to longer term sustainability, control within the community and an opportunity for both social and economic growth.

New funding is being made available at the Federal level for Northern projects through the CRTC and ISED (Canadian Government, Connect to Innovate). Two of the Participants

highlighted the complexity of the application process and the issue with broadband funding having an online application. Many of the places and people that need this funding are those unable to access the internet or those who do not have the capacity or experience to follow the outlined processes. The Participants also mentioned the short notice of the funding announcement, which put communities and organizations at a disadvantage. These Participants mentioned that many organizations have a limited capacity and have projects that they are currently focused on. Therefore, they did not have the time to apply with the given deadlines and with the complexity of the process. As Participant 4 stated:

> What's funny now is because Infrastructure Canada has all this money that they never had before, now all of a sudden they are trying to engage us all at the same time and we have prior commitments [so] we can't participate [in these opportunities]. (Participant 4)

Participant 3 discussed how cumbersome and frustrating the Connect to Innovate Fund application was to complete, and how by opening up the fund to larger broadband providers and telcos, it really put smaller, community-oriented or run organizations at a disadvantage in the application process:

> We have the Connect to Innovate Fund, which was a huge fiasco and still is, in that you have huge companies like Northwestel putting in applications to such complex application process to bridge that digital divide. And rather than concentrating on First Nations communities and remote communities, they opened up that program to telecommunications… providers. And the process was so complicated, I myself put in an application to the Connect Innovate Fund and the process was long, onerous ….But just applying for the fund really deters communities to gain access and gain knowledge to help. The process needs to be streamlined for more community owned networks and the

> GNWT needs to promote community owned networks through their new MVFL. (Participant 3)

If the policy and funding had started with a bottom up or grassroots approach, other mediums for communication and supports may have been developed.

Level 1: Infrastructure

Level 1	**Sub topics**
Infrastructure	Affordability of the technology
	Accessibility of the technology
	Speed
	Competition
	Limiting data downloads – data caps
	Environmental concerns

Infrastructure is vital to broadband development and is more than just the construction of the technology on the ground. Infrastructure has implications for a host of applications, usage and sustainability of the broadband technology in a given region. The Participants discussed many of the direct and indirect linkages between how the infrastructure was built and the success of digital adoption in communities, as well as some of the limitations due to the remote location and geography of the area.

The Participants highlighted there are several factors one must consider with the 'cost' of the services to the community members in the North, the geography and cost of putting in the infrastructure, the cost of maintenance, the wide spatial distribution of the communities, low

population to support the services, lack of competition, other socio-economic priorities and the capacity of the installed broadband technology. Several Participants point to low population as one of the barriers to not only building and including communities in development, but also to the lack of a business case to support the cost of the infrastructure and services. Participant 5 states:

> One thing, the population just isn't there, the numbers are not high enough to support it, even the people that would subscribe they are not going to pay 200-300 dollars a month for their internet service or whatever and there is only so much they can pay on their mobile service and even the government up there in the NWT has limited funding, the tax base is being ground right down and they have a lot of demands for all kinds of things from health care to social services to education. So they have limited funds to put into some of these things. (Participant 5)

The Participants also noted the complications the varied landscape and seasonality play in building and maintaining infrastructure: "Bringing stuff over ice roads, bringing towers in, choppers and all that, you know to do all that stuff" (Participant 5). Also, the cost of maintaining a system with redundancy – in the North, this is currently done by keeping the previous microwave system in place: "That can be a challenge for cost, if you still have to maintain an existing system and you add on the fibre, unless you can get one of those circular routes which is not always possible" (Participant 6). The North offers many challenges for infrastructure development: the landscape, cost, maintenance and long-term sustainability. Infrastructure development also offers a diversity of benefits: jobs, connectivity and the potential to enable communities in the principles of OCAP® in digital technology development.

Affordability of the technology. Affordability of digital technology includes both the cost of the hardware needed (computers, tablets, routers, etc.), the cost of the subscription to services to access the digital technology and the potential cost of going over data caps. These costs are directly related to the funding model used in the project and the involvement of the communities in ownership and control and how the community is connecting to the backbone infrastructure. As Participant 6 highlights:

> The price is a barrier, I think also that many communities and many people in the North have limited income and don't necessarily have their own computer and or connection in their home and have to use public facilities in which they could be limited in small communities. (Participant 6)

Another factor highlighted by several of the Participants was the low population and how that affects affordability: "It's like many things up here the costs are enormous, the rate payers or the people that pay for it are so few. It's not like what you could do in Alberta or a big city; it needs to be heavily subsidized" (Participant 6). Another factor that plays into the affordability of technology in the North is the ability to access digital technology.

Accessibility of the technology. Digital technology accessibility or lack of accessibility comes in many forms, the inability to access the tools needed to participate in digital technology, the knowledge gap that exists in how to access and use digital technology, language barriers as well as relevant content. Participant 3 highlights the irony in that information is often delivered through digital technology tools:

> … you are still dealing with digital access in the North and the people you are aiming this website to are the same people that do not have digital access and you know the only

> place they have digital access is either the local school or the band office or some sort of community library and those are too few and far in between. (Participant 3)

There is also the barrier of the knowledge gap: several of the Participants referred to this in conversation, many community members currently do not know how they would participate in digital technology and even if they want to participate, they need training and the equipment. The idea that you 'don't know what you don't know' came up in more than one interview: Participant 1 simply stated a question heard in community conversations that gets at the very basics 'what can it be used for? How does it work? Do we understand it? (Participant 1). Participant 6 goes further, bringing up the need for training in order to enable community members to take advantage of digital technology tools. This needs to be more than just what hardware and software to install in the community or for individuals, but also understanding how to access information and use tools like e-services. The accessibility of digital technology requires making sure community organizations and champions are involved in identifying what the needs are for a particular place and planning for those throughout the digital technology implementation.

Speed. There seem to be differing views on what is acceptable for speed of data transmission in the North. This also depends on what type of digital technology is available: satellite, microwave or fibre. One Participant who works in digital technology, but does not live in the North, felt that the speed, though slower than somewhere like Edmonton, was still good for most internet use (5mbps instead of 15mbps) (Participant 5). However, one of the Participants living and working in the North was frustrated that they pay for the 15mbps speed,

but never get that and that the lower speeds are not enough for multiple-member households or for newer digital tools that require more speed (Participant 2).

All Participants commented on the need for reliable speeds that allow for the same basic service people in the Southern parts of Canada receive, without having to pay a premium to receive these services. Many Participants also commented on the perception that the lower speeds available were sufficient for common uses often do not consider the number of members in a household or community members accessing the services at the same time.

Competition. Competition to provide digital services to the North is hindered by the policy direction, which states the focus to rely on market forces for broadband deployment. The North does present challenges not felt in more populated areas, which can lead to seemingly unequitable situations for competing service providers.

Five of the Participants mentioned the issue of competition in the North and how it may limit what is available to the user in terms of cost, data caps, and service. Participant 2 states: "I would want to have more options and hopefully when that comes, we do have the connection now, I kind of hope that competition from different providers will come and that will force more options for us" (Participant 2). Several Participants discussed the need for communities to have more involvement, taking a First Mile approach to providing digital technology. They also highlighted their concerns around a monopoly system that limits services, quality and affordability. Four of the Participants mentioned that the MVFL originally stated community participation as a goal, has not to date implemented any strategies to make that goal possible. Instead, as Participant 3 stated:

> All we did was hand over the infrastructure to Northwestel, who is going to manage it in the best interest of NWT residents? They presented that there would be many

> opportunities, but yet I don't see that being communicated to this day and it's done. (Participant 3)

The policies that lead to a lack of competition result in fewer options for communities and fewer opportunities for enabling solutions from within the community itself.

Limiting Data Downloads - Data Caps. Limiting the amount of downloaded data or 'capping' the data usage by customers per month allows the internet service provider to impose a tiered fee systems, control usage and charge for overages. Participants commented on the lack of choice in data options for the cost, and the frustration of having to monitor usage to avoid high overage charges. Northern consumers are already paying a premium for service that is acknowledged as being less than that of Southern counterparts.

A Participant living in the North commented that they often exceed the data cap limit when they have more family with them in the summer, with no real affordable options for increasing the limits and a burden of constantly monitoring the usage:

> I'm only half way through the month now and I called Northwestel just to see if I could a temporary increase and we are maxed out on how much data we can purchase. I'd be willing to pay the price to have no data limits, but I want the speed as well. (Participant 2)

Participant 5 explains that the data caps are imposed due to using the same backbone infrastructure for the mobile network as the DSL network, so it is needed from the 'providers' point of view to keep the congestion of the lines to a minimum. With the new MVFL, however, that should not be the case for many of the communities, as this Participant highlights: "Down in Alberta everything is all fiber and we just have capacity coming out our ears, so the two services don't compete with each other for bandwidth, but they do in the NWT to some extent" (Participant 5).

The necessity of data caps is contentious and with the recent universal service obligation may receive more attention in the attempts for digital equality and net neutrality.

Environmental concerns. Digital technology can play a role in lessening impacts on the environment due to travel as well as having a potential negative effect on the land during installation and maintenance.

Two Participants mentioned how digital technology may impact the environment. One emphasized how community organizations need to play a role in environmental impact concerns: "On a work perspective the only thing that we were able to share- when development happens, that it happens in the most environmentally protective way" (Participant 2). The other Participant viewed the ability to access and use digital technology as an inevitable means to combat global warming: "We've come so far in our technology in meetings over the last 50 years, at some point like with greenhouse gas emission, if we are truly serious we have to stop driving a car or stop flying to a meeting" (Participant 6). Technology itself may have many more impacts on the environment, but those were not within the scope of this research.

How infrastructure is executed from the policy and funding through development and implementation has direct influences on how community organizations are able to facilitate the ability to use, contribute to and benefit from digital technologies. The next section focuses on the next level in the whole community framework for digital adoption and community organizations.

Level 2: Community Organizations

Level 2	Subtopics
Community Organizations	Bottom up approach to digital adoption; Leadership, Champions and OCAP®
	Knowledge sharing, empowerment and training
	Barriers and Bridges

Community organizations in the North offer a wide variety of services from health and education to governance and social support services. These organizations are in a position to bridge communication from the Territorial and Federal governments to the local community and to understand the local community's needs and barriers to digital adoption. Some of the benefits of digital adoption brought up by the Participants in the interviews include: self-determination, leadership, ownership, engagement, economic development, bottom up approaches and empowerment. Some of the barriers include: social issues, economic constraints, low population, lack of capacity, lack of relevant content and not knowing what digital technology can do for them.

Bottom up approach to digital adoption; Leadership, Champions and OCAP®. The importance of a bottom-up approach to digital technology inclusion in the Northern communities was established by several of the Participants as foundational to any successful adoption, as stated by Participant 1:

> Coming from the bottom up, coming from the communities, that the communities have to be given the accessibility and what they are accessing has to be demonstrated within the communities and it can't be taught to them, you have to go in and talk to a few people

> sitting down over coffee and demonstrating it, having a workshop or video conferencing to show how education can be done, show how health can be done. (Participant 1)

The Participants mention the need for leadership within the communities to help facilitate adoption of digital technologies: the local governance needs to be supportive of initiatives, but also needs to help drive adoption of digital technology. However, as Participant 3 points out, there are often other social and economic concerns: "You need Chief and Council's leadership to help bring and bridge the digital divide, but they already have multiple social issues stacked against them" (Participant 3). Several of the Participants highlighted the link between the barrier of the social issues in communities and the ability of the digital technology to help bridge and help communities overcome those barriers:

> We need to work with the leadership, we need to work with the GNWT, and find other means of creating economic development and I believe the Chief and Council need to take a look at a healthier alternative process you know in bridging that digital divide, it creates jobs. (Participant 3)

Participant 1 mentioned the long-term vision that is needed from community leadership to participate in digital technology and enable community access, creating a sustainable economic and social support for the community. Leaders need to have an understanding of the potential future needs even if they are not current users of the digital technology themselves. Participant 3 also highlights the need to be part of the virtual and social network: "The need for bringing in new innovations, new technology, new jobs, new training, new education, eHealth, eLearning, distance learning, you name it the benefits outweigh the negatives" (Participant 3). Participants also highlight the positive impact social networking can have – the ability to share events, achievements within the community and throughout the broader population, connecting

to family and friends, showcasing talents and sharing information – all contribute to a sense of pride, ownership and control. Participant 5, who worked as part of a third party partnership on digital infrastructure builds in the GNWT, described how that organization acted as a community champion to Infrastructure Canada. The organization realized for their project the importance of having representation and involvement in the community, that they needed 'boots on the ground' and a community champion to make sure the community was part of the planning and management of the project (Participant 5). Participant 5 felt this model worked very well, but doubted Infrastructure Canada would repeat it.

It is important, also, that the champions come from the communities themselves: "I think there are opportunities for them to be involved, I think through the First Nations development corporations there is a strong voice there" (Participant 5). The need for a community champion came up in all the conversations, though usually the champion was from within the community, not an outside party, Participant 1 gives an example of how K-Net[2] worked to create champions, while acting as a broader champion for digital adoption Participant 1 explains: "They had access and had some community champions, what [Person] did was [a] community run [approach] and you did it yourself" (Participant 1). Using K-Net as an example, Participant 1 goes on to explain how having digital adoption as part of what community organizations are facilitating and training community members in, supports the understanding and ability to see the links between digital technologies and cultural preservation. In those communities, the members have grown up with digital technologies and they have been able to be innovative with tools like language applications, economic development, e-health tools and First Mile strategies, enabling the community in ownership and control of the digital technologies and infrastructure (Participant

[2] K-Net is a First Nations owned and operated ICT provider working in rural and remote areas of Ontario, for more information see http://knet.ca/ .

1). Participant 5 similarly discusses the need to have human capacity to facilitate digital technology within the community: "I'm not just talking about monetary, but qualified people, having that community vision or Chief and Council vision of what infrastructure might be able do for them and a system" (Participant 5).

All Participants commented on the importance of having the community involved and establishing leadership and champions within the community, which allows for long-term social and economic benefits and gives ownership and control to the community.

Knowledge sharing, empowerment and training. Familiarity with digital technology allows for a better understanding of how communities and individuals can use the technology for their own cultural preservation, eServices and empowerment.

Five of the Participants suggested using examples to show how digital technology has been applied and how it can benefit that community. Using 'success' stories and specific tools that make the digital technology relevant for community members, Participant 1 states:

> If you've never seen that stuff being preserved [language, art] then in a lot of cases you need something really good to make that leap, that jump. And unless you have someone there that can do it, that can make that leap, it is not going to happen. (Participant 1)

The Participants highlight that by sharing success stories it may help communities that are not currently digitally aware to find ways to ease into using digital technology. For example, Participant 4 mentions: "You could maybe use them [examples] as 'projects of excellence' or 'projects of completion' or just to showcase what has been done out there to give hope to some of these communities, some just see this as a daunting task" (Participant 4). Participant 5 mentions using the digital archive project that was discussed in the "Bridging the Gap: Community Engagement, Content, And Connectivity in the North" (Corbett et al., 2017), "that

was really interesting stuff and sharing the good practices and the good work on what has been done" (Participant 5).

The Participants also mention not only sharing examples of successful projects, but also the potential to share knowledge and resources: Participant 4 comments: "I did participate in the discussion paper for INAC for connectivity, and one of the things that we had discussed was communities pooling not only their resources, but also going after additional resources together" (Participant 4). Sharing resources and knowledge helps to prove a concept, without which some communities may hold back, the fear of it failing can be alleviated by knowing that others have succeeded. Sharing the knowledge of the process, and resources may make the difference for communities that have less funding or capacity, they can start from a known point and not reinvent what others have done; they can pool funding and also use successful projects as a framework (Participant 5).

The sharing of knowledge is necessary at all levels: "Not just with the stakeholders, the investors or the people that are funding the research projects, but with all communities" (Participant 4). Four of the Participants discussed that by involving the communities in more than just discussion, but also in the ideals of OCAP®, you are able to work on self-determination and empowerment, according to Participant 3: "A community owned network invested [in] by the community can give free internet to the community members. So it really comes down to again, community self-determination, economic development, job creation and innovation" (Participant 3). Several Participants stressed the importance of how digital technology is discussed, as Participant 4 states:

> You have to present this as maybe part of the big picture to move on from poor living conditions and help them bring in maybe employment and economic development in the

> community. It is not just about kids accessing Facebook it is about giving the opportunity to create economic development and employment in the community. (Participant 4)

Participant 4 also highlighted concerns with consultants coming in and not building any capacity within the community: "When it comes from a First Nations lens, from a community especially, it is really important to show that these are accomplishments that could be sustainable in the community given the right tools and capacity to develop it" (Participant 4).

Three of the Participants brought up the issue of consultants being used for projects and not enabling the community members through training, which would help with long-term sustainability and empowerment. There is often no local capacity left after the project is implemented as external technicians come in when needed. Three of the Participants also highlighted that when community members are trained, they are often offered jobs elsewhere by the companies that train them. Participant 4 explains:

> What happens is they will come in and they will train people and they will provide salary dollars and all that and next thing you know these people that have gotten trained on all that have picked up that knowledge and experience and they get high jacked by major ISPs or telecoms and the community loses that resource. (Participant 4)

However, Participant 1 gives an example of a Northern consultant that realized the issues with capacity and community members leaving once trained. This consultant made sure more than one person in the community was trained. Realizing people often come and go from the community for jobs or life situations, training is an ongoing process in the community.

All Participants mentioned some aspect of training, knowledge sharing, and working within the local community to enable digital adoption in a long-term sustainable manner.

Barriers and Bridges. Barriers to digital adoption in the communities ranged from fear of the unknown to social and economic factors, having trained expertise within the communities and willingness to use technology. Bridges to using digital technology came from both consumer and producer aspects of digital technology. Producers of digital technology are using it as a tool for creating content, preserving culture and language and connecting to other communities. Consumers of digital technology are accessing the tools, like communities connecting to eServices (health, education, governance), as well as using digital technology for increased safety, training of community members and partnerships, Participant 5 states:

> Especially when you live in a more remote area, it [internet] offers the potential to connect to the world and bring things right to you that you need, whether its telemedicine or distance learning, you know shopping or news or anything it is an opportunity to connect to the world and bring things to your phone or computer. (Participant 5)

One of the barriers mentioned by three of the Participants is a general fear that the leadership and some community members share: the digital technology might change the community in negative ways and the leadership is worried about making those long-lasting decisions. Participant 5 also mentions the fear of financial mismanagement:

> They are afraid that people are going to spend money foolishly on tech tools rather than some things that are more important, technology is important, but if you are spending your lunch money on tech things then you start to wonder if that is a good trade off. (Participant 5)

Three Participants mention that there is also unwillingness by some to adopt digital technology, whether that is fear or just a lack of training. Two of the Participants used examples from their

work where they have the ability to connect to modern video and audio conferencing software which the office owns, but does not use. Participant 2 discuses conference calls:

> I decided not to go with what Northwestel offered, even though it is really nice, I was really impressed with the orientation and can see it in the future, but I just feel like it is not quite there for my members, I have some that are more technology savvy and others that are older and even have trouble connecting to share files. (Participant 2)

Participant 6 highlights basic human nature as a barrier: people often desire face-to-face interactions, taking a trip to get out of the community sometimes outweighs the convenience and cost savings of connecting virtually.

Participant 2 and 6 both commented on people sometimes being unwilling to adopt technology that is new to them. Even in organizations that are more technologically literate, there is still hesitation, even though the new technology would ease distance issues, save money and aid communication. Participant 2 states:

> I have thought about it a lot myself, this technology and I see the benefit in how we can provide high quality meetings and save money, we could have meetings - I have board members all over, some in Alberta, NWT, few in Yellowknife, some in communities here some in Inuvik - I could have a meeting where we could all see each other, I just question whether they are ready. (Participant 2)

All of the Participants commented on some aspect of the Northern communities facing many social issues, some stemming from residential schools, settler colonialism and poor economic conditions. When prioritizing needs, digital technology can fall to the bottom of the list: "We are dealing with basic issues in our community, dealing with alcohol and drug issues

and family violence, the basic cost of living, trying to feed our families, in some of the communities those are some of the primary goals" (Participant 3).

The Participants also mentioned that there are not always social supports within the communities for basic services: there is often high unemployment, a history of colonial governance and frustration with the *Indian Act* impacting daily life. There is a lack of facilities to deal with alcohol and drug addiction, healthcare services, safe drinking water, housing and food security. Therefore, it is understandable that it is difficult for communities to know where to start, and to see how digital technologies could play a part in helping to alleviate some of the pressures felt by the demands.

The Participants highlighted the potential for digital technologies to act as a bridge for the social and economic barriers mentioned previously. Participant 5 uses the example of telemedicine:

> If I am in a remote community and I have diabetes and my health is failing, but I can get online and I can get access to somebody and I have the capacity to monitor my own blood sugar and maybe try and keep my diabetes under control, I can click on and do some teleconferencing or whatever just texting or email my physician with results or questions that I have. (Participant 5)

Participant 6 discussed how the proponents of the MVFL, during consultations, did highlight the potential bridging capabilities that the new fibre line might offer for social and economic concerns through the increased bandwidth it would offer. It was suggested it could help with telehealth, education, ecommerce as well as better access to entertainment. So, it may be that the communities that were at these consultations are waiting for the next phase after the completion of the line, implementation in the communities.

Four of the Participants discussed the importance of safety in remote communities and how increasing safety of community members could be another bridge to using digital technology: Participant 1 gave an example of the death of an Elder in a community that could have easily been avoided if the technology had been already there. Participant 3 highlighted that communities prioritize safety and how digital technology in one community made a positive impact:

> One of the biggest changes that I have seen, in [Fort] Providence alone was when Northwestel put up the 3G cell towers, was that the need for safety. Aboriginal people are always concerned about other people's safety, especially the elders, always concerned about the youth, their safety. (Participant 3)

Using safety as an example will also help communities adopt digital technology – it is a real situation they can relate to.

Five of the Participants noted that another barrier to digital adoption is the lack of relevant and cultural content. Using digital technology to create language applications for regions and developing community content that make the resource relevant was highlighted as a means to increasing adoption, as Participant 5 states:

> Maybe a bigger barrier is the content- so why would I want to have a computer there or why would I want to make more sophisticated use of my cell phone then just texting and cell phone calls and that is one thing there is a real biggest value added -you know if we could have more content, so I guess the lack of content is a barrier to broader adoption. (Participant 5)

Participant 1 highlights the current trends in language preservation and cultural resurgence and that as a gateway: "The power of accessibility in terms of politics, but also people are becoming

really more cognizant of culture and language and there is a push" (Participant 1). Examples of where language has been preserved already in digital formats show how that offers ownership and empowerment to those culturally tied. Participant one gives the example of work done at the Prince of Whales Museum in Yellowknife and the impact on residents of Behchokǫ̀ when they launched an exhibit with recordings in the local language, Tłı̨chǫ, and one of the residents reacted by saying "…now I can access parts of my culture and go back and relearn it" (Participant 1). Several of the Participants highlighted that when projects are done in communities, we need to remember that it is the community members they are being done for, so how they are done is important.

A big driver and bridge mentioned by the Participants when thinking about the above statement 'who are we doing this for', is the youth and the school systems: "The cycle needs to be broken by the school, bringing in the technology and distributing technology to the youth. The youth with their need and interest in technology will bring comfort to the community, that it is not this foreign thing" (Participant 3). The youth, if exposed to digital technologies, act as early adopters and become community champions acting as a bridge to their families as Participant 3 states "If it [content] is driven by community champions, the schools, the youth, help bring that technology back to their parents, that really have not interacted in these smaller communities" (Participant 3). Having the youth act as a bridge to fill the gap in knowledge also gives the youth an important role in the community.

Training organizations, youth and community members require someone with expertise to at least start the conversation about digital technology within the community: "Without someone there with the technical experience to say it is more than just Facebook and YouTube and email" (Participant 1). Several Participants mention that part of the difficulty in digital

technology adoption is that the community members do not know what they need, because they have not used the technology.

Community organizations and leadership can facilitate bringing in experienced people to help bridge the knowledge and understanding gap, and support training programs for community members through education, enabling communities to take on the leadership role when it comes to digital adoption.

Level 3: Community Members and Household Factors

Level 3	**Subtopics**
Community Members	Socio-economic concerns
	eCommerce
	Community Champions and Youth

Community members and the household factors that play into digital adoption are similar to and intertwined with the factors I outlined in the community organizations discussion above. The socio-economic situation individuals find themselves in, their cultural perspectives and needs as well as the support they receive from the community, play a part in how they are able to adopt digital technology and how accessible it may be. When talking about community members, several Participants mentioned the implications on businesses and how the speed of the connection and data capacity are an important factor in creating digital equality in commerce, as Participant 6states:

> If people can't contact us in a timely basis and we cannot respond to them in a timely basis, whether we are a tourism company or a supply company then we can't expect them,

> given the service they get through other broadband (i.e. instantaneous), we can't expect them to continue to rely on us for services, so I think the speed of transit is viewed as a limit on commerce and certainly with education as well. (Participant 6)

Training community members in a variety of digital technology skills, as well as sharing applications that are relevant to the life in the North, was frequently mentioned in the interviews as an important means of adoption and further enabling the communities in ownership and control of their digital technology resources. Not only training on using digital technology hardware and infrastructure, but understanding the potential applications of using various aspects of digital technology – from content and cultural preservation to safety, health, education, governance and commerce. As Participant 5 states it may be time to move from building the infrastructure to training people in how to use what they have:

> I would be thinking how can we make the internet more useful to people? How can we leverage this technology and what can we do in the way of telemedicine and distance learning? Because there is not a lot there yet, I think there is a lot of potential for them to do a lot more of it. (Participant 5)

Having community members confident in using and creating digital technologies helps support the broader community and encourages self-determination through ownership. Many people, researchers, community members and government staff have acknowledged the need for training and education throughout the years. This is not a new idea, but the longer it is not implemented, the larger the digital divide gap becomes. Participant 1 mentioned wanting to run workshops and conferences on digital adoption in the North, bringing in people from across the North to participate. The workshops would help in creating collaboration with community members, private and public sector experts to explore what services are available and to

demonstrate how to access and use the services. Unfortunately, they were unable to do this before leaving the North, but other groups like the First Nations Innovation Project/First Mile Connectivity Consortium may be able to help contribute to efforts to fill this gap.

However, Participant 2 pointed out that they thought training would have its own barriers to being implemented and though they thought it was a good idea, it may be challenging to implement due to funding, geography and willingness of Participants. This led to discussions with another Participant who described a more holistic team approach to building individual community members' abilities with digital technology, going back to the idea of community champions:

> My recommendation for communities is find the team that is willing to work with the community, willing to train and educate, transfer of knowledge, and transfer of skills. A team that is willing to put the concerns of the communities first. I guess finding those community champions, if they are willing to work with the community, work with the leadership, to bridge that digital divide in the community. Right now we have the MVFL and yet what opportunities is the GNWT presenting - none. (Participant 3)

With the new MVFL and potential connections that creates, this is an important time for the NWT to work on training members of its communities to enable them to take advantage and embrace the potential uses of digital technologies to bridge the current gaps.

Four of the Participants mentioned the importance for individuals to use digital technology as an economic resource through ecommerce: "Online businesses and stuff, but the whole technology thing, you know for example there are online outlets for art, Northwest Territories art.com and whatever, ones like that where they can market the goods and services they provide" (Participant 5).

All of the Participants mentioned the youth when discussing community members and the role they can play in helping with adoption of digital technology, as well as the skills and empowerment it could offer to the individual: "There are opportunities for young people up there to get involved and do this stuff and actually be creating these applications and populating the content, I think it is so important to get the success stories out there" (Participant 5).

Digital technology gives the youth an opportunity to become the champions, the drivers of how a community is able to engage with and adopt digital technology as Participant 1 discusses how the youth can use social media to showcase cultural events giving access to wider audience and promoting culture.

Enabling community members through digital adoption offers a potential tool for empowerment, cultural preservation and adding relevant content to the digital resources, as well as creating potential positive change in social and economic situations many community members face.

Future Research Ideas from Participants

Participant 6 was interested in how much the implementation of the MVFL had hit the targets the GNWT had set out, as well as how the line is being used: "What was really being hit home with the fibre optic project is how much this would increase your quality of life, and reduce government expenditures" (Participant 6). The Participant went on to suggest looking at how the new technology increased high school graduation rates, use of eServices and commerce in the communities. Going back into each of the communities that were part of the consultation and comparing today's use to what was hoped for, not just as a means of comparison, but to see what needs to be done to achieve those goals if they have not been met, or highlight what is working well for other regions to learn from.

Other Participants thought future partnerships with post-secondary institutions might bring awareness and education to the community members: "Partnerships with institutions to bring research in is going to help the communities to bring awareness and education" (Participant 3). In addition, Participant 5 brought up distance learning:

> Trying to develop a partnership with the GNWT not as a money maker with U of A, but kind of a social contribution - we realize we have a neighbor to north that is not served well with distance learning so do we target services to the NWT that would help them take advantage of stuff at the U of A. (Participant 5)

Conclusion of Findings

Using the whole community approach to digital technology adoption as a framework I was able to show through the interview data how the levels of the framework are implemented in the NWT. Using the data to guide the analysis, I added a fourth level of policy and funding to the framework, which supports the three levels as outlined by O'Donnell et al (2016): Infrastructure adoption, Community organizations, and Community members and household factors. In the next Chapter, I will discuss what these findings mean in the context of the Canadian North.

Chapter 5: Discussion

Digital adoption in the Northern communities in Canada requires a multifaceted approach that engages Northern residents and reflects their concerns and needs from the start of the conversation. The findings of this research show that lived histories in the Northern communities have an impact on digital inclusion, and the history of settler colonialism affects relationships and trust. Top down government approaches do not necessarily serve the needs of the Northern peoples in a way they may be accepted in more urban Southern areas of the country. With the

findings of the Truth and Reconciliation Commission Report (2015) and the efforts to more fully and fairly recognize Indigenous Peoples as outlined in the Royal Commission on Aboriginal Peoples (1996) as well as the adoption of the UN Declaration on Human Rights (Anaya, 2014), Canadians and their Government need to acknowledge the findings of these reports and move forward on policies of inclusion, appropriate and accessible funding, as well as a new approach to working with the Northern communities.

Federal government agencies such as the CRTC have come a long way in acknowledging the needs of remote residents of Canada, as well as all Canadians, in the declaration of the universal service obligation and the commitment to funding projects to help bridge the divide. However, there is still a large gap and one that requires communities to be included in the conversation and receive appropriate training and education. Understanding the roles digital technology can play in self-determination, empowerment, economic growth, as well as access to basic services and cultural and language preservation, is needed by all levels of government as well as by all players in the broadband infrastructure and deployment industry.

Research demonstrates that what works in Southern Canada does not work in the North: the geography, history, low populations and diverse cultural perspectives require a willingness for the Federal and Territorial Governments to adopt different approaches, ones that are not new, but do not follow the typical hierarchy and complexity of the current system. The ability for digital technology to offer a bridge to empowering community members, especially the youth, is evident in the research.

Community organizations are key players in facilitating knowledge sharing, supporting all aspects of community living in the North and provide a link between the community members, digital technology, industry and those implementing Government policies and funding

around broadband strategies. The findings of this research point to the need for more transparency and communication among all the players at all levels, but in a fair manner where time is taken to make sure the community members know what is possible and the various ways they can benefit from digital inclusion. The MVFL is already beyond the preliminary work that could have been done with communities, but still offers a platform for working with communities and members as well as government and post-secondary institutions in working toward digital inclusion in the North through partnerships, collaboration, innovation and, most importantly, though transparent communication and inclusion. Achieving the level of digital inclusion that is possible now, in the NWT, will require working on training and education programs. Training helps enable communities to adopt digital technology and empowers them to innovate for themselves, on their terms, for their needs.

As Nadasy (2005) highlights, being cognizant that the process of consultation itself comes from a dominant system is important to remember when working on solutions. In the era of the Truth and Reconciliation Commission (2015), the United Nations Declaration on the Rights of Indigenous Peoples (UN General Assembly, 2007) and the United Nations Declaration on Human Rights (Anaya, 2014), both government and industry need to be willing to use the lens of the Northern perspectives and need to move beyond a settler colonial culture. This is an opportunity to lead by example and set a new tone when working with the Northern communities.

Looking forward we can use the work done by Beaton, Burnard, Linden, and O'Donnell (2015), McMahon et al. (2014b) Schnarch (2004), and Whiteduck et al. (2012) on implementing the principles of OCAP® when working with the Northern communities, in an effort to move beyond settler colonialism and act as settler allies. OCAP® is becoming a tool for communities to

work towards self-determination, through economic growth, empowerment and control, increasing the resiliency of the communities and the sustainability of the projects being done within their communities.

The way in which digital technology projects are planned from the very early concepts through implementation and community adoption can play an important role in self-determination, as discussed by Beaton and Campbell (2013), McMahon (2014b), and Philpot, Beaton, and Whiteduck (2013) in their research. Roth (2014) has also pushed the federal government on broadband policies, highlighting the socio-cultural and socio-economic impacts digital technology can have on the North.

McMahon et al. (2015b) and McMahon et al. (2015a) discuss community informatics and researcher-Indigenous relations, self-determination and resurgence using digital data management strategies in the Kahnawà:ke First Nation. Community informatics theory highlights that the community itself needs to have the capacity to learn, use and need the technology for it to be successfully adopted, that the technology alone is not enough (O'Donnell et al., 2016). Community informatics theory is important and could have been applied in this research, looking at each of the levels of the Whole Community Adoption framework that was used. The broader Whole Community Adoption framework encompassed more of the components that came out in the data. The levels of interaction from the foundation of the infrastructure to community members and household factors, as well as the fit of adding the level of policy and funding, is pivotal in the Northern communities.

The work of the First Nations Innovation Project/First Mile Connectivity Consortium (http://firstmile.ca/about/), as outlined by McMahon et al. (2014a), offers multiple examples and resources to use in digital technology applications in remote, rural and Indigenous communities.

There is a need for communities to be considered as more than consumers, but also producers in the digital technology movement as highlighted in the Whole Community Digital adoption framework (O'Donnell et al., 2016).

The Telecom Regulatory Policy CRTC 2016-496 (2016a) sets forth a new path for digital inclusion. One of its objectives acknowledges the disparity in terms of speed, capacity, quality, and price for rural and remote Canadians (p. 1). This report also sets out the criteria to measure the success of the updated universal service objective stating that the subscribers to fixed broadband internet access should have speeds of a least 50 megabits per second (Mbps) for download and 10 Mbps upload (p.2). The report also acknowledges the need for other stakeholder groups to make these targets possible and the establishment of a funding mechanism for access to the new target speeds. These changes to policy are a step in the right direction to digital inclusion. However, the approach to implementing digital technology needs to be changed, looking to the First Mile and bottom up approaches as a means to build community involvement. Longford (2008) shows the relationship of ICT and civic participation, looking at specific community networks and how they implemented digital inclusion policies by providing training, creating opportunities for effective use, promoting information sharing, community involvement and social development.

Through the CRTC review of basic telecommunications services, recommendations were given for the Innovation Agenda program run by ISED - they highlight the need for a multi-faceted approach including a wide range of stakeholders and community organizations in tackling the affordability and adoption problems. The summary findings recognize the need for a holistic approach with all stakeholders involved (CRTC, 2016c).

With the new approach to digital technology and digital inclusion by the CRTC, Canadians may be closer to the realization that the digital divide goes beyond technological issues, but includes human development factors as well. Armenta et al. (2012) found that grass root participation, community leadership and human development were the indicators of successful projects reducing digital exclusion.

Limitations

Ideally, this work could be situated in a longer-term study that incorporates field research and involves communities in research activities. Due to the time constraints (this is a capstone project) and funding available, I decided to take an approach that still allowed for Northern voices to be the main input of data. The timing of University Ethics approval and getting the Polar ARI license also limited what I was able to get done. The CRTC was asked to participate in the interviews, but due to the current interventions underway, and associated rules around participating in research, they were not able to participate in the required timeframe. Though an effort was made to have Participants from various stakeholder groups, in addition to the CRTC being unable to participate, I believe it would have been beneficial to have someone from Northwestel also participate.

Future Research

As one of the Participants mentioned, it would be interesting to look at how the MVFL has changed the life in the communities it now serves, as well as how the communities are using it. It would also be important to do work with the communities to find out what the needs are and what members desire to learn about digital technologies to help empower and build self-determination. Also, I think we are at a stage where various partnerships and collaboration could be tested and various models of adoption created, building on work that has been done in other

jurisdictions. In this context, one approach would involve continuing and expanding on projects like those the First Mile Connectivity Consortium is leading in collaboration with communities and Universities on digital literacy (http://firstmile.ca/?s=digital+literacy), bringing workshops and training to the communities.

Chapter 6: Conclusion

Digital adoption can help bridge gaps in content, and cultural preservation, provide better services to community members for health, education and commerce, as well as increased safety in remote areas. These applications can help foster empowerment within the community and offer solutions to some of the difficult social and economic issues many communities face.

Engaging leadership early in the conversation, creating an enabling environment, finding champions and empowering the youth in communities are all necessary in ensuring the long-term sustainability of digital technology adoption and digital inclusion success. The policies that have pushed for market solutions in the North have led to short-term goals that are not realistic for the Northern governance structures, the diversity of regions, and low populations. Policies in the North need to be innovative and more inclusive of community's needs and the importance of self-determination through the principles of OCAP® (Schnarch, 2004).

Building the foundation of digital adoption by engaging community members at the earliest stages of policy and funding decisions and using the whole community framework as a guide to help in developing a more holistic process to digital adoption, will lead to more sustainable solutions in the North. Having a strong foundation with community participation core to the development will create opportunities for the long-term goals of self-determination, economic well-being, better social conditions, and empowerment in the communities. These gains for the communities are a win for the government and for third party partners as well. Any

uptake in usage should be positive for implementing e-Services, as well as subscription rates for ISP providers and the owners of the infrastructure. The Government and the infrastructure developers can be active members in acknowledging settler colonialism and work on inclusion policies that enable community organizations and members to be part of the conversation about digital technology projects increasing digital adoption.

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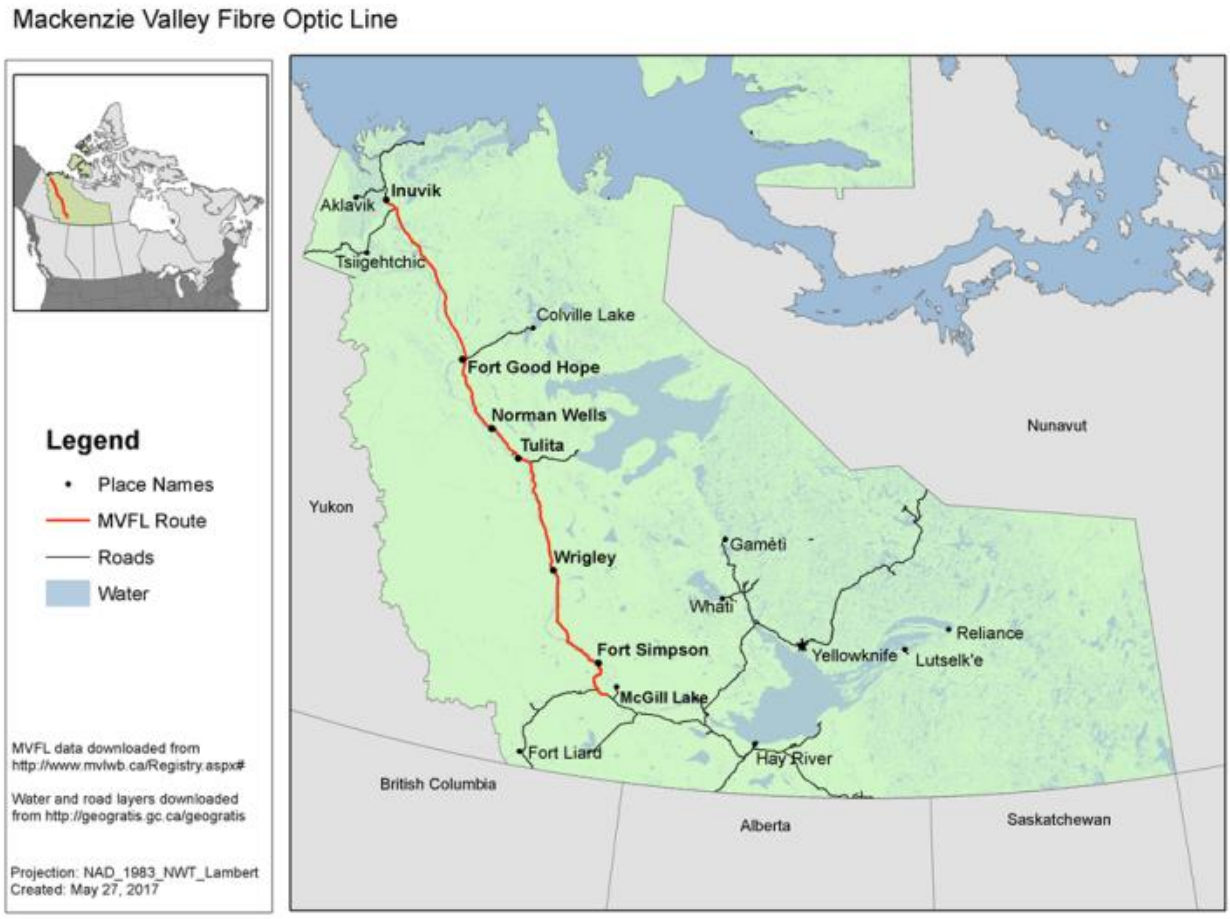
Appendix A

Map of the Mackenzie Valley Fibre Link, Northwest Territories of Canada.



Appendix A Mackenzie Valley Fibre Optic Line, 1145 km from McGill Lake to Inuvik, NWT. Project completed in 2017.

Appendix B

Data Collection and Coding process

Main Task	Description	Notes:
Conduct Interviews over Phone	Set up times and private location	
Record using a digital recorder	Define digital inclusion, number of questions, go over consent form	
Transcribe	Use InqScribe software	https://www.inqscribe.com/
	Insert time stamps when unsure of what respondent is saying or where need to look something up. slow to .7 playback	
Export to Text	Export transcription to plain text	
Import to Word	Microsoft Word (2010)	Use guidelines from Ose (2016).
	Import into word to clean up spelling and format	
Copy into Excel	Microsoft Excel(2010)	
	Create sheet for each interview, code descriptions	Coding reference - Saldaña, J. (2015).
	Add fields – Unique id, who is talking, interview data, code notes	
Excel formatting	Follow filtering from guidelines	
	Once coded go back through add more fields for sequence	Open coding, axial and selective - iterations
Export to Word	Follow instructions on importing data and converting the table to text.	
Word Outline view	Use Outline view to arrange levels and rearrange data if needed	

Appendix C

Research Ethics approval from the University of Alberta.

UNIVERSITY OF ALBERTA

RESEARCH ETHICS OFFICE

308 Campus Tower
Edmonton, AB, Canada T6G 1K8
Tel: 780.492.0459
Fax: 780.492.9429
www.reo.ualberta.ca

Notification of Approval

Date:	April 24, 2017
Study ID:	Pro00071487
Principal Investigator:	Patricia Fontaine
Study Supervisor:	Robert McMahon
Study Title:	Community involvement in technology infrastructure in Northern Canada
Approval Expiry Date:	Monday, April 23, 2018

Approved Consent Form:	Approval Date 4/24/2017	Approved Document ConsentForm_FontaineInterivews.docx

Thank you for submitting the above study to the Research Ethics Board 1. Your application has been reviewed and approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Anne Malena, PhD
Chair, Research Ethics Board 1

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix D

Aurora Research Institute license approval letter and Certificate of licence

AURORA RESEARCH INSTITUTE
AURORA COLLEGE

Aurora Research Institute
PO Box 1450, Inuvik, NT XDEOTO
Tel: (867) 777-3298 Fax: (867) 777-4264

www.nwtresearch.com

July 12, 2017

Ms. Trish Fontaine
University of Alberta
Edmonton, AB
T6G 2E1 Canada
Phone: (780)492-5717
Email: trish.fontaine@ualberta.ca

Dear Ms. Trish Fontaine,

Enclosed you will find your 2017 Scientific Research Licence No. 16140 as prepared under the Northwest Territories Scientists Act. Should you require support from the Aurora Research Institute's Research Centre(s), please contact the applicable Research Centre Manager(s) to discuss your research needs.

According to the Scientists Act, researchers issued licences must provide a summary report for each year of their research. Accordingly, upon completion of your 2017 field work in the Northwest Territories, please ensure that you provide a 200-word (maximum) non-technical summary of your research findings to our office via www.nwtresearch.com/polar. This summary is due no later than June 30, 2018, or with your 2018 application, whichever is earlier. In addition, we require a copy of your final report and copies of any papers that you publish that pertain to research conducted under this licence. Finally, if/as applicable, please provide to the communities copies of any reports that you have offered to them or that they have requested as a condition of their support for your project. Such reports should be provided to the communities prior to submitting new applications.

Thank you for assisting in the promotion and development of a scientific research community and database within the Northwest Territories. The summary report and other information that you provide are utilized in our annual report compendium, which is distributed to communities and organizations in the NWT as well as to researchers across Canada.

Best wishes for a successful study!

Sincerely,

Jonathon Michel,
Manager, Scientific Services

Licence No. 16140
File No. 12 410 1096
July 12, 2017

2017.

Northwest Territories Scientific Research Licence

Issued by:	**Aurora Research Institute - Aurora College** Inuvlk. Northwest Territories
Issued to:	Ms. Trish Fontaine University of Alberta Edmonton, AB T6G 2E1 Canada Phone: (780) 492-5717 Emai:l trish.fontaine@ualberta.ca
Affiliation:	University of Alberta
Funding:	
Team Members:	Trish Fontaine
Title:	Community **Involvement** In **technology Infrastructure** In **Northern Canada**
Objectives;	To study how and why digital connectivity ts Important to members of community organizations In the north.
Dates of data co//ection:	July 13, 2017 to August 31, 2017
Location:	Inuvlk and Yellowknife, NT

Licence No. 16140 expires on December 31, 2017
Issued in the Town of tnuvik on July 12, 2017

Pifif, a Seccombe-Hett
Vice President, Research
Aurora Research Institute

Aurora Research Institute - Aurora College
PO Box 1450 Inuvik NT X0E 0T0
Phone: 867-777-3298 **Fax:** 867-777-4264 **E-mail:** licence@nwtresearch.com

July 12, 2017

Notification of Research

I would like to inform you that Scientific Research Licence No. 16140 has been issued to:

Ms. Trish Fontaine
University of Alberta
Edmonton, AB
T6G 2E1 Canada
Phone: (780)492-5717
Email: trish.fontaine@ualberta.ca

to conduct thefollowing study:
Community Involvement In technology Infrastructure In Northern Canada (Application No. 3757)

Please contact the researcher if you would like more information.

SUMMARY OF RESEARCH
This licence has been issued for the scientific research application No.3757.

The Principal Investigator (PI) will interview participants of the digital panel forum and members of community organizations in the north to get a sense of how and why digital connectivity is important. The PI would like to make available the results such as what next steps are needed, what part of the process went well what did not and how communities can now benefit from this infrastructure. With Canadian Radio-television and Telecommunications CRTC funds becoming available the PI would like to help support northern initiatives in getting and using that funding to benefits the communities.

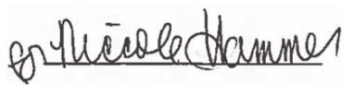
The PI will be conducted semi-structured interviews with individuals for up to an hour. I will record the interview so I can write down the content after to do analysis on the information and create themes around all the interviews. The data both the audio files and the written record will be kept in a secure location, for computer files they will be password protected and any paper documents will be kept in a locked cabinet. Personal information will be deleted after transcription and according to the consent form.

For the initial phase the PI will be doing preliminary work on getting background on digital connectivity issues in the North and on communities that may be interested in future work. The PI would like to make any products produced available and to potentially create a list of projects to work on or concerns communities have. Understanding how the new fibre line can be used to benefit communities for self-determination, possible economic opportunities as well as for social connections and preserving culture and language and youth initiatives.

The PI will be writing a report on the panel discussion Bridging the Gap and will make that available. The report will also be publicly available and if any group would like the PI would be very happy to present the information or talk about next steps, in person is always best but the PI is able to use University of Alberta video-conferencing rooms to remotely present as well.

The fieldwork for this study **willbe** conducted from July 13, 2017 to August 31, 2017.

Sincerely,



Appendix E

Interview guide for semi-structured interview with potential probing questions.

The broad questions are:

1. What types of barriers, if any, do you think prevent 'digital inclusion' in remote communities?
    a. Do you have trouble connecting or using digital technology?
    b. Could be social issues, economic, cultural
    c. Do you run into issues at work trying to use technology?

2. When you talk to community members or work on digital technology issues, what concerns are community members around digital inclusion?
    a. Lack of technical expertise?
    b. Connectivity, affordability?
    c. Ownership?

3. Are there ways that communities could or should be more involved in engagement when it comes to bringing digital connectivity to the community and how it is used?
    a. Competition – how many providers are there where you are?
    b. Empowerment – training, youth, education
    c. Self-Determination – OCAP®, bottom up approaches

4. What roles do you think Federal, Territorial and Local governments should play in the process of engagement and inclusion?
    a. Funding? CRTC, Infrastructure Canada, GNWT?
    b. Providing workshops or training
    c. Including communities from onset of development

5. Do you have concerns or recommendations for other remote areas thinking about putting in technology like fibre optic?
    a. Any red flags that could be avoided?
    b. Ways to better use technology.

6. What do you think needs to happen to make the most of the MVFL now that it is completed?
    a. Training
    b. Funding for backhaul
    c. Community ownership models, IT training and business

7. Do you have any recommendations for potential research that might help communities implement projects or make use of the MVFL or other digital technologies?

Have I missed anything?

Appendix F

Information letter and consent form.

UNIVERSITY OF ALBERTA

INFORMATION LETTER and CONSENT FORM

Study Title: Implications of digital connectivity on Northern Communities in Canada

Background

You are invited to participate in research being done as part of a final capping project for a Master's in Communications and Technology program. You are being asked to participate in this study because you have been identified as an expert on digital technology infrastructure or by the Regional Resource Board of your possible interest in the Mackenzie Valley Fibre Optic line in your community.

This graduate-level, course-based research project has been reviewed by the ethics review board of the University of Alberta (U of A). If you have any questions or concerns about this project, please contact the supervisor, Dr. Rob McMahon, Assistant Professor at the Faculty of Extension in the U of A. Contact information is provided at the top of this form.

Sponsorship

This project has not received any funding. I am undertaking this project as a component of my Masters of Arts in Communication and Technology (MACT) graduate program.

Purpose

I am interested in how community members and organizations in the north are included in northern digital infrastructure projects. Using the Mackenzie Valley Fibre Optic line as an example, from the pre-installation and bid for infrastructure installment to how the technology would serve the communities through social, economic and self-determination involvement throughout the process and future evolvement.

The research provides me and my supervisor an opportunity to learn about methodologies, theories, and frameworks used by different parties working in this area. It helps facilitate potential subsequent research and projects in this topic and geographic area through

building relationships with community organizations and members in the Mackenzie Valley and multidisciplinary offices at the University of Alberta.

Dissemination of results:

The data I collect through this research be used in my final capping project for my Master's degree.

Study Procedures

This interview involves answering questions about the process of implementing large infrastructure projects focused on digital technology in the north of Canada. If you agree to participate, I will ask you to share your expertise about this topic in a semi-structured interview. You will be asked to provide your comments and opinions and discuss your experiences about these topics. The interview will take between 30 – 60 minutes.

The interview is audio recorded; written transcripts will be made of the recording and then the original audio recording will be destroyed. You can ask to review the transcripts with or without me being present.

Benefits

While there are no costs involved in participation, we do not expect you to personally benefit from participating in this study. We hope that the information we get from doing this study will help inform our understanding of digital technology in remote areas and how it may or may not contribute to self-determination. If you would like to receive a copy of my final report and/or any other publications associated with this project, please provide your preferred contact information at the end of this form.

Risk

We do not anticipate any risks associated with your participation in this study. You do not have to answer any question if you do not want to. Unless you give your explicit permission, your name and organizational affiliation will not be associated with your interview data in any resulting publications.

Voluntary Participation

Your participation is voluntary. You have the right to refuse to participate in this study. If you decide to participate, you may decline to answer any questions that you do not wish to answer. You can choose to withdraw at any time without any negative consequences to your relationship with the University of Alberta. Should you wish to withdraw data already provided to the study, you must inform us in writing before 5pm MST on Friday July 21, 2017

Measures to maintain confidentiality

Your confidentiality will be respected. Information that discloses your identity will not be released without your consent unless required by law. Only I and Dr. McMahon will have access to your information. Interviews will be audio recorded and transcribed by myself. All interview transcripts will be identified through a code that can be linked by the researchers to the interview, and this link will be kept secure and never revealed outside the research team. The original recording of the interview will be destroyed after a written transcript is made. All documents will be identified only by code number and stored on a password-protected computer. Your information will be destroyed five years following completion of the project, after which all electronic and paper documents containing your information will be respectively deleted and shredded.

You are welcome to contact the researcher to request publicly available documents that are published about this research. The researcher's contact information is noted above.

Further Information

The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding Participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615.

Yes	**No**	
		I support the use of my information in the course final research paper resulting from this interview.
		I support the use of my information in any pedagogical research papers or materials resulting from this interview.
		I would like my name to be included in the acknowledgements section of any research papers resulting from this interview.
		I would like to receive a copy of research papers resulting from this interview. If yes, please provide your preferred e-mail address:

Signatures

Participant

I, _____, have read and understand the information given in this form and all my questions have been answered to my satisfaction. I have had sufficient time to consider whether or not to participate in the study and consent to participate. I understand that my participation is completely voluntary.

_____ _____

Signature Date