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Abstract

“Digital Self-Determination: Aboriginal peoples and the network society in Canada”

Digital self-determination seeks to elaborate the links between networked digital infrastructure development and the autonomy and agency of indigenous peoples. It foregrounds how indigenous peoples are involved in the diffusion, construction, governance, and use of networked digital infrastructures. Importantly, it considers how these infrastructures are not only tools of emancipation, but can increase the surveillance and control of indigenous peoples by powerful state and corporate interests. They can also extend the historic and ongoing reality of the ‘offline’ economic, social, political, and cultural marginalization of indigenous peoples by colonial powers. However, to accept such negative effects at face value is to fall into the trap of the teleological fallacies of social and technical determinism. Instead, in this dissertation I argue that indigenous peoples can shape and use networked digital infrastructures to support their self-determination. These processes are often guided by a recognition of self-determination that is grounded in and emergent from diverse indigenous laws, customs, and institutions. This frames digital self-determination with reference to the long-term and ongoing work of indigenous peoples to shape their own community-based media organizations and endogenous development projects.

My dissertation considers these issues as they articulate with several facets of digital self-determination. I ground my argument in empirical research on the Northern Indigenous Community Satellite Network (NICSN), a cooperative socio-technical network spanning the northern regions of three Canadian provinces: Ontario, Quebec, and Manitoba. NICSN involves two First Nations Tribal Councils and a regional government that administers the Inuit territory of Nunavik. These partners collaborated to build and manage regional infrastructure in ways that reflect the needs of their constituent communities. I explore how these institutions are taking control and ownership of the infrastructures that enable their development and use of online
applications. Moving beyond considerations of access, I frame these infrastructures as socially shaped platforms of agency that mediate relations between indigenous peoples and the global network society. They are the result of dynamic negotiations and struggles between political actors seeking to advance normative agendas. These activities play out in the formation of frameworks of subsidies and regulatory conditions that reflect attempts to decolonize state-based policies and institutions associated with networked digital infrastructure development. Finally, I end with a discussion of how indigenous peoples and governments are developing online applications, from social media to broadband-enabled health and education applications. Negotiating the requirements of existing jurisdictional and administrative structures, they are shaping these platforms into spaces of convergence that reflect their goals of self-determination. Throughout this dissertation, I situate my observations in broader political, economic, and cultural contexts to elaborate both the promise and the challenge of digital self-determination.

**KEYWORDS:** Indigenous Peoples; Aboriginal Peoples; First Nations; Inuit; Self-Determination; Network Society; Community Development; Infrastructure; Broadband; Policy; Sociotechnical; Media; Communication; First Mile
Dedication

To mom, dad, mormor, and the whole crew: this one's for you
Acknowledgements

I begin by acknowledging that most of my research and writing took place in the territories of the Coast Salish peoples of B.C., and I give thanks for the opportunity to live and work here.

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While this work could not have come about without the contributions of these individuals, shortcomings and errors are mine alone.

Meegwetch!

Rob McMahon
Vancouver, B.C.
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<tbody>
<tr>
<td>AANDC</td>
<td>Aboriginal and Northern Development Canada <strong>formerly INAC</strong></td>
</tr>
<tr>
<td>AFN</td>
<td>Assembly of First Nations</td>
</tr>
<tr>
<td>AMC</td>
<td>Assembly of Manitoba Chiefs</td>
</tr>
<tr>
<td>BCN</td>
<td>Broadband Communications North</td>
</tr>
<tr>
<td>BRAND</td>
<td>Broadband Rural and Northern Development</td>
</tr>
<tr>
<td>CI</td>
<td>Community Informatics</td>
</tr>
<tr>
<td>CRACIN</td>
<td>Canadian Research Alliance for Community Innovation and Networking</td>
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<tr>
<td>CSPQ</td>
<td>Centre de services partagés du Québec (Shared Services Québec)</td>
</tr>
<tr>
<td>FCC</td>
<td>Federal Communications Commission (United States)</td>
</tr>
<tr>
<td>FCNQ</td>
<td>Federation of Cooperatives of Northern Quebec</td>
</tr>
<tr>
<td>FNIF</td>
<td>First Nations Infrastructure Fund</td>
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<tr>
<td>FNIHB</td>
<td>First Nations and Inuit Health Branch (Health Canada)</td>
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<td>FNS</td>
<td>First Nations SchoolNet</td>
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<tr>
<td>HCSA</td>
<td>High Cost Serving Area</td>
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<tr>
<td>INAC</td>
<td>Indian and Northern Affairs Canada <strong>now known as AANDC</strong></td>
</tr>
<tr>
<td>JBNQA</td>
<td>James Bay and Northern Quebec Agreement</td>
</tr>
<tr>
<td>KiHS</td>
<td>Keewaytinook Internet High School</td>
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<tr>
<td>KO-KNET</td>
<td>Keewaytinook Okimakanak K-Net Services</td>
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<tr>
<td>KOTM</td>
<td>Keewaytinook Okimakanak Telemedicine</td>
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<tr>
<td>KRG</td>
<td>Kativik Regional Government</td>
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<tr>
<td>KTC</td>
<td>Keewatin Tribal Council</td>
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<tr>
<td>MFNERC</td>
<td>Manitoba First Nations Education Resource Centre</td>
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<tr>
<td>MFNTC</td>
<td>Manitoba First Nations Technology Council</td>
</tr>
<tr>
<td>NAN</td>
<td>Nishnawbe Aski Nation</td>
</tr>
<tr>
<td>NBDC</td>
<td>Nunavut Broadband Development Corporation</td>
</tr>
<tr>
<td>NICSN</td>
<td>Northern Indigenous Community Satellite Network</td>
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<tr>
<td>NOWG</td>
<td>Northern Ontario Working Group</td>
</tr>
<tr>
<td>PoP</td>
<td>Point of Presence</td>
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<tr>
<td>RICTA</td>
<td>Research on ICT with Aboriginal Communities</td>
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<tr>
<td>RMO</td>
<td>Regional Management Organization (First Nations SchoolNet)</td>
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<tr>
<td>UNDRIP</td>
<td>United Nations Declaration on the Rights of Indigenous Peoples</td>
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1. **Introducing Digital Self-Determination: Decolonization and Socio-Technical Development**

In this dissertation I investigate the multi-faceted concept of ‘digital self-determination’. This concept acts as a framework from which to explain the ways that indigenous peoples are shaping and using newly developing technologies to meet their needs as self-determined collectives. I analyze the dynamic and historically contingent processes encompassed in this concept as a new terrain of struggle in the long-term and ongoing dialectic between colonialism and indigenous self-determination. The chapters explore different dimensions of digital self-determination by examining socio-technical development projects that share a common normative goal. While these endogenous projects take shape in diverse forms, I show how they are commonly grounded in indigenous laws, practices, and institutions (Glenn, 2011).

I believe that the Canadian state can work with indigenous peoples to generate laws and policies to support their expressions of digital self-determination. Otherwise, I fear that the emergent network society risks reproducing existing structures of colonialism and inequality. The potential for these negative impacts is embedded in externally imposed approaches to bridging access divides. It is also reflected in the lack of substantive consultation with indigenous peoples on the policy frameworks guiding socio-technical development. It manifests in the ways the infrastructures connecting these communities are often administered by entities that remain detached from the needs of constituent users. Finally, it is highlighted in the failures of externally-generated online applications to support self-determination. While my investigation situates digital self-determination in a specific social and cultural milieu associated with First Nations and Inuit peoples in Canada, I believe the concept may be useful for other parties engaged in efforts to democratize socio-technical development.
At the contemporary historical moment, the dialectics between the creative agents and the structural forces shaping digital self-determination in the remote and rural indigenous communities of northern Canada are in flux. The Government of Canada is actively working to establish networked digital infrastructure in those regions that still lack robust connections to the emergent network society. At the same time, indigenous peoples are working to secure control over these processes. Beyond expressions of resistance, their activities reflect the persistence of a long history of creative agency, as seen in examples of their appropriation of socio-technical development. Yet these projects are also precarious and subject to policy frameworks and institutional structures that remain rooted in colonial logics. By documenting the interrelated connections between these contending processes, I hope my dissertation can contribute to efforts to decolonize our digital future.

1.1. From colonization to self-determination

Our shared histories are intimately linked to the politics of empire. A few short centuries ago, networks of unequal social relations between colonizing and colonized peoples intensified around much of the world, including in North America.¹ Post-colonial scholars demonstrated how colonized peoples have always exercised creative agency against the oppressive structures imposed on their lives and societies (Fanon, 1963; Said, 1979; Spivak, 1999). However, when interpreted temporally, the preface “post” may imply that the historical period of colonization has ended, and formerly colonized subjects are now free of its influences, therefore restricting critical analysis of associated social relations and structures. Scholars working in this field draw attention to how colonialism continues

¹ Moss (2003) notes that a clear divide is often perceived among postcolonial scholars between the ‘invader-settler’ nations of Canada, New Zealand and Australia, and the parts of the world “where colonization was more predominantly a process of displacement, impoverishment, sublimation, and even annihilation” (p.2). However, I agree with her position that Canada’s internal colonial practices in fact reflect many examples of displacement and impoverishment, as well as her point that “too sharp a division may obscure the terrible consequences of colonialism for the Indigenous peoples in the territories settled” (p.2).
to take place across a range of fields, from legal and institutional frameworks to elements of culture, politics, and economics (Regan, 2010; Youngblood Henderson, 2000; Moss, 2003). In Canada, their work confirms that we do not yet live in a post-colonial country.

This observation is reflected in the machinations of state policy. As Irlbacher-Fox (2009) writes, “Aboriginal policy [in Canada] focuses on ‘present suffering’ as though that suffering were unrelated to injustice and instead primarily the result of poor lifestyle choices and the non-modern nature of indigeneity” (p.3). The structural inequalities that justified and supported the dispossession of the rights, territories, and resources of indigenous peoples are deep-rooted and continue to be expressed (Stavenhagen, 2011). Critical researchers expose how these inequalities have become encoded over time into racialized policy prescriptions, acts of legislation, and institutional structures (Cairns, 2005; Green, 1995). The exploitation of indigenous labour, resources, and territories by colonial agents that started with the early settlers and extended to the fur trade persist today, in struggles over resource extraction in industries like forestry, fisheries, oil, hydro-electrical development, mining, and natural gas (Valaskakis, 1979).

At the same time, indigenous peoples (and their partners) are actively working to assert their rights, rebuild their nations, undertake their own economic and political development projects, and destabilize exploitative social relations (Alfred, 1999; Simpson, 2011). In Canada, these efforts of indigenous resurgence are supported by the unique legal status of Aboriginal peoples and the inherent, group-differentiated rights that flow from that status (Culhane, 1998; Ekstedt, 1999). They take place in various

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2 In this dissertation I occasionally use the Government of Canada’s term ‘Aboriginal’, which includes First Nations, Inuit and Métis peoples. In particular, I use it when referring to administrative, organizational, political, or legal contexts associated with the state. In other cases I use the term ‘indigenous’. Of the Government of Canada’s three legally defined Aboriginal groups, my dissertation focuses on First Nations and Inuit peoples. I recognize the importance of recognizing the diversity of Canada’s indigenous peoples rather than conflating them into a monolithic identity (Boldt, 1993; McDonnell & Depew, 1999; Voyageur & Calliou, 2000). Furthermore, I recognize that compared to specific terms like “First Nations” which reflect a recognition of sovereignty and nation-to-nation relations with the state, the term “Aboriginals” can
arenas, such as formal negotiations in law courts, parliamentary debates, self-government negotiations, endogenously-managed development projects, and collective and individual expressions of political action. They push beyond efforts of accommodation that do not change the institutional status quo, and instead argue for the state to substantively recognize the philosophies, values, institutions, and practices of indigenous peoples.

This dialectic between colonialism and self-determination encompasses a range of fields, changing in form, focus, and scope over time. For example, it is reflected in the complex political and policy relationships between Aboriginal peoples and the state. History proves that state policy in fields as diverse as health, education, housing, public works, employment, and justice had, and continue to have, negative effects on indigenous peoples (Valaskakis, 1979). The central conclusion of the Report of the Royal Commission on Aboriginal Peoples (1996) was “the main policy direction, pursued for more than 150 years, first by colonial and then by Canadian governments, has been wrong” (cited in Jenson, 1999, p.43). First Nations also continue to resist what they see as the unfair and incorrect implementation of treaty agreements signed with the Government of Canada (Long, 2010; Tremblay & Dufour, 2008). Parties to contemporary treaty negotiations point to the continuing frustration with the process, demonstrating the persistence of these conflicts (Union of BC Indian Chiefs, 2007).

Alongside these political tensions, economic interests have manipulated legal and governance frameworks to extract value and resources from unceded indigenous territories, often without adequate compensation or consultation to impacted individuals and communities (Alfred, 2009a). Examples of ongoing disputes include those over the be translated into policy, law, and practice to undermine group-differentiated rights and present these peoples as one ethnic group in a multicultural Canada (Moss, 2003). For this reason, where possible my discussion foregrounds specificity while also highlighting collective efforts and examples of solidarity among Canada’s indigenous peoples (Valaskakis, 2005).
Mackenzie Valley Pipeline in the Northwest Territories (Irlbacher-Fox, 2009) and massive hydro-electric developments in James Bay (Martin, 2010a) and northern Manitoba (Hoffman, 2008). Other disputes are associated with mining developments in northern Ontario, such as those affecting the First Nation of Kitchenuhmaykoosib Inninuwug (Long, 2010; Jamasmie, 2012) and Inuit peoples in Nunavik (Rodon, 2012). In short, powerful economic and political actors continue to manipulate colonial-derived legal and administrative frameworks to extract value and resources from unceded indigenous territories. As Youngblood Henderson (2000) writes, these structural frameworks present a significant challenge to state reform:

“Contemporary colonialists violently resist remaking or reimagining or even changing their social or governmental constructs or institutions to accommodate Indigenous knowledge. They deny that their artificial construct can be reimagined and remade; they deny that its assumptions could be wrong, because if they did their privileges would be threatened” (pp.30-1).

In spite of these challenges, efforts to overcome our shared colonial situation seek to reconfigure these inequalities. Proposals for decolonization draw on the past while looking to the present and future. For example, Hoffman (2008) suggests “decolonization means recapturing a way of life and reinvigorating a prior set of cultural and social relationships that were repressed as a functional part of colonial control” (p.105). As a non-indigenous person, in this dissertation I try and focus my efforts on critically analyzing colonial logics and structures while advocating reforms that support indigenous-led development projects. I recognize that, in part due to Canada’s historical circumstances and the contemporary benefits that flow from them, the activities of government and corporate entities are often circumscribed in their efforts to reshape these unequal social relations. This is reflected in valid and necessary critiques of the decolonization process as a primarily symbolic venture. Recently, indigenous scholars like Alfred (2009), Coulthard (2007), and Palmater (2011) have argued that state-based

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3 That said, the development patterns of Canadian society – including the impacts of large-scale resource extraction projects on indigenous territories – has made such options challenging, if not impossible, to achieve in practice for many communities.
decolonization projects merely reflect assimilation by another means. They call for an autonomous expression of indigenous nationhood that emerges outside of existing state structures. I recognize these valid critiques of the decolonization process and calls for alternatives to the politics of recognition and resurgence of indigenous nationhood. However, I also think that the state can offer support for indigenous expressions of self-determination. I recognize sincere efforts to accommodate indigenous self-determination in substantial ways, as seen in many examples of reforms to existing structures and institutions. I believe the state can generate a support policy environment for the self-determination of indigenous peoples. At the same time, I acknowledge the active and necessary role of indigenous peoples in driving these processes. Finally, I recognize that in many cases, their efforts lead, rather than follow, the presence of state and corporate support. This dissertation articulates my ideas on this topic, and in Chapter 3 I outline these critiques and tensions in further detail in my discussion of contending approaches to self-determination.

These issues must be critically interrogated in situated historical contexts. The Canadian government has formally stated its goal to encourage reconciliation. Recent announcements associated with the Truth and Reconciliation Commission of Canada, Prime Minister Stephen Harper’s formal apology to Aboriginal peoples for the residential school system, and Canada’s adoption of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) all demonstrate this symbolic goodwill. However, many of these efforts remain constrained in practice. The Truth and Reconciliation Commission, created as part of the settlement agreement of the class action suit and tasked with presenting a history of Canada’s residential schools, was forced to take the federal government to court for restricting access to historical records associated with the investigation. The Prime Minister’s apology may ring hollow to those indigenous peoples protesting his government’s imposition of policies associated with continued resource extraction and environmental (de)regulation on their (sometimes unceded and

4 For more information about the Truth and Reconciliation Commission and its mandate, visit: http://www.trc.ca/
treaty-protected) territories. At the 2009 G20 convention in Pittsburgh, Prime Minister Harper stated in a speech that Canada has no history of colonialism. While Canada was an important architect of the UNDRIP, after a shift in the federal administration, the state only adopted the motion in a qualified form, after voting in opposition to its passing. These are only a few examples of actions on the part of the state that contradict public statements of goodwill.

As Nancy Fraser (2003) argues, economic restitution as well as symbolic recognition is a necessary component of social justice. Formal support for Aboriginal and treaty rights that fails to address continuing relations of material inequality does not adequately support goals of reconciliation (Alfred, 2009a; McCaslin & Breton, 2008). In this context, proposals to move forward decolonization must necessarily involve all members of Canadian society (Regan, 2010). Rice and Snyder (2008) describe how everyone can play a part in this process. First, we can work to understand the legacy of colonialism and its ongoing impacts on the lives of indigenous people. Second, we can challenge the historical and contemporary myths used to rationalize the perpetuation of colonial-derived stereotypes, policies, and practices regarding indigenous peoples. Third, we can recognize the impacts of colonialism on both indigenous and non-Aboriginal peoples. Collectively, these three suggestions seek to collectively transform society, and demonstrate how decolonization and reconciliation are not just ‘Aboriginal’ issues, but rather social relations that involve and impact everyone living in Canada. They also show how these issues encompass a variety of fields, including cultural representation, social suffering, and economic and political struggle. In this dissertation, my goal is to analyze this complex dialectic of colonialism and self-determination as it plays out in processes of socio-technical development. I argue that a decolonizing approach to these activities is captured in the diverse phenomena I explain as articulations of digital self-determination.

1.2. The role of technology development

What role does technology development play in this complex dialectic? To answer this question, I draw on scholarship that frames technologies as more than neutral ‘black
boxes’, but rather socially constructed platforms of agency (Mackenzie & Wajcman, 1999; Pinch & Bijker, 1989). Historically, positivist studies of technology development tended to focus on narrowly technical features of pre-existing devices. Researchers framed technology as a determining factor that, once diffused throughout a society, generated social effects (Rogers, 2003). This perspective sometimes overlooked the underlying social relations that shape technology transfer and development. Focused on empirically measured social, psychological and cultural impacts associated with diffusion, some researchers framed technology as a “value-neutral tool that can shorten the path to natural ends or, alternatively, social goals” (Lorimer, Gasher and Skinner, 2008, p.253). Critics argued that framing technology development this way was a form of ‘technological determinism’, a teleological fallacy and analytical simplification that describes technologies as exogenous from the societies they emerge from (Morozov, 2011). They also pointed out that this approach undermined human agency by failing to consider people’s involvement in the active shaping and appropriation of emergent technologies (Baym, 2010; Van Dijk, 2005).

As a result of these critiques, starting in the 1970s and 1980s, researchers began proposing a more social constructivist (Berger & Luckmann, 1966) perspective to research technology development. This position frames the design, development, construction, adoption, and use of technologies as shaped by unequal social relations. These scholars cautioned against suggestions that technology in itself can fix social problems, demonstrating how it can just as easily reproduce or exacerbate them. Instead, their work sought to demonstrate how the activities of active agents (embedded in various structures) can provide insight in the social relations that shape the

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5 Social constructivism in this context does not presume the absence of material constraints: it recognizes broader social, temporal, political, economic and cultural contexts that shape processes of design, diffusion and use. This addresses Winner’s (1999) critique of some social constructivists for ignoring or subsuming normative questions regarding technology and technological change.

6 For actor-network theorists, these interactions are between mutually constituting actor-networks, both human and non-human, engaged in dynamic tension (Latour, 1993; Stalder, 1997).
development and use of technologies. Work in this area highlighted, for example, processes of technical decision-making and the development of expertise, institutions, and communities of practice. Sociologists like Bijker (1993), Pinch and Bijker (1989) and Mackenzie and Wajcman (1999) showed how technologies are linked to the societies from which they emerge, and coined the term ‘socio-technical ensemble’ to highlight the interpretative flexibility of the artifacts that active agents shape and appropriate to meet their needs (Bijker, 1993; Pfaffenberger, 1992).

Some critics argued this methodological approach leads to a tautological relativism (reflecting broader critiques of post-modern theory). For example, Woolgar (1991) raised the question: when and under what terms can one determine a socio-technical ensemble is ‘fixed’ or ‘finished’? 7 Others cautioned that such grounded approaches failed to adequately address larger-scale or theoretical contexts that might guide subsequent political action (Roth, 2005). To address these problems, researchers imposed normative frameworks on their studies that recognized a process of ‘closure’ as technologies are fixed into material objects (according to the degrees and latitudes of choice available to their creators) (Feenberg, 2010/1999). Starting from a confirmed point of closure and working backwards, they traced the choices, tactics, techniques, values, and conceptual frames that play a role in the development of technologies as they emerge over time. They framed technologies as socio-technical ensembles to foreground how these activities encompass both cultural material and material culture (Boczkowski & Lievrouw, 2008). This process set the stage for researchers to consider the political implications of socio-technical development.

7 For Woolgar (1991) the solution to this dilemma is to methodologically treat socio-technical ensembles as texts. He outlines three ways this can be done. First, they can be examined instrumentally, with development understood as the result of a series of contingent social processes. Second, an interpretativist perspective foregrounds connections between an organizational environment and development process. Finally, a reflexive analysis examines the dialectical negotiation between the researcher and the people involved in technical development. This approach asks how technology is created, described and sustained by agents driving these changes. I attempted to apply this reflexive approach in this dissertation.
Scholars interested in these questions showed how socio-technical ensembles can be designed (consciously or unconsciously) to achieve political ends (Winner, 1999; Mackenzie & Wajcman, 1999). Some sought to use their research to inform alternative proposals and development paths that might be publicly proposed, debated and developed (Feenberg, 2010; Thorpe, 2008; Hess, Breyman, Campbell, & Martin, 2008). Taking up a challenge issued by Raymond Williams (1975), they argued that as a society we must strive to articulate and debate the normative elements underlying technology development, diffusion, and use.8 They examine:

“[H]ow societal circumstances give rise to technologies, what specific possibilities and constraints technologies offer, and actual practices of use as those possibilities and constraints are taken up, rejected, and reworked” (Baym, 2010, p.45).

These investigations require an empirical object of analysis as the concrete manifestation of a normative set of political values. This methodological process involves tracing a development path to show how a targeted socio-technical ensemble emerged in a specific time and place, through the activities of creative agents working under various structural constraints. It seeks to reveal the underlying social relations and embedded values that gave rise to the social shaping of the object of analysis, for the purposes of critique and reform. In this dissertation, I apply this methodological approach to consider infrastructures as sites of analysis of the normative goals of digital self-determination.

Infrastructures are somewhat unique in their analytical constitution. Rather than fixed material or physical objects, they are generally studied as constantly evolving networks linked together through various social, physical, and discursive elements. Given their embeddedness in the built environment, they are both shaped by, and simultaneously shape, the activities of agents. Finally, as they move towards closure, they are increasingly domesticated in a process of banalization over time (Bowker &

8 As I argue in Chapter 6, it is important to structure these deliberations in ways that enable substantive participation among actors that are structured in dominance.
Star, 1999). For example, consider hydro-electric systems: these networks of wires, poles and electrical currents – and the knowledge, protocols, and expertise associated with them – play an invaluable role in our lives, and are constantly changing in form and scope, but most of us remain unaware of their histories and operations (Hughes, 1999). As Bowker and Star (1999) write: “Good, usable systems disappear almost by definition. The easier they are to use, the harder they are to see” (p.33). But despite their tendency to turn invisible, infrastructures are indeed constructed socio-technical ensembles, subject to design choices linked to the normative values of their shapers.

Infrastructures are built by active agents engaged in political processes of conflict, negotiation, and compromise. Sometimes, their activities are the result of conscious strategy, while at other times they reflect an ad hoc “bricolage” of problem-solving, opportunism, and luck (Ciborra, 2004). Likewise, some decisions are overtly motivated by political or socio-cultural ideologies, while others remain technical. But regardless of their characteristics, these activities all play a role in shaping infrastructures (Menzies, 2001/2006; Jacobs, 2001). In this dissertation, I apply this methodological focus to a specific type of infrastructure that is associated with the contemporary emergence of the network society (Castells, 2010a).

Networked digital infrastructures are distinct from transportation or electrical networks because of their ontological status as both the results of, and the platforms for, creative agency. Unlike infrastructures that carry resources like water and electricity, they carry a public good – information – that generates positive and negative externalities necessary to the functioning of a democratic society. These externalities include the ability to support political participation, expose the abuses of power, and enable interactions between people over distances (Baker, 2002). Given their links to media systems, networked digital infrastructures can play a role in governance and democratic participation by functioning as watchdogs on public and private sources of power, supplying information, and providing a forum for members of the public to contribute to policy-making (Buckley et al, 2008). However, compared to the print and broadcast media that also support these processes, networked digital infrastructures also provide certain distinct affordances. The platforms they generate and the data they distribute extend beyond the field of cultural production to areas like health, education,
politics, governance, and economic development. In this way, they potentially enable a much deeper level of engagement than the more restricted and centralized forms of print and broadcast media.

Networked digital infrastructures are also distinct in their composition. They consist of highly integrated and mutually-constituting material and symbolic components: in Buzan and Little’s (2000) terms, ‘social technologies’ and ‘physical technologies’. Physical technologies are “system-wide in their deployment, as well as in their effects... once developed to the point of cost-effectiveness...tend to spread quickly throughout the system” (p.82; see also Rogers, 2003). At present, they include fibre optic networks and satellite systems, as well as devices like PCs, mobile phones, and tablets. Social technologies include the languages, shared ideas, norms, rules, and institutions that both structure and are structured by physical technologies. For example, Harold Innis analyzed transportation, communications, and trade infrastructures, demonstrating how the diffusion of standardized weights, measures and prices alongside various physical distribution networks provided an infrastructure of industrialized market expansion (Adria, 2008).

In the contemporary moment, the diffusion and shaping of the social and physical technologies of the network society are highly interrelated and subject to public deliberation (Star, 1999). To borrow from Hackett and Carroll (2006), they offer opportunities for democratization both in and through the communications processes they support. As noted above, as platforms of agency, they make possible various economic, political, cultural, and social activities (Van Dijk, 2005). At the same time, they arise as concrete socio-technical ensembles that are the results of negotiations between political actors. For example, the language of digital code emerged from a discursive framework of binary thinking originating in the West. Post-colonial scholars like Said (1979) critiqued this framework for its tendency to create and valorize differences between actors like imperialist Europe and the colonies. His work offers one example of how a seemingly technical protocol links to past colonial endeavors. These kinds of examples demonstrate how the study of networked digital infrastructures reveals “the rapid development and application of new and increasingly powerful techniques of control” (Babe, 1990, p.250). In this context, my goal in this dissertation is to analyze the
development processes of rapidly diffusing infrastructures that are quickly achieving closure as the invisible platforms that guide our activities in the network society (Castells, 2010a; Hassan, 2004). In doing so, I foreground how these processes link to the colonialism/self-determination dialectic.

I situate these struggles over control and agency in the emergent field of ‘digital divide’ research. Digital divide literature broadly considers the relationships between inequality and development in the network society. The concept emerged alongside predictions of an integrated, ubiquitous, transnational network society (Babe, 1990; Graham, 2011). As these predictions failed to reflect empirical observations, researchers began exploring how and why some individuals and populations remained outside this totalizing system (Castells, 2010d). They observed that even as networked digital infrastructures increasingly diffuse throughout societies, digital divides persist over time, and in some cases deepen.

The approach that researchers use to conceive and analyze these digital divides has changed over time (Nakamura & Chow-White, 2011; Graham, 2011). Early work focused on considerations of access and diffusion. For example, Norris (2001) developed a three-part definition of the digital divide that includes the global divide (between industrialized and developing societies), the social divide (inside each nation), and the democratic divide (issues of technological ownership, control, access and use). However, some critics argued that studies that focused on securing ubiquitous access reflect a technologically determinist position that assumes an inclusive and democratic information society will somehow naturally develop once social and physical technologies become available (Latukefu, 2006). Critics of this assumption shifted digital

9 Horst and Wallis (2011) categorize existing research on the emergent network society in three waves. The first wave considered transformations in our understandings of community and identity. The second wave explored the embeddedness of technologies in everyday life, like mobile phones and online gaming. The third wave explores the relationship between society and emergent infrastructures, including on how networked digital infrastructures are appropriated in different sociocultural contexts.
divide research towards studies that highlighted how ‘offline’ contexts, including historically-grounded and unequal social relations, limit the abilities of individuals and groups to appropriate these tools (Servon, 2002; Shade, 2010; Raine & Wellman, 2012; Davidson, Santorelli & Kamber, 2012; Dean, 2009). Some scholars working in this ‘second wave’ of digital divide research theorized that the more these infrastructures pervade everyday life, the more they become attached to existing social divisions (Van Dijk, 2005). Compared with early studies that measured digital divides in terms of an on/off binary of access (whether or not individuals or populations connected evenly), this work involved a more nuanced analysis of factors like the quality and cost of connection, the types of activities undertaken online, and issues of representation in online spaces (Clement & Shade, 2000; Hudson, 2011b).

In shaping studies to explore these processes, scholars like Howard (2011) and Nakamura and Chow-White (2011) presented digital divides as closely tied to ‘offline’ social relations. They examined the persistence and deepening of social inequalities associated with factors like the distribution of economic resources, interpersonal skills and motivations, involvement in processes of socio-technical development, and engagement with structures of governance and institutional frameworks, to name a few areas of consideration. Their work sought to explore the relational aspects of digital divides (Van Dijk, 2005), and encompassed a multi-faceted conception of the problem. For example, Graham (2011) suggests that researchers:

“[E]mploy a more grounded vision of the relationships between geography and technology. Specifically, by taking into account the economic, cultural, political and technological positionalities of each person attempting to access cyberspace, as well as both the material and cyber-divides that obstruct communication through the Internet” (p.212).

Given the persistence of digital divides faced by many individuals and populations, research in this area continues to develop new methodological approaches. For example, a recent (2012) issue of the International Journal of Communication was dedicated to proposals to measure ‘meaningful broadband adoption’, given the failure of past policy (Gangadharan & Byrum, 2012). This latest stream of research may constitute a ‘third wave’ of digital divide research that seeks to incorporate the voices of individuals and populations affected by digital divides. Rather than treating these people as passive
objects to be studied, some scholars are proposing digital divide studies that engage with individuals and populations as active subjects. For example, several authors writing in the *International Journal of Communication* argued that user communities must be more involved in developing the methodologies used by researchers to measure digital divides (and tailor subsequent policies to address them) (Davidson et al, 2012).

Suggestions from this ‘third wave’ of digital divide research serve as a bridge to the phenomenon of digital self-determination that I explore in this dissertation. Positioning the existence of digital divides in a relational framework of analysis, I explore the relations between networked digital infrastructure development and the societal positions of indigenous peoples. In focusing on development projects undertaken by indigenous peoples and their partners in the context of their engagements with structural frameworks, I argue that projects of digital self-determination represent the outcome of processes grounded in indigenous control over the diffusion, construction and use of networked digital infrastructures. In making this argument, I recognize that networked digital infrastructures are not only tools of emancipation – they can also support past and ongoing structures of colonialism.

Approaches to the study of socio-technical development tend to be either dystopian or utopian (discourses I discuss in Chapter 6). Researchers showed how state and corporate entities have used networked digital infrastructures to undertake the surveillance, control, and containment of indigenous peoples (Leclair & Warren, 2007). These infrastructures can exacerbate existing relations of inequality and hasten the extraction of economic resources from indigenous territories. They can support assimilation and privilege non-indigenous knowledges, values, and cultures, reflecting the “hegemonic reach of dominant logics and their proposed importation into local sensibilities and spaces” (Landzelius, 2006, pp.293-4). However, I contend that to accept such negative effects at face value is to fall into the trap of social and technical determinism. Instead, I argue that it is impossible to define with conviction *a priori* the path or effects of any socio-technical development. At best, we can attempt to describe the logics, activities, and structures involved in such processes.
While I do not consider myself a technological utopian, I am interested in the productive elements that networked digital infrastructures may offer to indigenous peoples. As Roth (2005) writes, “Among First Peoples practitioners and audiences, technology is viewed strategically as a tool to facilitate larger social and or cultural projects” (pp.9-10). Framing these considerations in the wider context of the colonialism/self-determination dialectic, in this dissertation I highlight and analyze digital self-determination as a metaphor and a practice that aims to decolonize technology development.

In the following chapters, I explore how indigenous peoples are shaping and developing networked digital infrastructures while also using them to assert their self-determination in other fields, like political leadership, economic development, cultural production, and the provision of public services. I frame networked digital infrastructures as the platforms of engagement that mediate relations between indigenous peoples and the global network society. They are the object, subject, and terrain of digital self-determination.

1.3. Chapter overview: Conceptualizing Digital Self-determination

Indigenous peoples around the world face multiple digital divides in their access to, control over, and use of rapidly developing networked digital infrastructures. My argument in this dissertation presumes that as the network society becomes increasingly ubiquitous, it threatens to reflect and exacerbate existing relations of social inequality rooted in past and continuing processes of colonialism. Indigenous peoples are acutely aware of this potential, and so are working with various partners to decolonize this environment. They are undertaking a variety of endogenous development projects that reflect their diverse and localized experiences, alongside a common desire for self-determination. In Chapter 2, I situate my observations of these processes through an overview of the ‘installed base’ of infrastructure in the regions and communities I analyze in this dissertation. This grounds my argument in a recognition of the ongoing economic, political, social, and cultural effects of colonialism, as observed in indigenous
communities in Canada. It also highlights the similarities and differences between four case studies drawn from communities I visited in my field research. Case studies from Slate Falls, Sachigo Lake, Bloodvein, and Ivujivik provide locally-contingent empirical evidence that informs my later thematic discussions of the colonialism/self-determination dialectic.

In Chapter 3, I turn to a discussion of the normative aims of my work. Drawing on the recommendations of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), I take a position on self-determination that recognizes that the practices and institutions of self-identified indigenous communities are embedded in a policy environment that includes existing state structures. Building on this position, I describe a normative approach to endogenous technology development that unfolds according to the values, practices, philosophies, and institutions of place-based, self-identified indigenous communities. This perspective builds on my argument in this chapter that a ‘third wave’ of digital divide research might support indigenous self-determination by involving individuals and populations as engaged agents working to reform state structures to support their own socio-technical development paths and solutions.

After normatively positioning my work, I situate digital self-determination with reference to the history of state-Aboriginal relations in Canada. Given my disciplinary location in the field of communication, I chose to provide a summary of indigenous efforts to appropriate print and broadcast media technologies. I present this history as a gradual shift from colonial representation to self-determined control over the relations of representation and politics of representation (Hall, 1995/1996). This process resulted in a development path for Aboriginal media grounded in the efforts of community-based

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10 I recognize that some indigenous peoples may choose to reject customary or traditional practices or values and adopt alternative approaches derived from Western (or other) contexts. However, I bracket this consideration outside the scope of my dissertation.
institutions, alongside a state enabling environment\textsuperscript{11} of regulatory conditions and subsidies that supported their efforts. This dialectical process reflected indigenous self-determination in ways that extend beyond the field of media:

“Historically, the demand by Canadian indigenous and minority constituencies for state support of local, regional, and national identity-building tools such as sustained media access, regional control over programming and distribution of broadcasting signals, and fairer portrayal and employment practices, has resulted in new configurations of democratic power. These have become central to the process of “constructing” the indigenous nation and the Canadian state” (Roth, 2005, p.10).

My analysis in this section also recognises a paradox embedded in the ontological status of indigenous media. The small-scale, linguistically and culturally diverse, and geographically dispersed nature of Aboriginal media’s ‘target audiences’ leads to significant challenges to its long-term sustainability in a commercial media environment. As a result, self-organized Aboriginal media institutions tend to rely on externally-supplied funding frameworks that support innovation, but also lack stability over time. However, I note that in some cases, these conditions led the state to generate subsidies and regulatory requirements to support the formation of local, regional, and national Aboriginal media institutions.

In Chapter 4, I focus on the state enabling environment in shaping the emergent network society in Canada. I discuss how rural and remote indigenous communities face persistent access divides associated with uneven patterns of development linked to the historic and ongoing effects of colonialism. Sandvig (2012) describes remote Native American communities as ‘offline by design’; a descriptor that I contend also applies to Canada. To address this challenge, the federal government established a state enabling environment of funding initiatives and regulatory conditions that support networked

\textsuperscript{11} Throughout this dissertation I employ the term ‘enabling environment’ to describe supportive policies and regulatory frameworks deployed by the state to encourage indigenous self-determination. I recognize the contested nature of this term, which is normative and therefore must be critically interrogated. Therefore, I invite readers to consider how such an environment can be made truly ‘enabling’, as one area for future research.
digital infrastructure development in regions left neglected by profit-oriented private sector service providers. Framing the shaping of this enabling environment as the result of negotiations between private and public interests, I provide an overview of the policy instruments leveraged by indigenous socio-technical institutions to address the access divides faced by their constituent communities.

In Chapter 5, I shift my focus from structural factors to illustrate how a productive agency emerged from these conditions of scarcity. Aboriginal socio-technical institutions use funding initiatives and regulatory conditions to build networked digital infrastructures that not only connect their constituent communities, but also support their needs as self-determining, politically autonomous collectives. Their work reflects a recurring theme in this dissertation: the mutual shaping of indigenous socio-technical institutions and networked digital infrastructures. Beginning with a general overview of the diffusion of networked digital infrastructure in rural and remote indigenous communities, I argue that indigenous peoples and their partners are bridging access divides in ways that reflect their digital self-determination.

In Chapter 6, I focus more closely on the political activities that gave rise to the state enabling environment for networked digital infrastructure development in Canada. Historically, across a range of fields, the state has dictated policies to and imposed development patterns on indigenous communities and individuals. At the same time, indigenous peoples consistently argued for increased consultation and engagement regarding these decisions. I describe how this dialectic of colonialism and self-determination played out in debates over networked digital infrastructure development. Drawing on examples from the U.S. and Canada, I describe how indigenous governments, political associations, and socio-technical institutions all interacted with state institutions to assert digital self-determination. Despite their efforts, I conclude that in Canada, this process has largely failed to allow First Nations and Inuit peoples to substantively engage in the strategic development of networked digital infrastructure. This points to a need to reform state institutions and associated policy frameworks to provide indigenous peoples with more control over their interactions with the structural conditions guiding the emergent network society.
Alongside this challenging history, indigenous peoples established their own socio-technical institutions to drive self-organized networked digital infrastructure development projects. In Chapter 7, I outline the organizational structure of some of these institutions. I show how they work to manage the local and regional governance of infrastructure. Arguing their activities reflect attempts to put into action the normative goals established by organizations like the Assembly of First Nations (through its e-Community strategy). While my goal in this chapter is not evaluative, I do address some of the challenges that indigenous socio-technical institutions face in their efforts to balance local engagement with centralized efficiency, and public goods with private interests. I present these various organizational frameworks as another facet of digital self-determination.

Finally, in Chapter 8 I focus on the online applications made available to indigenous peoples once networked digital infrastructures are in place. I argue that indigenous peoples are asserting their digital self-determination by using these platforms to build online communities, express virtual identities, and create broadband-enabled public service applications. In my discussion of these online practices, I engage with the concept of ‘networked individualism’ (Raine & Wellman, 2012). I argue that the ways that indigenous peoples engage with online applications resist both imposed identities associated with colonialism and deterritorialized conceptions of virtual communities. Their activities instead point to the persistence and re-articulation of place-based identities and communities that are tied to the lands these peoples have inhabited for millennia. Furthermore, I describe how governments that represent indigenous peoples are shaping online applications into ‘spaces of convergence’ (Chow-White & García-Sancho, 2012). I argue these activities reflect the efforts of indigenous governments to unite their areas of jurisdiction – such as education and health service delivery – with the shaping and operations of networked digital infrastructures. This strategic process demonstrates the co-construction of Aboriginal self-government and the underlying platforms of the network society.

Throughout this dissertation, I explore the various themes expressed in these chapters through a strategically-chosen empirical site of analysis, the Northern Indigenous Community Satellite Network (NICSN). NICSN is a cooperatively managed
not-for-profit satellite network that provides networked digital infrastructure to some of the most challenging to serve communities in Canada. Three indigenous socio-technical institutions partnered to set up NICSN. Keewaytinook Okimakanak’s Ku-ke-Nah Network (KO-KNET) in Ontario shaped an experimental satellite network into regional infrastructure. This organization sought to balance centralized efficiencies with the local autonomy of member First Nations, and to generate a suite of broadband-enabled public service applications that combined self-government with socio-technical development. In Manitoba, the Keewatin Tribal Council was inspired and assisted by KO-KNET. It set up its own satellite and terrestrial networks, establishing Broadband Communications North (BCN) to manage them as an independent not-for-profit service provider that balances the needs of a broad constituency of indigenous and non-Aboriginal communities. The Kativik Regional Government (KRG) administers the Inuit region of Nunavik in northern Quebec, as a condition of the James Bay and Northern Quebec Agreement (JBNQA). Mandated to deliver communications services to its mainly Inuit constituents, KRG created Tamaani Internet as a government department and regional service provider. Operating from Kuujjuaq and serving all of Nunavik’s 14 villages, Tamaani Internet’s management and operations are strongly integrated with the region’s education and health service providers, both of which also arose through the JBNQA negotiations. Despite their differences, these three institutions collaborated across significant geographic, institutional, and jurisdictional boundaries to generate a satellite-based cooperative that services 43 primarily First Nations and Inuit communities. Their development history offers a strong, if precarious, example of digital self-determination.

1.4. Limitations of this study

While the limitations of my dissertation are impossible to capture here, I will note several issues that occurred to me over the course of my research and writing. Some readers might critique my dissertation as based on the presumption that the network society is developing into a ubiquitous global infrastructure. Several problems arise from such a teleological discourse, including an over-determination of the inexorable progress of socio-technical development, and the potential restrictions on associated reforms and critiques such a position entails (Prey, 2012). With these valid points in mind, I tried to
focus my analysis on revealing the social relations involved in these processes, while recognizing that they do not proceed in any pre-determined fashion.

My focus on how indigenous peoples are shaping and leveraging their connections to the emergent global network society opens a host of related challenges. My primary interest in this project is how creative agents engage with various structures, work to reform them, and in some cases build their own alternatives. Some readers might challenge my stance as overly optimistic, techno-utopian, or insufficiently critical (Morozov, 2011). I tried to engage with these concerns by outlining the political and economic contexts associated with my object of study. For example, I apply a critical stance towards symbolic versus substantive engagement in decision-making, and try to outline the economic and political challenges associated with endogenous development projects. Throughout this dissertation, I also highlight that newly emergent socio-technical ensembles have unpredictable consequences: while neither inherently ‘good’ nor ‘bad’, they are never neutral. Focusing on issues of power, control, agency, and engagement, I worked to uncover the social relations embedded in the colonialism/self-determination dialectic as it plays out in socio-technical development. Throughout, I state my normative commitment to support digital self-determination and assist in projects of decolonization. In the next section, I outline my methodological reasoning.

1.5. Methodology: The paradox of an ‘outsider’ writing about self-determination

I began my doctoral program at Simon Fraser University’s School of Communication in 2007, interested in researching journalism practices and media representations of Aboriginal peoples in the context of Canada’s Truth and Reconciliation Commission. In the course of my studies, I shifted my focus to socio-technical development, but retained my core interest in working with indigenous peoples. As my program progressed, I gained opportunities to work directly with indigenous individuals and communities. This was possible through the tools of networked digital infrastructure I studied. These developments came together in the First Mile Project, a research and public outreach initiative exploring how remote and rural First Nations communities are shaping
community broadband networks. My involvement in this project, led by Dr. Richard Smith at Simon Fraser University and Dr. Susan O'Donnell at the University of New Brunswick, also introduced me to three of Susan’s long-term partners: KO-KNET in Ontario, the First Nations Education Council in Quebec, and the Atlantic Canada First Nations Help Desk. My entry into this group became a catalyst to join a long-standing network of researchers and practitioners involved in First Nations and Inuit socio-technical development and research. This dissertation is my contribution to their work.

My engagement with the First Mile project also shaped several methodological, ethical, and practical considerations associated with this dissertation. Contacts in indigenous institutions provided financial and organizational support for my visits to several remote First Nations and Inuit communities. My experience in these communities proved a turning point in my research. It empirically grounded my observations in ways that proved essential to subsequent interpretation and analysis. I am thankful for the opportunity to visit these communities, and strongly encourage any researcher working in this field to do the same.

Turning to my methodological rationale, I want to highlight some of the ethical considerations I engaged with during this project. Self-reflexivity has a place in all research, and particularly so in projects involving indigenous peoples (Tuhiwai Smith, 1999; Culhane, 1998; Jones & Jenkins, 2008). As a result, many researchers working in this area take an explicitly engaged standpoint, which Milan (2010) describes as:

“[T]hose inquiries into the social world which, without departing from systematic, evidence-based, social science research, are designed to make a difference for disempowered communities and people beyond the academic community” (p.856).

The First Mile Project is associated with two SSHRC-funded projects. The first project (2010) was a Knowledge Synthesis Grant that provided support for a summary of existing research and knowledge gaps on First Nations and Inuit broadband development. The second (2011-2013) was a 12-month Public Outreach and Dissemination project titled the ‘First Mile’. For more information, please see: http://firstmile.ca.
I recognize that researchers practicing more ‘detached’ research methods may raise concerns over the potential methodological biases associated with my standpoint.

Engaged and qualitative researchers face critiques around the treatment of their audience (engaging policy-makers or empowering communities to speak for themselves), their relationships with key informants (research about versus research with), and their interpretation of data (co-constructed findings versus independent analysis). They also face challenges regarding the supposed generalizability of their findings, particularly in projects that examine discrete case studies. In choosing to foreground examples of innovation and creative agency, and in its relatively short duration and small sample size, my study may also reflect challenges of quantitative validity and interpretive bias. I also acknowledge that some readers may question my close relations with some of my key informants. Along with providing a gateway to interview sources, and organizational and financial support that enabled my travel to several remote communities, my key informants at the three NICSN partner organizations received an opportunity to review a previous draft of this work to identify any incorrect facts.  

Milan (2010) suggests that while motivations, methodologies, and presentation of results differ, both engaged and detached research can be equally systematic, provided the researcher is upfront about any potential challenges or conflicts arising from this approach (see also Hintz & Milan, 2010). With this goal in mind, I outline my methodological reasoning.

First, I sought to build a relationship with my research contacts based on mutual clarity, respect, and trust. Researchers working with indigenous peoples often describe

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13 When I completed my draft dissertation chapters, I invited my key informants to clarify my interpretations of their comments during interviews. Along with addressing factual inaccuracies, this step informed the context-dependent nature of interpretation. While I did not make any substantial changes to my work, I was prepared to note areas of tension or disagreement within the text. I did make changes to some facts presented in this dissertation (such as confirming bandwidth allocations or relationships between institutions), but did not change any aspects of my argument, analysis, or interpretation. However, I want to provide transparency in this process to address potential critiques of methodological bias, while also highlighting my efforts to engage with my key informants.
their role as ‘partners’ or ‘allies’ of key informants. In part, this terminology seeks to challenge precedents set in past anthropological and sociological research (Tuhiwai Smith, 1999; Denzin & Lincoln, 2008). Drawing on the work of Said (1979) and Fanon (1963), many researchers working with indigenous peoples are aware of historic efforts to produce knowledge about indigenous peoples that reproduced structures of inequality and oppression (Freire & Faundez, 1989; O’Riley, 2004). To counteract these challenges, some researchers actively partner with indigenous peoples and shape collaborative research projects (Jones & Jenkins, 2008). This engaged methodology faces significant challenges. For example, my efforts to practice it required a long time frame to build trust with my research contacts. I spent almost a year discussing my plans with staff at KO-KNET, KTC/BCN, and KRG before conducting field research and interviews. This involved many emails, conversations, and meetings that continued into the data interpretation and writing phase of my project. Despite the personal frustration that sometimes accompanied this extended timeline, on the whole it helped shape my project and strengthen my professional development by instilling a sense of flexibility towards fieldwork and research collaborations. An ethical case further supports these methodological decisions. Researchers and indigenous peoples alike demonstrate that indigenous knowledge is governed by community norms and rules of exposure, ownership and control (O’Riley, 2004; Schnarch, 2004). While I did not specifically conduct research on indigenous knowledge, I do recognize the potential of my data and interpretation to inform policies that may impact the lives of indigenous peoples.

My attempts to navigate my degree requirements alongside the organizational structures and protocols of several socio-technical institutions and communities also proved challenging. I began this journey by stating my own subject position as a middle-class, Euro-Canadian, urban-situated male. In doing so, I sought to practice a form of reflexivity that examined institutional networks of power. To this end, I drew on Bredin’s (1993) ‘reflexive anthropology’, which proposed that “reflection must take place not so much on a personal and confessional level as on a historical or political level that explores the institutional networks of power within which anthropology and cultural studies operates” (para 11). I also turned to Roth’s (2005) work for guidance, and her suggestion to neither speak on behalf of indigenous peoples nor promote their specific interests, but rather to “weave together the historical, the theoretical, and the empirical”
in one’s interpretations and observations (p.8). My research contacts acted as invaluable guides in this process. Along with supporting my work financially and logistically, they challenged my motivations and standpoints in ways that led to further dialogue and reflection. These discussions generated two paradoxes that informed my work:

1) How can I address the challenge of defining and writing about the self-determination of indigenous people as an outsider to those communities? This articulates the paradox of an outsider ‘speaking for’ indigenous peoples without (re)producing colonial relationships.

2) How will I address the challenge of using Western-derived theory and research to interpret the lived experiences of indigenous individuals and communities? This articulates the paradox faced by an outsider interpreting ‘findings’ about indigenous peoples using Western frameworks of knowledge.

In engaging with these paradoxes, I was influenced by Grande’s (2008) discussion of ‘Red Pedagogy’. Red Pedagogy seeks to incorporate Western critical pedagogy and indigenous knowledge in a research methodology grounded in the experiences and perspectives of diverse indigenous peoples. Researchers that employ Red Pedagogy position their work as overtly political, framing the primary relation between the state and indigenous peoples as one of material exploitation ("the forced extraction of labor and natural resources in the interest of capital gains") that stems from historic and ongoing legacies of colonialism. They also recognize that understandings of ‘radical democracy’ must be supplemented with a conception of a land-based indigenous sovereignty that is distinct from Western notions of rights, citizenship, property, and exploitation. That is, the indigenous case is unique among critical research projects:

“[W]here revolutionary scholars ground their vision in Western conceptions of democracy and justice that presume a ‘liberated’ self, indigenous scholars ground their vision in conceptions of sovereignty that presume a profound connection to place and land” (Grande, 2008, p.240).

Associated with this point, Grande (2008) argues it is critical that researchers analyze data regarding processes of identity formation or institutional development in ways that resonate with this indigenous conception of place. Indigenous peoples construct boundaries to maintain their distinctiveness while simultaneously building networks of solidarity. According to Red Pedagogy, researchers studying these processes of identity formation must try and represent them as evolving in relationship with broader struggles
over lands, resources, treaty rights, and intellectual property (p.241). Finally, scholars practicing Red Pedagogy resist the linear teleological path presented in some histories of modernization, instead recognizing that indigenous cultures are rooted in intergenerational contexts that focus not on ‘progress’, but rather on managed change over time. Rather than a teleological approach to analysis and interpretation, this involves development patterns that are associated with the unique and specific contexts of the societies from which they emerge. My attempt to present the interrelationships among these themes of land, time, sovereignty, and identity are threaded throughout this dissertation. In Chapter 3, I engage with them directly in a theoretical consideration of self-determination. I articulate a normative position grounded in a recognition of the place-based laws, institutions, and practices of self-defined indigenous peoples. This frames my dissertation’s focus on reforms to state structures and institutions to incorporate these processes. My position is further informed by the participatory rights articulated in the United Nations Declaration on the Rights of Indigenous Peoples, which provides one blueprint for such work. In later chapters, I discuss this position in more detail, and explore how it unfolds across various fields of analysis.

Given my chosen empirical site, I also draw on Star’s (1999) work on the ‘ethnography of infrastructure’. Star demonstrates how infrastructures emerge in communities of practice through learned conventions, technical expertise, and tacit knowledge. She notes they are historically contingent and embedded in an installed base of social relations, institutional arrangements, and technologies. Since infrastructures are fixed in modular increments, they expand and shrink over time, and their scope can be small or giant, targeted or diffuse. She highlights how the development of these infrastructures takes place as much in so-called margins as in any professed ‘centre’. In order to study networked digital infrastructure development, I deployed several methods drawn from Star’s process of ‘infrastructural inversion’: identifying both master narratives and local stories; researching work undertaken by system developers and users; and describing the symbolic/discursive and the physical components of infrastructures.

Turning to the ‘nuts and bolts’ of my chosen methodology, as noted above, I recognize that it may draw critiques of methodological bias. To mitigate this potential
challenge, I support my conclusions by triangulating existing research and documentary analysis, participant observation, and semi-structured interviews. Documentary analysis provides a solid grounding in existing research in this area. I used this method to support the reliability and validity of my study through comparing my own interpretations (gained through participant observation and interviews) with existing studies of similar focus and scope. To this end, I draw on research, policy documents, and ‘grey’ literature (meeting minutes, emails, websites, media reports, videos, audio files, etc). I also draw on the results of an online survey sent to all K-Net email account holders in Northern Ontario by KO-KNET and the University of New Brunswick in November 2011 (KO-KNET, 2012). The survey yielded a total of 132 responses from people living in Ontario’s 14 NICSN satellite-served communities.14

To situate the interpretations I draw from interviews and documentary analysis, I also conducted participant observation. Given its relatively short duration (with site visits ranging from a few hours to a few weeks) I would not classify my work as an ethnographic study, but rather as drawing on several extended field trips. While I was unable to spend enough time at my research sites to conduct thick descriptive work (Geertz, 1983) my on-site experiences did situate my observations. The opportunity to visit several remote First Nations and Inuit communities proved invaluable in gaining an introduction to the unique contexts of life in these communities, as well as some of the people living in them. As well, tours of the socio-technical institutions I am writing about helped demonstrate the physical technologies associated with the NICSN project. I engaged in participant observation both during in-person field trips, and as mediated by interactive technologies like videoconferencing. I connected with all three NICSN partner institutions and several remote First Nations and Inuit communities in this way.

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14 While I do not specify population characteristics in my use of this survey data, I wanted to note that the results are fairly evenly distributed among gender (47% male, 53% female) and age (youth, middle-aged people, and Elders).
Finally, I conducted interviews with 68 key informants. These interviews provided the bulk of my primary research. Along with targeted information, they offered clarification on the data collected through documentary analysis, existing research, and participant observation. I recruited interview participants through a combination of snowball sampling, targeted sampling (focused on individuals working in indigenous socio-technical organizations, government, and public service provision), and convenience sampling (when I was in communities). I recognize this method holds limitations in terms of generalizability about what it can say about populations, and instead present the findings as a starting point for future systematic research. I approached my interviews with a goal of securing qualitative rather than quantitative data, and so employed a semi-structured conversational approach rather than a set survey method. While this method may not yield the high number of responses associated with a quantitative approach, it was better suited towards my project’s goals of exploring how people frame their experience of the development of networked digital infrastructure, with the overall aim of using their responses to reflect on the phenomenon of digital self-determination. As noted earlier, what I gained in depth I may have lost in breadth, in terms of the generalizability of my findings. For this reason, I suggest that more comparative research is required in this area to further test the assertions and claims made in this dissertation.

The majority of these interviews took place on-site and in-person, with several conducted over telephone, videoconference (supported by KO-KNET’s bridge), and Skype. I conducted most interviews one-on-one, with two conducted in a group setting (two people) at the request of those participants. My field work was guided by protocols requesting formal permission from community leadership to work with communities that I visited (see Appendix 1 for a sample copy of one of these letters). The process outlined in my interview protocols was as follows:

- Establish relationship with local Chief and Council, facilitated by NICSN partner institution (KO-KNET, KTC/BCN, or KRG).
- Send formal letter to local leadership outlining my dissertation project and requesting permission to visit the community for research purposes.
• Meet with NICSN partner institution to plan community visit. During site visit, meet with local Chief and Council to discuss my project and present a gift. At this time invite leadership to complete an ‘Approval of Chief and Council’ form signalling their support of my project. Note that if they did not raise any concerns, tacit support for my project was assumed.

• After community visit, send thank you letter to Chief and Council.

Given the limitations and scope of my current project, I did not conduct any analysis with regards to contexts of gender, age, or language group, although I do recognize that such work is one promising area for future research. Instead, I focused on analyzing several strategically chosen empirical sites that illustrate articulations of digital self-determination. As noted above, I recognize that the specificity of my method may restrict the generalizability of my findings. However, I argue throughout this dissertation that indigenous research projects must sustain a clear recognition of the localized and specific nature of the communities they emerge from. Generalizability in this context might be tested by applying the multi-faceted concept of digital self-determination in a variety of contexts.

I provide a detailed overview of the regions and communities I visited during these field trips in the next chapter. Briefly, in Fall 2011 and Summer 2012, I visited five First Nation and Inuit communities located in the northern regions of the provinces of Ontario, Manitoba, and Quebec.\textsuperscript{15} During these visits I conducted semi-structured interviews with 38 community members, the majority of whom are Aboriginal. My informants ranged in age, gender, and occupation – from Youth ICT Workers and Band councillors to local cable plant technicians and online education service providers. Participants in the First Nations of Sachigo Lake, Slate Falls, and Bloodvein received a $20 honorarium funded by KO-KNET (in Sachigo Lake and Slate Falls) and the First Mile project, via SSHRC (in Bloodvein). Interview participants in Ivujivik and Kuujjuaq did not receive any honorarium. Here is the breakdown of interviews.

\textsuperscript{15} Parallel to these visits I travelled to several other remote and rural First Nations communities through my work with the First Mile Project (some of these stories are available at http://firstmile.ca). This work implicitly and explicitly informs my dissertation.
I also interviewed 30 administrators and technical support staff from the three NICSN partners (KO-KNET, BCN, KTC, and KRG-Tamaani Internet Internet). These interviews were accompanied with ongoing discussions and planning meetings, and follow-up phone, video chat or email communication. The final group of people I interviewed worked in federal and provincial agencies like Industry Canada, FedNor, and Health Canada, and Aboriginal organizations like the Assembly of Manitoba Chiefs. Here is a breakdown of these interviews.

Table 1: Summary of Community Interviews

<table>
<thead>
<tr>
<th>Community</th>
<th>Date</th>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sachigo Lake</td>
<td>Oct 10-11, 2011</td>
<td>9</td>
</tr>
<tr>
<td>Slate Falls</td>
<td>Oct 13-14, 2011</td>
<td>7</td>
</tr>
<tr>
<td>Bloodvein</td>
<td>Nov 22-23, 2011</td>
<td>4</td>
</tr>
<tr>
<td>Kuujjuaq</td>
<td>June 6-9, 2012</td>
<td>6</td>
</tr>
<tr>
<td>Ivujivik</td>
<td>June 10-16, 2012</td>
<td>12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>38</strong></td>
</tr>
</tbody>
</table>

All interview participants received a copy of my ethics protocol, which I presented prior to the interview. Participants also signed a consent form signalling their agreement to participate in my study. Appendix 2 provides copies of the ethics protocol and consent form. In all interviews, I used a pre-determined set of questions followed by semi-structured discussion. Appendix 3 lists my interview participants (edited for anonymity). My interviews lasted from 30 minutes to over two hours. Often, the process was determined by the circumstances at hand: from formal targeted interviews set up weeks in advance (targeted and snowball sampling), to spontaneous interactions that arose from ‘hanging out’ at a community’s Band Office or walking through a community (convenience sampling). This work was often accompanied by tours of local institutions.
(including administrative and technical centres and public service providers). I was shown everything from online classrooms, to server rooms, to satellite ground infrastructure, to prized moose antlers.

In interpreting my interview data, I transcribed all audio interviews into written form. I then coded the interview data according to various themes, which I developed using an iterative methodology. First, I transcribed all audio recorded interviews into word processor documents. Once this process was completed, I identified several themes that emerged from this data, using them to set up coding categories. These themes shifted as I worked through the data, and so I repeated the process once my themes solidified, through a second analysis of the data. I also highlighted any quotes that particularly well illustrated or articulated a point or impression associated with a specific theme.16 Reflecting on my interview data, existing research, and government, organizational, and media reports, I then wrote summaries of these themes, which informed the components of digital self-determination that I explore in this dissertation. This process continued during the dissertation writing process, as the themes – when considered alongside existing research and theory – shaping the structure of my chapters and overall argument. Through this iterative process, I sought to incorporate the voices of the people I interviewed alongside my own impressions and theoretical reasoning.

16 My interpretation of this data respects the privacy of my key informants by not quoting anyone by name. Direct quotes are anonymized using a randomly assigned number. To further protect the privacy of these individuals – who can be easily identified through their geographic and/or institutional position (given the small size of the communities and organizations I worked with), I ensured that this process was randomized in all levels of data presentation. This is reflected in the List of Interviews (Appendix 3) which lists individuals in an intentionally haphazard fashion. I do list those participants who wanted to be identified by name in my acknowledgements.
1.6. Conclusion

In this chapter, I outlined the core argument and claims I present in this dissertation. Grounding my analysis in the past and ongoing effects of colonialism, I positioned my work as focused on how indigenous peoples are asserting their self-determination in socio-technical development projects. I situate these sites of contestation in broader struggles over social relations of autonomy and control, as expressed in the centuries-old and ongoing colonialism/self-determination dialectic. Narrowing my scope to a consideration of networked digital infrastructures, I presented my core argument: that indigenous peoples express examples of digital self-determination of, as well as through, the platforms that connect their communities to the emergent network society. After a brief chapter overview, I presented some of the methodological and ethical considerations that inform my work. In the next chapter, I introduce several case studies drawn from my field sites as locally-emergent examples of digital self-determination that highlight how in the globalizing network society, place still matters.
2. Legacies of Colonialism and Local Innovation: The Installed Base of Communications and Information Infrastructure in Aboriginal Communities

“The communities [had] ...street lights in the middle of the bush. With roads, sewers, schools, new schools, Band offices, all the new health centres, all this stuff, new houses – and no telephones...The communities weren’t going to be served unless they served themselves” (interview 1001).

The people living in the three regions I visited during this dissertation project reflect shared challenges and opportunities that take shape in distinct local and regional contexts. This observation reflects my argument that digital self-determination is a flexible concept that balances recognition of the colonialism/self-determination dialectic with the specificities of diverse, place-based indigenous communities. In Chapter 3, I outline the theoretical and normative reasoning for this position. In this chapter, I consider how this dialectic played out across fields of economic, political, cultural and communications development, and end with empirically-grounded case studies of digital self-determination in four communities I visited. Along with showcasing the similarities and differences among these communities, these case studies demonstrate how indigenous peoples and their partners are managing their relationship with the emergent network society. This analysis provides an overview of the socio-economic challenges, cultural practices, and political relationships that shape locally-emergent articulations of digital self-determination. In this way, the chapter provides an introduction to later chapters that analyze in more detail the themes of access, politics, organizational structures, and applications.
Aboriginal peoples in Canada are a young, diverse, and growing population. Between 1996 and 2006, their population increased in size at a rate almost six times more than the country as a whole. The Government of Canada estimates it will reach more than 1.5M by 2026 (ANDC, 2012). While many of these peoples live in urban centres, others continue to live in their traditional territories, in small, dispersed, rural and remote communities that range in size from a hundred to several thousand residents. The conditions present in these communities reflect the legacies and ongoing effects of colonialism. Many are located near profitable resource extraction sites, but their residents often lack a fair share of profits from or engagement in these activities (Jacobs, Berrouard & Mirellie, 2009; Kativik Regional Government & Makavik Corporation, 2010). A variety of indicators further demonstrates that socio-economic conditions in these communities remain worse than those in the rest of Canada. Challenges include high levels of violence, suicide, family breakdown, unemployment, and household poverty. For example, a 2006 Statistics Canada report found that housing conditions in Nunavik
are among the worst in Canada, with little improvement since 1996 (Jacobs et al., 2009). People I met during my field research described crowded housing, widespread poverty, alcoholism and drug abuse, and cases of spousal abuse. In Ivujivik, most students do not graduate from high school and many face conditions like fetal alcohol spectrum disorder, depression and dyslexia, alongside a lack of access to support staff and other resources (interview 4040).

Along with these socio-economic challenges, people living in these communities lack equitable access to the transportation, electrical, and communications infrastructures that residents of the south take for granted. This is partly due to their geographic location. In northern Ontario and Manitoba, hundreds of tiny lakes and muskeg pepper the landscape, while northern Quebec is isolated from the province’s more populated south by hundreds of kilometres of wilderness. However, factors other than geography also shape these conditions. Even in regions like James Bay in Quebec that are the sources of hydroelectricity used in many metropolitan centres, many communities still rely on diesel power. As recently as 30 years ago, residents had little or no access to roads, airports, telephones, or television, while industries like mining, forestry, and oil and gas exploration spent millions of dollars on regional development projects. When these infrastructures arrive, many do so according to the mandates and motives of external corporations and governments, along with researchers, media organizations, and other parties (Roth, 2005). These challenges are compounded by a shortage of local capacity and human resources. For example, in Manitoba, Bloodvein First Nation’s housing manager told me that despite a housing crisis in the community, construction is stalled because “a lot of people don’t know how to build a dog house up

17 Dr. Gerard Duhaime, a professor at Laval University, is tracking socio-economic conditions in Nunavik through the Nunivaat Statistics Program (available at: http://www.nunivaat.org/).
18 All of Nunavik’s 14 villages remain off-grid and still rely on diesel-burning generators, and seasonal barges and flights that can cost thousands of dollars (every year, Inuit beneficiaries are entitled to one 75% discounted ticket or cargo shipment, subject to certain conditions). Although some communities in northern Ontario and Manitoba connect to seasonal winter roads, most still cannot access all-weather road systems.
This lack of access to local capacity and infrastructure, and the public services and economic development opportunities they make available, will continue into the foreseeable future. Recent feasibility studies on road networks, electric transmission lines and fibre optic links all concluded that due to high costs, these projects largely remain out of reach.\textsuperscript{19}

These unequal development patterns and challenging socio-economic conditions are further reflected in the contentious history between Aboriginal peoples and the Canadian state. Some of these tensions stem from the terms and implementation of treaty and Aboriginal rights. First Nations in the regions of Ontario and Manitoba that I studied signed historical treaties with the Crown in the late 1800s and early 1900s.\textsuperscript{20} At present, many First Nations signatories remain dissatisfied with the written terms of these treaties and their implementation in practice. As a result, they continue to resist federal and provincial authority over their territories, and founded their own political and economic organizations to protect their interests and represent their collective

\textsuperscript{19} Notable exceptions include an all-weather road network being developed in Manitoba, and a regional fibre optic telecommunications network in northern Ontario.

\textsuperscript{20} In Ontario, Treaty 9 (also known as the James Bay Treaty) covers much of the province’s north. Signed in 1905, it extinguished Aboriginal title to land, but created several treaty rights, including funding for First Nations public service delivery organizations (McMillan & Yellowhorn, 2004). (The Ontario provincial government retained jurisdiction over public lands, natural resources, and education) (Long, 2010). In northern Manitoba, First Nations signed Treaty 5 in 1875-76 in exchange for specified reserve lands and rights to hunting, fishing, and other resources. As in Ontario, signatories continue to dispute the location and size of reserves and the size of annual treaty payments, among other issues (Long, 2010; Slowey, 2008). In one assessment of this situation, Kuchyski (2008) writes that compared to other land claims it is “clear that the Cree in northern Manitoba would have been better off had they never signed a treaty” (p.135).
socioeconomic and political aspirations (Long, 2010). Over the years these federated associations of autonomous First Nations helped their members to secure administration over public service delivery, negotiate revenue-sharing agreements with resource companies, and set up regional businesses like Wasaya Airways, CreeWest, and Five Nations Energy Inc. They continue to work on behalf of their member First Nations to support treaty rights, generate economic development opportunities, and provide public services to their constituents. Alongside these collaborations, member First Nations also continue to preserve their local autonomy, stressing active participation and engagement in any regional projects that impact their community members.

Compared to the two Anglophone provinces, the Inuit territory of Nunavik in northern Quebec reflects a very different political and administrative context. This reflects the different ways that the colonialism/self-determination dialectic played out in that region. In just a few generations, the Inuit shifted from a semi-nomadic subsistence society to a modern political state (McMillan & Yellowhorn, 2004). After decades of administrative neglect on the part of the federal and provincial governments that had formal jurisdiction over and fiduciary

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21 In Ontario, a coalition of 49 First Nations (representing some 45,000 peoples) created the Nishnawbe Aski Nation (NAN) in the 1970s. (From the Ojibway word ‘(a)nishinaabeg’ for ‘Indigenous people’; and the Cree work ‘askiy’ meaning ‘land’). In Manitoba, First Nations founded similar coalitions, including the provincial Assembly of Manitoba Chiefs (AMC). Like NAN, the AMC (through its precursor, the Manitoba Indian Brotherhood) asserted that member First Nations gain “full and continuous participation in the establishment of structures and processes...[that] unfold from a knowledge of the Indian reality, as articulated by Indian people” (Manitoba Indian Brotherhood Inc., 1971, p.13). The AMC now represents 60 First Nations in Manitoba (approximately 140,000 of the province’s registered First Nations people). I discuss how these Tribal Council associations moved forward networked digital infrastructure development projects in Chapter 5.

22 The name ‘Nunavik’ is a recent social construction. Prior to the JBNQA, the government referred to the area as ‘Nouveau Quebec’ (a term still used for electoral purposes). For Nunaviummiut the term ‘Nunavik’ (the great land) is tied to their cultural and regional identity and based in “their position on inalienable rights obtained and maintained through their close relationship with the land” (Müller-Wille, 2001, p.33). It was formally articulated in the early 1980s and recognized by the Quebec government in 1988. The term ‘Nunavik’ is positioned differently from ‘Kativik’, which is linked to the Kativik Regional Government. Müller-Wille (2001) describes Kativik as a “legal-administrative regional construct connected with land rights”, while Nunavik is “a cultural-linguistic concept based on geographical names and other cultural elements” (p.37) (see also Drummond, 2001).
responsibilities towards the indigenous peoples of Northern Ontario, in 1975 the Inuit of Nunavik and the James Bay Cree united to negotiate and sign the *James Bay and Northern Quebec Agreement* (JBNQA).\(^{23}\) At that time, both indigenous groups lacked formal political structures and the provincial government did not recognize their claims to the territory (Wera & Martin, 2008). Shared resistance to a massive hydroelectric development project in James Bay united the two indigenous groups, who jointly signed the JBQNA after a challenging series of negotiations with federal and provincial governments. Support for the *Agreement* among Cree and Inuit people was divided, and not every community ratified it. This criticism continues to the present, demonstrating the reality of diversity and disagreement among members of indigenous communities. Martin (2008a) notes that some residents of Nunavik refer to the JBNQA as a ‘colonial treaty’. For example, in the village of Ivujivik, many locals see the *Agreement* as undermining the preservation of their culture and a means of losing jurisdiction over their lands and seas (interview 4045). In the words of one local leader:

“In a way they [the critics] were right that the *Agreement* did not go as far as they would have liked. Locally, the Elders, the elderly Inuit, have a history of opposing new forms of governments. And they point out that the [new] services have not improved things, and even have made things worse than before...Young people are beginning to find out that the compensation money was not enough. It did not meet the needs of the region. And now you have all sorts of mining activities, you have road development, you have new talks of oil drilling that are going to exploit the [resources of the] region. So the people are faced with this tremendous progress, with big corporations they feel they have very little control over. So they would like to gain control and regain their land and do with it what they want. They want to continue harvesting the wildlife, as before, whether it be polar bears or whales or caribou or fish. They want those [development] activities to stop” (interview 4045).

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\(^{23}\) Until 1912, the territory was part of the District of Ungava of the Northwest Territories. That year, the Quebec Boundaries Extension Act gave Quebec responsibility for the territory and its Aboriginal inhabitants, but the provincial government played little active role in the region until the 1960s (Martin, 2008a). While First Nations have relations with the federal government through the *Indian Act*, Inuit in Nunavik do not have Indian status and so have direct relations with the provincial government. The Government of Canada similarly neglected the administration of Nunavik, although it stationed federal agents there after World War Two (Drummond, 2001).
These reflections show the persistence of externally-managed development projects that continue to impact the lives of people in Nunavik, or Nunavummiut.\textsuperscript{24} That said, those signatories that did support the JBNQA believed it could be used as a tool to support their land base and traditional ways of life, develop public services and economic development, and allow the region a degree of political autonomy (Papillon, 2008). The Agreement did provide material benefits and resources to support these goals: the Nunavummiut received $90 million in cash, ownership to nearly 9,000 square kilometres of land, and hunting, fishing, and trapping rights. Makavik, the Nunavik land claims corporation, used these funds to set up several regional organizations to benefit signatories of the Agreement. This organizations include Air Inuit, Avataq Cultural Institute, and Taqramiut Nipingat Inc.

The JBNQA also supports the self-government aspirations of the region’s primarily Inuit population. It created several governing institutions to administer the territory on behalf of residents. These include the Kativik Regional Government (KRG), which consolidated the region’s 14 villages into a regional government.\textsuperscript{25} To support the regional delivery of public services in Nunavik, the JBNQA also created the Kativik School Board (KSB) and the Nunavik Regional Board of Health and Social Services (NRBHSS). KSB was the first Inuit-controlled school board in Canada, and it continues to develop and deliver culturally-appropriate and Inuititut-language educational services.\textsuperscript{26} The NRBHSS oversees the region’s hospitals in Kuujjuaq and Puvirnituq, and nursing stations in the 12 other villages. Both organizations work to adapt health care and educational services to regional contexts, support local capacity building, and ensure public services remain under community control (Lavoie, 2001). They operate on an independent basis, but sometimes collaborate on shared

\textsuperscript{24} This is a translation of the Inuititut word meaning people of Nunavik (primarily Inuit).

\textsuperscript{25} Municipalities in the region can raise taxes, and activities performed by KRG are financially supported by the municipalities. As a territorial rather than an ethnic government, non-Aboriginal residents can vote in KRG elections, and local government remains in Inuit control only as long as they maintain a population majority.

\textsuperscript{26} Some sources spell the language spoken by Inuit people in Nunavik ‘Inuktitut’. In this dissertation I use the spelling ‘Inuittitut’, which was recommended by one of my interview participants, a young Inuit man in Ivujivik.
projects (including in broadband development; see my discussion in Chapter 8). Although these three institutions provide residents of the region with formal administrative structures to support self-government in Nunavik, some observers critiqued them for their links and accountability to non-Aboriginal federal and provincial governments. Rather than sovereign institutions that emerged from Inuit communities, the administrative organizations are non-ethnic entities. As a result, attempts at collaboration between the organizations are sometimes politically challenging. For example, two villages (Puvirnituq and Ivujivik) did not sign the JBNQA, resulting in different approaches to program management and delivery of public services in those communities.27

This brief summary demonstrates some of the tremendous social, political, economic, and technological changes that indigenous peoples have experienced over the last 50 years. They also highlight the persistence of unequal social relations associated with colonialism, alongside ongoing economic and political projects of self-determination. This is seen in the continuing extraction of economic resources from indigenous territories by external entities (in many cases without adequate consultation or compensation), the lack of access to infrastructure and public services common in most of Canada, challenging socio-economic conditions, and the convoluted structures of governance and administration that reflect the complex history of negotiations over state-Aboriginal relations. Yet this overview also reflects how indigenous peoples are far from passive victims of these externally imposed development patterns, but also active.

27 In recent years the region’s leadership began negotiating whether or not to unite the institutions created through the JBNQA into a more politically autonomous regional government. This new entity will have its own assembly and constitution, and operate with Inuktitut as an official language (McMillan & Yellowhorn, 2004). Nunavimmuit will obtain rights over the protection of culture, establish traditional institutions (like a Council of Elders) to balance modern institutions like KRG, and share governance responsibilities with federal and provincial governments (Martin, 2008a). In 2007, involved parties signed an agreement-in-principle regarding the formation of this new regional government, and in Spring 2011, Makavik and KRG organized a referendum on the Final Agreement. Almost 8,000 Nunavimmiut registered to vote, with many discussing the issue on social media. Support was divided and Nunavik residents eventually rejected the final agreement. At present, the territory continues to be administered by the KRG, with public services delivered by KSB and NBHSS.
agents who have generated their own endogenous development projects. This observation is supported in recent literature on development theory and practice.

Historical conceptions of ‘development’ often focused on how external entities – whether state agencies of civil society organizations – imposed structural changes on states, regions and communities. These organizations applied quantifiable economic indicators of success, such as increasing levels of employment or numbers of ‘widgets’ manufactured. Schuurman (2000) points out that these approaches have been criticized. For example, they tended to hold a strong belief in top-down, exogenous notions of progress rooted in ethnocentric values. As Escobar (1997) points out, in the 1940s and 50s, development policy typically focused on modernization projects as a way to destroy ‘archaic superstitions’ (p.86). It also tended to ignore the unequal political and economic realities of global hierarchies (Cooper & English, 2005). Critical political economists continue to argue that “the latest phase of globalization has led to a reassertion of the power of global capital at the expense of organized labour and the democratic state” (Curran, 2002, p.175).

The development community responded to such critiques by formulating proposals for alternatives to ‘mainstream’ development, including alternative development, post-development and reflexive development (see Pierterse, 2000). These approaches considered structural inequalities, aimed at substantive, transformative change, and sought to redefine the goals of development to incorporate the practices and normative goals of affected groups (ibid, p.344). One important focus of these alternatives was an emphasis on supporting the agency of involved individuals and populations, as opposed to imposing structural reforms on them. In short, these proposals sought to re-configure research, policy, and practice to foreground community participation in a form of development ‘from below’.

In line with this trajectory, recent research demonstrates how indigenous peoples are building and shaping their own institutions, practices, and socio-technical ensembles. As indigenous peoples living in remote and rural communities selectively appropriate various elements of Euro-Canadian society, they also continue to practice their cultures and ways of life. For example, while people in all three regions I examine in
this dissertation speak English (and/or) French, most also speak Aboriginal languages, with the result that Cree, Ojibway, Oji-Cree, and Inuititut are all among the few Aboriginal languages in Canada that are not endangered (McMillan & Yellowhorn, 2004; Papillon, 2008). These practices of cultural syncretisation extend to other fields and activities. Alongside wage-based employment, people continue to be involved in hunting, fishing and trapping for ‘country food’ on the land (Chabot, 2003). These examples demonstrate the continuation of indigenous cultural practices alongside activities associated with contemporary Euro-Canadian society.

Indigenous peoples are also driving their own local and regional development projects, building infrastructures and organizations that emerge from the unique needs of their constituent members. Distinct from exogenous development models imposed on their communities, many of these initiatives attempt to fill gaps or address needs identified by residents through community-driven solutions. For example, researchers describe how cooperative social and organizational structures play a strong role in both traditional seal hunting camps and more contemporary projects like the Nunavik cooperative store movement of the 1960s (McMillan & Yellowhorn, 2004; Jacobs, 2001; McComber, 2012). Every village in Nunavik has a membership-based co-op, and in 1967 these 14 organizations united in the Fédération des coopératives du Nouveau-Quebec (FCNQ) through a vision called Atautsikut (which means ‘working to develop as a people, leaving none behind’). Over the years the FCNQ developed various services in the region, including banking, a postal system, cable TV and Internet services, hotels, and even a regional travel agency (Tulgak & Murdoch, 2007). In short, while unequal social relations stemming from Canada’s history of colonialism accompany the extension of mainstream and capitalist political and economic agendas into rural and remote Aboriginal communities, indigenous peoples have also generated their own endogenous development projects, reflected in a diverse array of infrastructures and organizational structures (Slowey, 2008). Indigenous peoples are not passive victims of colonialism, but rather active agents undertaking development projects informed by their own values, practices, and institutional arrangements. In the next section, I provide a concrete example of some of these projects in a short overview of regional information and communications infrastructures, a theme explored in more detail in Chapter 3. This
demonstrates how these projects reflect processes of creative appropriation under conditions of marginalization – a dynamic analyzed throughout this dissertation.

2.1. Endogenous media development in northern Ontario, Manitoba, and Quebec

People living in remote and rural indigenous communities in Canada historically transmitted messages in person (Gibson, Kakekaspan, Kakekaspan, O’Donnell, Walmark, Beaton, & the People of Fort Severn First Nation, 2012). Later, they established more permanent and tangible transportation and communication links using technologies developed in the urban south, often moved to action by the failure of corporate and government entities to establish infrastructure and services in their communities. As a result of these efforts, by the 1960s, people transferred messages throughout the regions by skidoo, airplane, and HF trail radio. In Ontario, local nursing stations and government administrators used radios to route messages through a central hub in Kenora to several remote communities.

Starting in the 1970s, indigenous peoples set up their own community-based institutions to coordinate this work. Several federally-funded regional not-for-profit Native Communications Societies began driving communications development projects – a history I describe in Chapter 3. These institutions sought to reflect the constituents of the indigenous communities they emerged from, and strike a balance between regional solidarity and local ownership and control. For example, people in Nunavik founded the Taqramiut Nipingat Incorporated (TNI) or ‘Voice of the North’ in 1975 to promote Inuit culture and language across the region. In the words of TNI’s current Vice-President: “What TNI does is it operates in our language, in our mother tongue Inuttitut. It preserves and practices our language every day” (interview 4033). To this end, TNI set up a network of FM radio stations across Nunavik, first in Kuujjuaq and later in the 14 other villages. I interviewed the community radio station manager in Kuujjuaq, who told me how he built a local system powered by a single 9-volt battery. Initially only reaching around eight houses, TNI provided the system with stronger equipment and soon three announcers started broadcasting throughout the village. By the mid-1970s, the
organization’s radio network included eight radio stations, and by 2004 long-range radio
towers connected 10 villages. Now every Nunavik community has a low-budget, low-
power FM station managed by the municipality and supported by a mixture of public
subsidy and local fundraising.\footnote{28} Residents of Nunavik drove the development of this
network themselves:

“We got a microphone and mic cord. We plugged it in and tried it. I brought my
own turntable, my records. I brought it to the HF station and plugged it in. And we
had to do an adjustment on the transmitter to get it into a frequency we could
pick up on the radio. So we started going house to house and told people to turn
on their radio to this frequency. Check it out. See if you can hear it. And then we
put on a tape recorder and turntable and started playing it. And went house to
house and turned the dial. And there it was. That’s how it started” (interview
4039).

The medium of radio proved extremely popular in indigenous communities. It also
reflects the cultural syncretism present in other development projects and described
earlier. People listened to southern broadcasts about news, sports and music, but also
used radio to broadcast Aboriginal language content, and even relay messages between
communities. In some cases, they also used the technology to support public services.
For example, in Ontario the Wawatay Native Communications Society partnered with the
Wahsa Distance Education Centre to deliver adult education courses over radio. Elders
told stories of life prior to contact with Euro-Canadians, while announcers hosted game
shows and promoted local and regional events. Many people I interviewed created their
own radio content: “You would stay home and listen to these guys tell stories, tell
legends. And that was something you looked forward to as you grew older. I wanted to
be a radio DJ” (interview 1009). I visited radio stations in Kuujjuaq and Ivujivik and was

\footnote{28} I want to note that the content on Aboriginal community radio stations is sometimes criticized
by listeners. For example, a March 21, 2013 article in the *Nunatsiaq News* noted that due to
complaints to the CRTC, community radio announcers in Nunavut must take a course on
proper on-air protocol and how to enforce it (*Nunatsiaq News*, 2013).
impressed by the level of community engagement: phones lines rang constantly as broadcasters spoke in Inuntitut, English, and French.

These radio stations remain an important space for political dialogue in these communities. Some authors frame these radio stations as a public sphere that helps people bridge distances and maintain close ties between and inside communities (Martin, 2008b). Even with the advent of television and digital media, they remain vibrant sites of public debate: “People call in to give their opinion, their ideas, things like that. And sometimes the whole community is listening and they do something about it afterwards” (interview 4039). Today, many communities continue to produce their own radio content. For example, TNI has professional broadcast studios in Kuujjuaq, Salluit, Puvirnituq, and Montreal. One recent study estimated as many as 120 Aboriginal community radio stations in operation across Canada (Roth, 2013).

Television arrived in all three regions in the mid-1970s. Similar to radio, the history of television reflects a balance between ‘mainstream’ and locally-generated content. At first, non-Aboriginal institutions like CBC produced the majority of programs in large urban centres located in southern Canada. Many local residents initially resisted the introduction of this content, given their concerns over cultural assimilation. I discuss their reactions in Chapter 3, as well as some of their responses, which included setting up their own television broadcast institutions and producing Aboriginal content (Roth, 2005). More recently, digital satellite feeds became available and now people watch hundreds of channels from around the world. Some of these channels feature Aboriginal content, including that produced for the Winnipeg-based Aboriginal Peoples’ Television Network (APTN). While many people told me they felt this exposure to satellite TV “altered the mindset” of locals (interview 1006), they also continue to watch content produced in their communities and regions. For example, by the 1980s TNI radio announcers in Nunavik began producing half-hour television shows, later broadcast on the APTN in a series called Nunavimmiut. However, as I discuss in Chapter 3, due to its relatively small audiences and diverse content, Aboriginal media is contingent on external funding that has decreased over time – even as demand for regional and local programming increases. These economic challenges continue today.
Telecommunications infrastructure development reflects a similar dialectic of cultural syncretism that involves both the extension of southern-based infrastructures into remote indigenous communities, and locally-driven responses that generated community-based projects. Although the focus is on carriage rather than content, the development patterns of telecommunications infrastructure echo similar challenges and opportunities as broadcast media. Residents of indigenous communities addressed the lack of access to southern-based infrastructures by starting their own telecommunications development projects. In the three regions I studied, analogue telephone services arrived in the late 1970s and early 1980s as a result of regulatory obligations for incumbent providers to deliver universal service. However, prior to these regulatory requirements, local and regional institutions took on small-scale telecommunications development projects. Their efforts reflect a well-documented history of similar endogenously-managed projects in other rural and remote communities in Canada. For example, Babe (1990) describes the multiplicity of independent and municipal telephone companies set up in several provinces between the late-1800s and mid-1900s, before incumbents bought out many of these independents.29

In the regions I studied, to meet the CRTC’s universal service provisions, incumbent telecommunications companies typically provided a single satellite pay phone shared by the whole community. However, several communities also set up their own local telephone systems to interconnect homes and organizations. For example, in Kuujjuaq, residents set up a network linking neighbours together. As I describe in Chapter 6, partly due to the lobbying efforts of indigenous socio-technical institutions, residential telecommunications services became more widely available in the 1980s. But

29 This work was often driven by the efforts of residents of underserved and unserved communities. For example, in 1904 the Bell Telephone Company of Canada only supplied one telephone for every 1,247 rural residents, compared with one for every 21.9 urban residents (Babe, 1990, p.80). As time passed and incumbents began extending their infrastructure into rural markets, they employed various techniques to drive their competitors, the independent enterprises, out of business. According to Babe (1990), these included refusing interconnections, cutting prices, engaging in public relations and government advocacy, and negotiating exclusive rights-of-way access with railways and municipalities.
despite these gains, to date many communities still cannot access digital services like voicemail, and the limited number of long distance lines in many communities quickly reach saturation. The persistent lack of digital (compared to analogue) telecommunications infrastructure also restricted access to the emergent network society, leading regional institutions to take on networked digital infrastructure development activities themselves. I present a sustained consideration of this endogenous development process in Chapters 4 and 5.

In this section, I described several theoretic and empirical similarities among the three regions I focus on in this dissertation. Framing these observations in the colonialism/self-determination dialectic, I explore the common challenges faced by people living in remote indigenous communities, as well as their responses, which included a resistance to externally-imposed development agendas and a desire (often born from necessity) to establish their own locally-grounded organizations and infrastructures – reflected in their historical persistence. These endogenous development projects reflect examples of cultural syncretism that highlight the appropriation of new technologies alongside a respect for the continuation of Aboriginal cultural practices, including those rooted in place-based communities and traditional territories. This analysis frames my later discussion of similar processes in the context of the network society.

In the next section, I turn from these general observations to describe four case studies of locally-contingent development patterns. These case studies demonstrate the diversity of digital self-determination. I argue that despite their differences, the four case studies all show how place-based indigenous populations are negotiating the challenging dialectic between colonialism and self-determination.
2.2. Access divides: Slate Falls First Nation and Bamaji Voice-over-IP Telephone Services

My first case study, drawn from Slate Falls First Nation in northern Ontario, illustrates how that community set up an organization to manage local networked digital infrastructure and associated services.\(^{30}\) This reflects an endogenously-managed development solution to a persistent access divide: a theme I expand on in Chapters 4 and 5. In Slate Falls, local leadership set up Bamaji Telephone Services to address the community’s telecommunications and Internet access divide. Along with providing affordable services to local organizations and individuals, the system keeps revenues circulating inside the community, and provides employment for a local technician. While it faces several challenges, including reliability problems and a lack of awareness among the local population, Bamaji Telephone Services provides a strong example of digital self-determination in Slate Falls.

Located a few hours from Sioux Lookout down an all-weather logging road, Slate Falls is a community of around 260 people located on the south shore of North Bamaji Lake. According to the community’s website, in the 1700s members of the Osnaburgh House Indian Band established permanent camps on the village site to manage nearby traplines and hunting grounds.\(^{31}\) The community formally incorporated in 1985. At that time it lacked basic infrastructure, including hydro electricity (the community used a diesel generator) and running water (people drew water from the lake by hand). People lived in log buildings connected by boardwalks and foot trails. They carried hand-held radios around town and out on the land, paging different channels to reach friends and family. Slate Falls remained a fly-in community until 2008, when it connected to Ontario’s all-weather road network. Locals continue to live off the land today, but also set up a number of economic development projects in industries like forestry and tourism (despite

\(^{30}\) I spent two days in Slate Falls in October 2011: one with KO-KNET’s videoconference coordinator; and one by myself.

\(^{31}\) Read more about Slate Falls here: http://www.windigoeducation.on.ca/communities/slatefalls
local rumours of a Sasquatch roaming nearby woods). In one of these projects, they set up a Band-owned Internet Service Provider and Voice-over-IP phone system.\textsuperscript{32}

\begin{center}
Map 2: Slate Falls First Nation
\end{center}

Before Slate Falls established its own networked digital infrastructure, the community had only limited connectivity to the network society. In 1985, Bell Canada and Telesat installed a local satellite pay phone to meet the CRTC’s universal service regulatory obligations. Until 2001, residents lined up for hours in the Band office lobby to use this phone between 9am and 5pm. Demand for residential telephone services pushed the Band leadership and the Windigo Tribal Council to secure more access. Initial projects

\textsuperscript{32} Voice-Over-IP service refers to the delivery of voice communications and multimedia over Internet Protocol (IP) networks like the Internet. Popular examples of such services include Skype.
involving Bell Canada and a company called Superior Wireless did not work out, but in the late 90s the community began accessing Internet services through a MSAT/DirecPC infrastructure managed by KO-KNET. I describe this system in more detail in Chapter 5.

Along with using the MSAT/DirecPC system to access public services, residents of Slate Falls could surf the Internet at a public access site at Bimaychikamach School. In 2001, KO-KNET replaced this system with an experimental satellite network that also connected the First Nations of Fort Severn (in Ontario) and Anaheim Lake (in B.C.) (described in Chapter 5). This more robust connection enabled locals to set up a wireless network that distributed satellite bandwidth to several public buildings, including the Band Office, nursing station, school and Wahsa adult learning centre. By 2002, the community could access enough bandwidth to support video and voice applications. Working with KO-KNET, the Band began using this upgraded system to deliver several broadband-enabled health and education services, including the Keewaytinook Internet High School and Keewaytinook Okimakanak Telehealth (applications discussed in Chapter 8).

Over time, this infrastructure also became a platform for videoconferencing and voice-over-IP telephone service. In part, this development was motivated by the need to meet growing demand among residents of the community. In the early 2000s, penetration rates for residential connectivity remained low, with less than half (26-50%) of households accessing Internet services via a ‘high-speed’ (1.5Mbps) link in 2002 (INAC 2003). To improve residential services, the Slate Falls Band (in partnership with Windigo Tribal Council) applied to Industry Canada to fund the construction and ongoing operations of local cable infrastructure. At that time, the community and its partners in KO-KNET enjoyed several high-profile successes through their broadband-enabled

33 Plans to upgrade Bell’s service did not move forward given the lack of a business case (terrestrial infrastructure was inaccessible, and so projected costs for new connections reached $3.5M). In 2000, the community leadership also considered a proposal submitted by Superior Wireless of Thunder Bay, but that project fell through.
public services, and Industry Canada approved their funding application. KO-KNET and a company called Blair Electronics worked with local leadership to plan and build the cable network. Owned and administered by the Band as a collective enterprise, the system aimed to generate local employment and support broadband-enabled public services, as well as generate revenue. By 2005, all local public services and three-quarters of residences could access ‘high speed’ (1.5Mbps) connectivity, despite their remote location and small population. The system also solved the community’s telecommunications problem through an IP-based service called Bamaji Telephone Services.

A former economics professor from Guatemala who worked as the Band’s financial controller led this project. Funded by several public agencies, Bamaji Telephone Services began with VoIP telephones in several local buildings, including the Band Office, nursing station, school, Nishnawbe Aski Police Service, and Wahsa Adult Education Centre. Band leadership and KO-KNET followed up this project with a survey to solicit local input around services, pricing, and equipment. Residents indicated their strong desire for household telephone services, and so the Band extended the Bamaji Telephone Services to residents. By November 2005 it set up 60 telephone numbers (5700 – 5798) purchased from Bell Canada (with an additional 30 allocated for future use) and two Asterisk computers to manage calls. The Band owned the system’s hardware, sharing management responsibility with KO-KNET, which leased them backhaul satellite infrastructure, helped with funding applications, and provided training for the local technician (KORI Business case for VoIP Phones, 2005). In 2004, the Band leveraged funding from Industry Canada to train a community technician. Revenue

34 Slate Falls became a demonstration community for examples of endogenous local technology development. For example, in 2004 staff from Industry Canada, FedNor and TeleSat visited Slate Falls with staff from the Windigo Tribal Council and KO-KNET. Similar visits took place in May 2005 and November 2006. Watch a four-min video, Learning about broadband uses in Slate Falls and Weagamow First Nations at: http://streaming.knet.ca/learning_about_broadband.wmv.

35 Read a profile of the system’s local technician here: http://meeting.knet.ca/mp19/mod/data/view.php?d=31&mode=single&page=35
from the system is used to pay this person’s salary, purchase new equipment, and subsidize phone and data services (including videoconferencing) for public and community service providers.36

Bamaji Telephone Services remains popular today. On my visit to the community, I was shown usage stats of up to 1,600 – 1,700 calls a day between October 2-3, 2011 (interview 2012). While the system does not allow direct long distance calling, people can use calling cards, and calls to several communities (Sioux Lookout, Dryden, Wabigoon, Balmertown, Cochenour, Lac Seul, and Red Lake) are considered local. The service costs $60 per month for bundled phone and Internet, once users have paid start-up costs for equipment (around $500). But despite its successes, the community system faces several challenges. Awareness among residents that the Band owns and operates telephone and Internet services remains low. Given the community’s geographic location, it is difficult for the local technician to access equipment and spare parts. Residents complain about the system’s clarity and reliability, and lose service whenever power goes out (which is frequent, due to the region’s harsh weather conditions and unreliable electrical infrastructure).

These challenges will likely improve in the near future. Slate Falls recently transitioned off satellite infrastructure and joined the regional Northwest Ontario fibre optic network. During the transition to this new infrastructure, some residents expressed concerns that Bell Aliant (the private sector partner in this project), might undermine the Band-owned system by introducing competing services. Presented with the opportunity to transition from the Band-owned ISP to managed services purchased from Bell Aliant, the community decided to maintain the Bamaji system. As of early 2013, the Band network and Bamaji Telephone Services remain in operation. This illustrates the importance that the community of Slate Falls places in retaining digital self-determination.

36 For example, Bell Canada quoted the Band $6,000 a month for a fax line, but the Band instead purchased a phone number through TelusFax.com, and now routes faxes through email – a solution that costs $800 a month (interview 1012).
through their locally-generated, owned, and operated system. In the next case study, I consider a different example – of a community where local residents resisted, rather than promoted, their connection to the network society.

2.3. **Online applications: Sachigo Lake First Nation’s Keewaytinook Internet High School classroom**

My second case study examines how indigenous communities use the networked digital infrastructure they connect to. Focusing on broadband-enabled public services, I use this case study to illustrate how access alone is not sufficient for digital self-determination. During the three days I spent in Sachigo Lake in October 2011, I was guided through the fly-in Oji-Cree community by an IT and cable plant technician. Originally from Fort Severn, he now teaches online IT courses and provides technical support to First Nations across Northwest Ontario. With his breadth and depth of experience, as well as his understanding of local and regional histories, this technician helped me understand the diversity of approaches to networked digital infrastructure development among the First Nations of northern Ontario.

In Sachigo Lake, many local residents initially expressed apprehension with the arrival of networked digital infrastructure in the community. However, over time they worked with local leadership and KO-KNET to appropriate newly available networked digital infrastructure to meet their needs. Along with a community Internet usage policy, local residents began accessing online courses made available through the Keewaytinook Internet High School. Through these applications, connectivity became a popular and well-utilized service. This case illustrates how people in remote indigenous communities are not only setting up their own socio-technical organizations and local networks, but are also shaping online applications to meet their needs.

Sachigo Lake is a fly-in community located approximately 425 km north of Sioux Lookout. A signatory to Treaty 9 in northern Ontario, it is a member of the Windigo Tribal Council. The community is growing: between 2008 and 2011, its population increased from approximate 680 people (534 on reserve) to 800 people (442 on-reserve) (AANDC, n.d.). Residents still lack access to transportation and electrical infrastructure. In the
By the late 1990s and early 2000s, residents of Sachigo Lake could access Internet services, first through the DirectPC/MSAT system, and later over satellite links provided by Bell Canada, KO-KNET, and XplorNet. The community was initially divided as to the utility of networked digital infrastructure, given its potential negative cultural and social impacts. Local leadership held public meetings to discuss whether to allow computers and connectivity into the community. Some members, including Elders, expressed serious concerns. One person told me: “a lot of the Elders at the time, there were a few who were quite vocal from what I understand. They didn't want [Internet]. Thought it was a bad thing” (interview 1003). However, the majority of the population supported the plan, and Chief and Council responded to local concerns by introducing a community Internet usage policy to prevent online bullying and block inappropriate content.

The community was soon connected, but in early years residential Internet penetration provided through a Bell Canada system (DSL running on copper infrastructure) remained low, with less than half (26-50%) of households subscribed to
‘high speed’ (1.5Mbps) services (INAC, 2002). At that time the community also lacked on-site capacity to fix the network when it went down (a common challenge in remote communities). A Bell Canada technician periodically flew in for repairs and maintenance, which resulted in long outage times and unreliable service. Similar to Slate Falls, when KO-KNET’s satellite infrastructure became available, public services like the Band Office, health centre, Wahsa, water plant, school, CAP site, and police station connected to it through a copper circuit. As time passed, the Band worked with KO-KNET to set up a Band-owned and operated service provider to manage the local network. This system, like the one in Slate Falls, was operated by the Band like a public utility rather than a private enterprise. Primary goals included creating local employment, providing Internet services, and supporting public and community services, rather than generating profits.

In 2009, the copper system was upgraded to a coaxial cable infrastructure the Band now uses to sell Internet and digital television services to residents. Two local employees, a technician and a business administrator, operate it. However, these staff lack the capacity to set up advanced applications like a VoIP phone system (interview 1003). The technician from Fort Severn told me:

“The big difference between Fort Severn and here is that in Fort Severn they’re going ahead with it. They want to harness that [connectivity], the benefits of it and all that. Whereas here they’re more hesitant, you know, ‘what do we do with it?’” (interview 1003).

In 2008, limited competition for residential Internet services became available through Xplornet Communications Inc. (formerly Barrett Xplore Inc.), a commercial broadband provider headquartered in New Brunswick. The company utilizes terrestrial (fixed long-range wireless) and satellite (Ka-band) links to provide Internet services to remote and rural communities. Fairly high levels of residential uptake of this competing service in Sachigo Lake was partly driven by the lack of connectivity services provided by the community system: at one point, the Band-owned network only consisted of a dial-up

37 Telesat Canada released KA-band space segment on Anik F2 in 2004. According to one interviewee, Xplornet’s service may have been available in some communities as early as 2005 or 2006 (interview 4034).
server linked to six phone lines, shared by three-dozen users at a cost of $35/month (interview 1003). Relatively expensive compared to the community network, costs for Xplornet equipment, installation, and system access fees run to around $600 per connection. Community members organized into informal cooperatives to share costs, and now around 40 people use the service (sometimes distributed among neighbours through wireless LANs). However, compared to the community network, the Xplornet dishes are relatively simple to set up and maintain. In comparison, the community network keeps revenues circulating inside the community, created two sustainable jobs, and costs less for residents ($35-$40 per month).

Despite their somewhat cautious approach to early Internet uptake, many residents of Sachigo Lake now access broadband-enabled public service applications on a regular basis. For example, the Keewaytinook Internet High School (KiHS) developed by KO-KNET is very popular in the community. Everyone I met was aware of the service. While students can attend Martin McKay Memorial School for primary and elementary school, during high school they must either leave the community or attend KiHS. At the online high school, students take courses facilitated by an on-site teacher rather than move to boarding schools in larger communities like Pelican Falls. Many parents I spoke to encouraged their children to stay in Sachigo Lake during high school. One person told me: “some kids are too young to go out [of the community], so their parents let them stay here” (interview 1009). The program’s flexibility was another reason that students and parents liked it. For example, one former student told me he attended KiHS because his mother was pregnant and needed help at home while his father was studying at police college in Thunder Bay (interview 1007). I spent some time at the KiHS classroom, during which I observed the teacher blending lectures with online assignments, multimedia learning materials, and discussions with other classrooms over videoconferencing. He told me that five years ago he would not have been able to do these activities, given the lack of available bandwidth in the community. Since then, his usage of the online application increased and in late 2012 he used videoconferencing
once or twice a week for student assemblies, events like the Science Olympics, and remotely-delivered workshops. His students even formed an after-school online gaming league to play against other KiHS classrooms in the region – a nice reward for diligent students.38

This case study illustrates how people in Sachigo Lake are actively using online applications as a means to assert digital self-determination. Although locals initially expressed caution regarding the introduction of connectivity services in their community, once they appropriated the new technology and shaped it to meet their needs (for example, through KiHS), it became a popular and useful resource that enabled local high school students to remain in the community. This demonstrates the importance of ensuring a degree of local control and involvement in development projects to ensure they meet the needs of community members. While both Slate Falls and Sachigo Lake manage their own community networks, that process is not always easy for remote indigenous communities. In the next case study, I highlight some challenges associated with efforts to establish a community Internet Service Provider in Bloodvein First Nation. While residents there do manage local connectivity services, they face a lack of capacity and other challenges that constrain their efforts.

2.4. Capacity-building: Bloodvein First Nation’s technical challenges

My third case study is from Bloodvein First Nation in Northern Manitoba. I use it to discuss the importance of local capacity in networked digital infrastructure development projects. Many remote, dispersed, and low population communities lack skilled technical and administrative personnel to operate and maintain community networks. Although

38 After my visit to Sachigo Lake, I stayed in touch with this teacher (and others at KiHS), and two of his students developed a short (and funny) video about life in a KiHS classroom. The video is available here: http://meeting.knet.ca/mp19/mod/data/view.php?d=31&mode=single&page=16
residents of these communities recognize the benefits of local control and management of infrastructure, many face challenges in ensuring the long-term sustainability of these systems. As a result, efforts to support digital self-determination must recognize the need to provide ongoing training and other resources for local staff. Otherwise, communities remain reliant on external service providers, and so miss out on the self-government and economic development opportunities made possible through community-managed infrastructure.

In November 2011, Dr. Susan O’Donnell from the University of New Brunswick and I flew over icy Lake Manitoba to visit Bloodvein First Nation as part of the First Mile Public Outreach Project (see: http://firstmile.ca).\(^3^9\) I used our visit as an opportunity to interview several locals about their experiences with the Band-owned and operated network made possible through satellite connections set up and managed by Broadband Communications North (BCN). Bloodvein First Nation is located on the east side of Lake Winnipeg, 210km north of Winnipeg. It is one of the Treaty 5 signatories and belongs to a Tribal Council called the Southeast Resource Development Council. The approximately 1,600 people (around 1,000 on reserve) who belong to Bloodvein First Nation are descendants of the Saulteaux-Ojibwa, who have lived in the region for thousands of years. In the 18th century, people used the village site as a trapping area and fur transport route. Locals continue to live off the land, and many continue to speak their Aboriginal language at home. One interviewee told me that in the recent past “you could hear it [Ojiway] every day. And the only time you could hear English was when people were at school” (interview 3024). Now most young people speak English outside

\(^3^9\) Funded by the Social Sciences and Humanities Research Council of Canada through a Knowledge Synthesis Grant for a Digital Economy, the First Mile report combined a literature review and interviews with 23 individuals involved in First Nations and Inuit broadband development. It employed a participatory research process through which researchers from two universities (Simon Fraser University and the University of New Brunswick) worked in partnership with four First Nations regional socio-technical institutions: KO-KNET; Atlantic Canada’s First Nation Help Desk; the First Nations Education Council in Quebec; and the First Nations Technology Council in B.C. to highlight challenges and opportunities for broadband development policy.
of language classes. While Bloodvein is a remote community, it is accessible through a winter road, gravel airstrip and 39-passenger ferry in summer months. In 2009, the province began building an all-weather road to the community, a project nearing completion in Fall 2012.

Map 4: Bloodvein First Nation

As in the Ontario communities, Bloodvein has a long history of local communications development. A two-way HF radio system once interconnected public service buildings like the nursing station and teacher’s homes. The Band owns and operates an Internet Service Provider (ISP) that leases satellite bandwidth from BCN and sells Internet services, with revenues accumulating in a fund managed by the Band Council.40 Plans

40 The Band ISP leases bandwidth from BCN at a cost of $650 per month, while residential customers pay a flat rate of $50 per month (one business customer pays $150 per month), for a total monthly revenue of $1,650. Customers rent modems (the equipment costs $150 including technical support and repairs) and the technician charges $80 per installation (interview 3024). Excess revenue is used to purchase additional radio boxes; in late 2011 the community ISP purchased nine new modems. Finances are managed on behalf of the community through an independent bank account.
to connect the community first emerged in 2005. Although Chief and Council supported the initiative, due to organizational challenges and a lack of local technical capacity, the community ISP only launched in 2010 (interview 3022). The system interconnects with BCN’s satellite network through a tower on the outskirts of town. The Band initially considered setting up a coaxial cable system, but given the cost and difficulty decided to go with wireless infrastructure instead. BCN owns and maintains the tower, which distributes wireless connectivity through the community. Customers access Internet through radio boxes installed outside their houses. The system is fairly reliable, but trees and rocky outcroppings pose line-of-sight challenges. Competing services are available through XplorNet, which is relatively expensive compared with the community network (one interviewee paid $89 per month) (interview 3024). The community network began with 10 customers, but as of fall 2011 expanded to 30, with more requesting service. Locals attribute the high demand for Internet services to increasing use of social media and other applications, and because of cost reductions associated with the cooperative ownership model: the more customers, the cheaper the equipment and overall connectivity costs) (interview 3022). When the local services first became available, start-up costs for customers ran to $600 but they are now down to $350. However, many locals still cannot afford the services, and many feel anxious about the online bullying, gossip and access to inappropriate content that they feel accompanies the Internet.

Another challenge faced by residents of Bloodvein is the uneven availability of networked digital infrastructure in the small community. Public services connect to an ad hoc installed base leased from several different service providers. For example, the Band Office, lands management office, and economic development corporation all formerly used the Band-owned system, but transferred to XplorNet because they perceive it as offering faster and more reliable Internet service. Bloodvein’s nursing station utilizes a dedicated connection managed through a service agreement between Manitoba TeleHealth and BCN. Staff told me the connection to the nursing station was unreliable in the past, but has improved in recent years (interview 3020). They now use their system for Internet and videoconferencing. While nursing staff initially faced challenges given a lack of training, they now use it to hold administrative meetings, provide programs like the Native Alcohol and Drug Abuse Program and Aboriginal Diabetes Initiative, conduct public health outreach services, and work with off-site
physicians for remote diagnosis. In fall 2011, the Band ISP did provide services to the local school, which was first networked in the early 2000s. However, the computer lab continues to face challenges due to a lack of technical staff. On the days I visited the school, Internet access was not available because of a connectivity problem, and no-one was available on site to fix it.

The Band-owned ISP in Bloodvein also reflects challenges associated with the lack of capacity in the community. The organization employs two local staff: an administrator (who is also a Band councillor) and a technician. These individuals described how strong winds and bad weather can knock out the local network, which sometimes takes weeks to fix since spare parts are so slow to arrive in the remote community. Frequent power outages damage electrical equipment, and installation and repair work is difficult to stay on top of. The staff also lack formal technical training: the technician taught himself how to set up and manage the local network with help from BCN (interview 3024). Whenever the network goes down (estimated at three or four times a year), the Band technician gets phone calls from angry customers. Some residential customers also refuse to pay for their service since it is owned by the Band (they feel it should be provided as a free service). Given close relationships among people in the tight-knit community, staff also find it difficult to cut off people who are behind on their payments. During my visit, the local technician was planning to cut off six or seven people: “I don’t really want to do it...[but] it’s not really fair for these other people who are paying” (interview 3024). Given all these challenges, while the technician enjoys his job, he was looking for someone else to take over the position.

This case study of Bloodvein illustrates both the benefits and the challenges of a community-driven approach to local networked digital infrastructure development. Although the Band-owned ISP offers local jobs and provides low-cost connectivity services to residents, it also suffers from social and technical challenges associated with the circumstances present in the remote First Nations community. My goal in describing these challenges is not to evaluate or judge the performance or staff of the Bloodvein Community Network. Instead, I present them to highlight the need for capacity-building initiatives to support any infrastructure development projects in remote and rural indigenous communities. Government initiatives often focus on providing short-term
funding for targeted infrastructure projects – sometimes without taking into consideration the ongoing requirements to ensure the system is sustainable. Different communities have different levels of administrative and technical capacity, and so any initiatives designed to support and encourage digital self-determination over the long term must consider these factors, as well as the need to bridge access divides and shape online applications.

In my final case study in this chapter, I explore issues of governance. Specifically, I explore how networked digital infrastructure in the small village of Ivujivik in Nunavik is set up and managed by the Kativik Regional Government through a balance of local engagement and centralized efficiencies. This supports my argument that digital self-determination involves a consideration of how infrastructure is administered, as well as how it is built, shaped, maintained, and used.

2.5. Governance structures: Balancing local and centralized engagement in Ivujivik

Compared to the three preceding case studies, Ivujivik presents a different regional context, given the community’s location in the Inuit territory of Nunavik. Along with ethnocultural and geographic differences, Ivujivik is affected by the James Bay and Northern Quebec Agreement described earlier, and connected to the institutions associated with it, including the Kativik Regional Government, the Nunavik Regional Board of Health and Social Services, and the Kativik School Board. This administrative context influenced the way that networked digital infrastructure was established and continues to be operated in Ivujivik. It demonstrates how structures established through negotiations over state-Aboriginal relations shape how the balance of local control and regional centralization play out in digital self-determination projects.

In June 2012, I spent three weeks in Nunavik, during which I visited the northern villages of Kuujjuaq, Salluit and Ivujivik. For almost a week of this trip, I stayed in Ivujivik, a tiny village named after “the place where ice accumulates because of strong currents” in Inuttitut. The community of 340 is only accessible by flights and a seasonal sea barge, and relies on a diesel generator for electricity. It houses a radio station, school, nursing
station, co-op store, Northern Village, daycare, and youth centre. Several businesses are based in the village, including carvers, artists and an IT services company called Pirnoma Technologies. The village faces relatively high unemployment rates, but along with their ‘day jobs’ residents continue to live off the land, gathering murre appak eggs and hunting animals like beluga whales and walruses. The primary language spoken at home and work is Inuttitut. The town is proud of Lydia Angiyou, who was recognized by the Governor General of Canada in 2006 for saving local children from a polar bear attack.

Ivujivik is one of the villages in Nunavik that did not sign the James Bay and Northern Quebec Agreement in 1975, but is still represented by the Kativik Regional Government (KRG) and receives public services from the Nunavik Regional Board of Health and Social Services and Kativik School Board. Access to the Internet arrived in the late-1990s, through a dial-up connection at the local school. Here are some reflections about those early days from a local technology entrepreneur:

“[Tamaani Internet] was a great addition to services that would ultimately allow Nunavummiut to easily and freely access previously unavailable information. In the past information was mainly available through local organizations, and although finding books, videos, music and other media was possible, it was difficult and expensive. Internet access was a boost for the people of Nunavik, who were ready to absorb and contribute data throughout the world. Imagine living in one of the most isolated areas in Canada, still adapting to living conditions introduced by governments and by consumerist values publicized through external media like television and radio. These one-way broadcasts did not give audiences control over content. It was comparable to parents talking to their children, who are not yet able to ask questions. Tamaani Internet’s instant success and high traffic proved that Nunavummiut are hungry to absorb what the world offered” (cited from McMahon and Mangiouk, in press).
Unlike the First Nations described in the previous case studies, local infrastructure in Ivujivik is not governed and operated by a local institution. Instead, following the more centralized connectivity model employed in Nunavik, Ivujivik’s local network is owned by Tamaani Internet, which is a department in the Kativik Regional Government. Tamaani Internet distributes publicly subsidized satellite bandwidth to villages across Nunavik. At the local level, connectivity is distributed via licensed wireless spectrum and remotely managed from the network’s hub in Kuujjuaq. This network provides both residential and commercial Internet access, and more advanced services dedicated to public services like the Northern Village government, school and nursing station. Tamaani Internet staff in Kuujjuaq occasionally visit the community to conduct repairs and maintenance. Although they are not directly involved in the governance of the local network, two local agents do assist Tamaani staff with the community’s connection. They sign up new customers and maintain the earth station for a small commission and free Internet. Both agents are personally interested in technology, and received some training (subsidized by KRG) in the late 2000s. They spoke with pride about acquiring the knowledge and skills to become “real technicians”, but noted the position does not require a high degree of expertise. As a result, they rely on technicians from Tamaani Internet for major problems. As in the other communities I visited, competing Internet services are available through XplorNet. When Tamaani Internet became unreliable in the mid to late
2000s many locals migrated to the commercially available service, although several told me they have since moved back to Tamaani Internet.

Local public services also use Tamaani Internet to deliver broadband-enabled public services. At the nursing station, two on-site nurse practitioners schedule telemedicine appointments with physicians in Montreal, and use a stethoscope and camera for remote diagnosis. One patient told me when he broke his shoulder he met with a specialist in Montreal over videoconferencing. Nurses also use the system for training sessions hosted by the region’s two hospitals (in Puvirnituq and Kuujjuaq). These activities help lower costs, lessen travel requirements, and improve local access to health care. The services are relatively new in the community: as recently as 2010, the nursing station could only connect to 64 kbps service through a privately-managed provincial health network. Ivujivik’s school, where approximately 100 students take classes, uses both Tamaani Internet and Xplornet. Many staff remember when computers first arrived in 2007. The school now has approximately 12 computers but no dedicated technical staff, so a semi-retired volunteer manages the network and troubleshoots problems. Administrative staff use an Xplornet link, while classrooms are networked through a single Tamaani Internet account, which makes Internet painfully slow. One teacher expressed her frustration:

“The minute you put the class on a number of computers the system can’t handle it at all. And just will not link to any Internet site. So it basically acts as if the system has gone down. Which it actually hasn’t but just can’t handle the load” (interview 4047).

The Kativik School Board is working to address these challenges through new service contracts with Tamaani Internet. As of June 2012, the school’s connection was upgraded to a 3 Mbps link, thanks to additional bandwidth made available through KRG’s Broadband Canada project (interview 4034). The school also recently set up a dedicated videoconference system presently used for teacher-training by Inuit language immersion teachers. The course is provided through the Université du Québec en Abitibi-Témiscamingue. I interviewed one Inuit teacher about her experience with this initiative. She told me that since the late 1980s, she has taken courses on topics like culture, language, and early child development on visits to Rouyn-Noranda and regional centres like Kuujjuaq and Puvirnituq – an intense and exhausting experience. Last year, she
started using the videoconferencing system and was impressed, pointing out benefits like increased access to teaching resources, less travel time, and cost-savings. In her words:

“I’m one of the teachers who used to have to travel to Puvirnituq often. And at that time my children were still growing up and I was still getting pregnant so it was hard for me to leave my family behind too much. And that and some teachers don’t go to teacher-training because of their children, like me. So I’m really happy to have this videoconferencing ready for us now. Our future teacher-trainees will have more chances not to miss courses” (interview 4048).

Teachers and administrators also spoke with excitement about the potential of using videoconferencing and Internet services to access subjects like music, cooking and theatre. The principal told me about one remote school where students took violin lessons over videoconferencing connections. Another teacher worked with his class to create a short video about the community’s new airport, using DropBox to transfer local media footage to the southern-based filmmakers. Staff are also starting to use Internet-enabled Smart Boards to engage students and access multimedia curriculum.

While in Ivujivik, I also observed how local residents are using Tamaani Internet’s infrastructure as a platform for economic development. I met the founder of Pirnoma Technologies, an IT support, graphic design, and web development company based in the remote village. Pirnoma staff working in different villages use Tamaani Internet’s network to share files and email, collaborate through online storage tools, and hold meetings with Skype and instant messenger. Pirnoma’s staff also created Tamaani Internet’s new logo, an igloo made up of 14 blocks of ice representing the Nunavik villages (see Figure 1). The company is now working on translating the Ubuntu open source operating system into Inuttitut, and staff are looking to secure funding for this project. Pirnoma staff also provide online and in-person technical training to people located throughout the region. Between 2007 and 2011, they taught courses leading to Microsoft A+ and Cisco N+ certification funded by KRG. Many of their graduates now work in organizations like KRG and the Kativik School Board. Since Pirnoma cannot function properly without a reliable connection, when Tamaani Internet’s service quality degraded, Pirnoma moved to XplorNet. However, after services improved, the firm migrated back to the regional service provider.
Finally, people in Ivujivik are using Tamaani Internet as a platform for political engagement. Many debate political issues on online forums like Qanuuq.com and social media sites like Facebook. Recently, they used these platforms to discuss a major referendum on regional self-government. But despite their successes and energy, like people in the First Nations I visited, Ivujivik’s residents face considerable challenges in utilizing the various tools and platforms made available through networked digital infrastructure. It is difficult and expensive to purchase equipment and conduct repairs, and the village’s small population limits its technical capacity. That said, Ivujivik, like the other communities discussed in this chapter, offers a vibrant example of how indigenous people in some of Canada’s most remote villages are using networked digital infrastructure to support various elements of digital self-determination, from network ownership and management, to broadband-enabled public services, to political engagement and economic development.

2.6. Conclusion

In this chapter, I provided several empirical case studies to illustrate the various themes encompassed in the multi-faceted concept of digital self-determination. I began by describing the ‘installed base’ of infrastructure in the three regions examined in my dissertation. I highlighted some of the tensions associated with the colonialism/self-determination dialectic that indigenous peoples living in these regions continue to face. Persistent challenges include a lack of transportation, electrical, and communications infrastructures, alongside their socio-economic marginalization. However, I also
illustrated how people in these communities are driving their own endogenous development projects, often motivated by these conditions of scarcity. The array of projects I described demonstrate examples of cultural syncretism and the creative agency of the people living in these regions.

Turning to four case studies drawn from the communities I visited during my field research, I then presented several examples of how various themes associated with digital self-determination play out in diverse local contexts. I examined the themes of access, applications, capacity, and governance to introduce facets of digital self-determination that re-appear in later chapters. The four case studies collectively show how digital self-determination projects link to social, cultural, political, and economic contexts.

In Slate Falls, a skilled technical and administrative staff set up community owned and operated ISP and VoIP phone service that enabled local residents and organizations to connect to the network society. Working in partnership with KO-KNET, local leadership bridged the access divide facing their community in ways that reflected their social shaping of networked digital infrastructure. My next case study, from Sachigo Lake, illustrated how in some communities, this endogenous development process is more hesitant. Sometimes people raise concerns about the negative impacts of new technologies. As a result, Sachigo Lake reflects an example of how local residents foregrounded the need to adapt new technologies before allowing them into the community. I illustrated this process through the use of online applications, and specifically through the local ISP’s usage policy and the Keewaytinook Internet High School. In different ways, residents of both Sachigo Lake and Slate Falls attempted to balance the perceived negative impacts of the network society with its positive outcomes.

The case of Bloodvein First Nations underscores the importance of support for local administrative and technical capacity. When communities gain opportunities to take control and ownership of local networked digital infrastructure, they also face challenges to sustain such an endogenous development path. This case study illustrated how a lack of local capacity, combined with an ad hoc installed base of existing infrastructure,
restricted community development projects in Bloodvein First Nation. However, despite these challenges, the local ISP does offer affordable services to local residents. As staff gain capacity (and hopefully support) over time, it may generate the kind of projects seen in First Nations like Slate Falls and Sachigo Lake.

Finally, Ivujivik shows how differing administrative and political contexts impact the development and management of networked digital infrastructure in remote and rural indigenous communities. Due to the governance frameworks established by the JBNQA, Ivujivik represents a balance between centralized administration (from Tamaani Internet’s hub in Kuujjuaq) and local participation (through agents tasked with signing up customers and performing minor repairs). Although this arrangement reflects a more centralized governance structure than the three First Nations cases, that does not mean that people in Ivujivik are not asserting their digital self-determination in other ways. They utilize the infrastructure to access health and education services, engage in political activities, and set up entrepreneurial ventures like Pirnoma Technologies.

In outlining these differences and commonalities across the three regions, my goal in this chapter was to highlight the persistence of colonialism alongside the active agency of indigenous peoples living in unique place-based communities. This empirically-grounded dialectic provides an introduction to the theoretical framework for digital self-determination. In the next chapter, I outline in more detail the normative reasoning and political context underlying that concept. Situating my discussion in the historical trajectory of state-Aboriginal relations and media development in Canada, I outline the theoretical arguments that underlie digital self-determination.
3. Situating Digital Self-Determination: State-Aboriginal Relations and Communications Development in Canada

Networked digital infrastructure development intersects with indigenous self-determination in multiple ways. In the previous chapter I discussed how digital self-determination is grounded in the lived experiences of indigenous peoples. In many cases, these projects emerge from conditions of scarcity associated with the legacies and continuing reality of colonialism. In this chapter, I draw on theories of post-colonial socio-technical development and the politics of self-determination to situate these empirical examples. Applying the normative reasoning employed in formal agreements like the United Nations Declaration on the Rights of Indigenous Peoples, I outline a perspective on self-determination that is based on the laws, practices, institutions, values and goals of indigenous peoples. I argue that such an approach can support the decolonization of socio-technical development in ways that resist an exogenously-imposed logic that threatens to perpetuate the unequal social relations established through colonialism. To make this case, my argument advocates a state enabling environment that provides support to endogenous projects undertaken by indigenous peoples. This standpoint is contextualized with reference to state-Aboriginal relations and Aboriginal media development in Canada. This positions digital self-determination as the integration of indigenous self-determination with the politics of the network society – an argument expanded on throughout the rest of this dissertation.

My argument draws on a long tradition of research and theory on post-colonial socio-technical development. Over the past 20 years, “scholars in science and technology studies have tried to develop a vocabulary to describe the articulation of knowledge and practice across cultures” (Anderson & Adams, 2008, p.181). These scholars situate examples of socio-technical appropriation in ways that attempt to reconcile universal validity and local knowledges. For example, Harding (1998) outlines
a programme of Postcolonial Science and Technology Studies (STS) that describes the relationships between scientific and technological change, projects of European-American empire, and accounts of non-European scientific and technological traditions. Postcolonial STS disrupts the notion that socio-technical development is a solely Western project. Harding argues how it is better expressed as the syncreticism of multiple, overlapping cultures, knowledges, and practices. This problematizes assumptions of a homogenous understanding of modernity, showing how different societies with their own development paths can and do co-exist (Feenberg, 2002/1999). It is important that the epistemology guiding research in this area is sufficiently reflexive, to avoid unintentionally supporting the logics and structures of colonialism. For some critics, although post-colonial STS reveals ‘hidden’ or ‘subaltern’ histories of socio-technical development, it can sometimes subsume these examples under the umbrella of a hegemonic, Western-derived scientific objectivity (Andersen & Adams, 2008; Jones & Jenkins, 2008). As a result, developments generated at the ‘margins’ by indigenous actors end up co-opted by powerful centralizing entities that threaten their assimilation. To counter this perspective, Andersen and Adams (2008) argue that Postcolonial STS projects should be instead examined on their own terms as articulations of alternative modernities grounded in and emerging from local knowledges, practices, and contexts. This is a call for situated pluralism, rather than cosmopolitanism:

“We are arguing for the value of postcolonial perspectives – views from elsewhere – in science and technology studies, and not for any transcendent postcolonial theory. This requires a multiplication of the sites of techno-science, revealing and acknowledging hidden geographical notionations and power relations, and further study of the mechanisms and forms of travel between sites. It means we need to be sensitive to dislocation, transformation, and resistance; to the proliferation of partially purified and hybrid forms and identities, to the contestation and renegotiation of boundaries; and to recognizing that practices of science are always multi-sited“ (Andersen & Adams, 2008, pp.183-4).

Framed this way, a decolonizing epistemology of post-colonial socio-technical development recognizes that culturally-specific indigenous projects offer evidence that no such thing as a ‘modern’ or ‘traditional’ society exists; instead, every human society is engaged in an ongoing process of becoming. People engage in the active elaboration, appropriation, and modification of artifacts in ways that reflect their myriad cultures, values, traditions, and practices (Pfaffenberger, 1992; Horst, 2011; Buddle, 2004;
Much existing research on indigenous peoples and socio-technical development implicitly reflects this epistemological focus. For example, in her introduction to *Native on the Net*, an edited collection of international research in this area, Landzelius (2006) highlights examples of indigenous peoples around the world who are appropriating socio-technical ensembles in ways that reflect their cultures and communities. She describes how newly developing technologies are ‘indigenized’: “creatively integrated and indexed into practices and beliefs rooted in a local cultural logic” (Landzelius, 2006, p.2). In an example of similar research in Canada, Alexander (2009) describes how Inuit peoples are appropriating information and communications technologies in ways that echo the same adaptability and innovation they used to build tools, knowledges, skills, and institutions to survive in the challenging Arctic environment.

Despite its vibrancy, most work in this area does not yet explicitly articulate and theorize the connection between these ‘indigenized’ processes of socio-technical appropriation and the political goals of indigenous self-determination. In this chapter, I seek to contribute to efforts to address this gap by considering how socio-technical development interacts with persistent structures of colonialism in Canada. My focus is on state-Aboriginal interactions, and so I direct analytical attention away from physical artifacts towards the social relations involved in their diffusion, shaping, and use. This quote from Pfaffenberger (1992) influenced my thinking on this topic:

“Where technological change has apparently disrupted so-called ‘traditional societies’, the villain is much more likely to be colonialism than technology. Colonialism disrupts indigenous political, legal, and ritual systems, and in so doing, may seriously degrade the capacity of local system-builders to function effectively within indigenous activity systems...[This] suggests that it is not..."

Horst (2011) categorizes different forms of culturally-contingent technological appropriation in a three-part typology. Cannibalism reflects appropriation through dismembering, absorption, and transformation. Baroque approaches to appropriation transform spaces through filling and layering. Creolization is a process of miscegenation and detour through unpredictable mixing. Sandvig (2012) proposes a fourth form: ‘appropriation towards parity’ undertaken by marginalized groups with the ultimate goal of equity with the ‘mainstream’.
transferred technology, but rather the imposition of an alien and hegemonic legal and political ideology – arguably, technicism, but not technology – that effects disastrous social change in colonized countries. It is when sociotechnical systems come into direct competition, as is the case in advanced technological diffusion, that spectacular disintegrations of indigenous systems can occur” (p.512).

These important points lie at the junction between self-determination and socio-technical development, and inform my argument here. In the new millennium, the discourse of self-determination developed to include a new, specifically indigenous character and application (Parry, 2011). Laws and policies around the world have largely shifted towards consensus on models of ‘internal decolonization’ that formally recognize land claims, self-government rights, and indigenous laws and customs in the context of existing states (Kymlicka, 2007; Borrows, 2010). This de jure recognition of indigenous self-determination is expressed in documents like the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which was endorsed by Canada (one of the last countries to do so – and only after voting against it) in 2010. The UNDRIP was articulated only after years of consultation with indigenous groups, who stressed the inclusion of direct and meaningful participatory rights to enable them to operationalize self-determination to fit their diverse lived experiences (Daes, 2011; Quane, 2011; Burger, 2011). To this end, the UNDRIP provides a framework for how indigenous rights might harmonize with state-based laws and policy frameworks. It does this through four broad categories of participatory rights (Stavenhagen, 2011, pp.273-4):

1. The right to participate fully in the political, economic, social and cultural life of the State.

2. The right to maintain and develop distinct political, legal, economic, social and cultural systems and institutions.

3. The right of indigenous institutions to act as a nexus between indigenous peoples and States, to support participation in public life and control over their own affairs.

4. The right that States give due recognition to indigenous laws and customs.

The UNDRIP reflects a deep appreciation for and recognition of the laws and practices of indigenous peoples rooted in their relationship with the lands they inhabit. For example, Article 3 of the UNDRIP describes self-determination as a sacred right to which indigenous peoples have been entitled since time immemorial. Scholars and practitioners describe this formal recognition of indigenous lands and customs as a form of self-determination that emerges from the place-based laws, beliefs, and practices of indigenous peoples (Borrows, 2010; Simpson, 2011; Alfred, 2009b; Young, 2007; Glenn, 2011). It is very different from discourses of self-determination that emerged in the Western context following World War Two and the founding of the United Nations. That discourse foregrounds the self-determination of states, framing issues of political sovereignty in the context of the Westphalian international system and associated rights and responsibilities. While international civil society organizations and state governments broadly supported this position, it was met with less enthusiasm when indigenous peoples sought to apply it in the context of their relationships to states (Daes, 2011). States did not want their support of indigenous self-determination to undermine their own sovereignty in the international system. In some cases, they also did not want the right of self-determination to impact existing economic and political relations to the extent that it undermined the lucrative extraction of resources and land from unceded indigenous territories. Partly due to the economic and political benefits of colonialism, many states resisted the application of the right of self-determination inside their borders, raising questions of sovereignty and legitimacy that often led to the lack of a consistent and defined application of the right in practice – reflected in the convoluted logic expressed in the so-called “Blue Water” or “Salt Water” thesis of decolonialization (Youngblood Henderson, 2000; Tuhiwai Smith, 1999).

Given the high stakes of these negotiations, they often generated tense political and legal debates, with the result that some indigenous peoples now see their legal right
to self-determination, and the written discourse it is expressed in, as linked to externally-imposed frameworks of legitimacy that were historically used to justify and perpetuate colonial rule (Glenn, 2011; Alfred, 2009a; Coulthard, 2007). In this context, some indigenous peoples disagreed with states over the sources of legitimacy of claims to self-determination (the burden of proof of the legal existence of a distinct ‘people’ as the sovereign ‘self’ that will exercise the ‘determination’). For example, critics raised questions of whether an external arbiter (like a state government or organization like the UN) can judge an indigenous people’s self-defined identity claims. This decision remains unresolved: at present, there is no universally agreed-upon criteria that distinguishes indigenous peoples from stateless nations (Thornberry, 1989; Quane, 2011). For example, the United Nations Charter (Articles 1 and 55) makes reference to ‘peoples’ but also stresses the interpretive flexibility of that term, referring to “groups of human beings who may, or may not, comprise States or nations”.43

Even when this ontological question is settled, challenges arose regarding the implementation of the right to self-determination. For example, some scholars expressed concerns over the balance of the right as applied to individuals vis-à-vis ‘peoples’ or collectives (Kymlicka, 2007; Culhane, 1998). The Human Rights Committee of the International Court of Justice describes how the right of self-determination is an essential condition to guarantee individual human rights, yet at the same time is one of the few collective rights legally binding in international law (Parry, 2011). For indigenous peoples, recognition of a collective right to self-determination helps preserve the communal dimension of their societies, worldviews, and identities (Quane, 2011). Yet collective rights may in some cases impinge on individual rights: the self-determination of a group may restrict the liberty (self-determination) of individual members of that group. Scholars attempted to resolve these tensions by suggesting that a third party arbiter determine a legitimate and fair balance between individual and group rights in practice, for example by distinguishing between ‘internal restrictions’ (that pertain to

43 In another example from Canada, the Baker Lake case in the Northwest Territories tested the definition of ‘organized society’ in the context of Aboriginal title and lands (Bickenbach, 1980).
intra-group relations) and ‘external protections’ (that pertain to inter-group relations). For example, Kymlicka (2007) argues that internal restrictions must not inhibit the abilities of members of a group to exercise their liberties (pp.148-154). Culhane (1998) similarly notes there is a need to “ensure the limit of one individual’s rights is formed by the boundary at which another individual’s liberty is inhibited” (p.41). However, as with questions of the ontological status of indigenous peoples in international law, these difficult questions remain unresolved, and many states still refuse to recognize and implement the right of indigenous self-determination.

Other controversies arise when the right of self-determination is implemented by the institutional structures of an existing nation-state (IrIbacher-Fox, 2009; Alfred, 1999). Under international law, indigenous sovereignty must yield to state sovereignty. This means there are state-imposed limits to indigenous self-determination, some of which undermine the ability of indigenous peoples to secure control and jurisdiction over their traditional territories (Burger, 2011; Parry, 2011). Historically, these limits are framed with reference to a binary between ‘internal’ and ‘external’ forms of self-determination. External self-determination refers to the right of a people to determine their own international status in the world system, for example by seceding and forming an independent state (Macguire, 2008; Thornberry, 1989). While grounds for indigenous secession from states are not supported in international law, indigenous peoples sometimes invoke this action as a political strategy in their negotiations with state governments (Murphy, 2008). For example, some indigenous peoples see their political sovereignty as a sacred trust their ancestors entered into with the Creator: a relationship that precedes the existence and legitimacy of settler states (Simpson, 2011). From this position, to capitulate to the sovereignty of colonial-derived settler state governments is “a betrayal of what they believe is their sacred covenant with the Creator” (Culhane, 1998, p.355). In Canada, some indigenous people take this position by refusing to accept Canadian citizenship or vote in federal, provincial, or Band council elections (they

44 This approach can be seen in examples such as Ireland, where some Irish nationalists have claimed self-determination by challenging the status of existing borders (Macguire, 2008).
see Band councils as foreign institutions imposed by colonial powers), choosing instead to follow the legitimacy of indigenous governments (Boldt, 1993; Cairns, 2005). However, this strategy can be counter-productive, since majority populations might see claims for ‘external’ self-determination as a threat to state unity, undermining broad public support for indigenous claims. Scholars also make pragmatic arguments against external self-determination; in the contemporary Canadian context, “there is no point to fantasies about the end of non-Native rule” (McMillan & Yellowhorn, 2004, p.332; Borrows, 2010). For these reasons, most indigenous peoples in Canada do not take a hard position on external self-determination. The more common position is that of ‘internal’ self-determination, which refers to the right of a people to choose their own system of government and develop their own policies and institutions inside the framework of, and in negotiation with, an established state apparatus.

States depend on and tolerate subnational entities, including some that aspire to statehood. Supporters of ‘internal’ self-determination frame it as a form of negotiated autonomy (Kymlicka, 2001; Murphy, 2008; Stavenhagen, 2011). Proponents argue that given their relatively low populations, broad geographic dispersion, and high diversity, it is highly unlikely that indigenous peoples will form their own sovereign states, and therefore work within existing state structures and institutions (Kymlicka, 1999; Cairns, 2005; Culhane, 1998). Some caution this process is a slow march to assimilation because it allows states to set limits on indigenous sovereignty, relegating indigenous laws and customs to secondary status (Boldt, 1993). Others point out that states might restrict indigenous autonomy if it threatens the profitable extraction of resources from unceded territories, which frames internal self-determination as a largely symbolic venture (Irlbacher-Fox, 2009). An associated epistemological argument contends that the progressive incorporation of indigenous peoples in existing political, legal, social, and

45 Furthermore, elected Band councils are not perfect institutions: for example, a 2012 report from the Canadian Human Rights Commission determined that the number of human rights complaints filed by First Nations against Band councils is climbing: from 87 in 2011 to 138 in 2012 (APTN National News, 2013).
economic institutions may undermine and eventually be used to eliminate the basis of
their group-specific claims as sovereign nations (Culhane, 1998). For example, Alfred
(2009) writes that “colonial institutions and the dysfunctional subcultures they have
spawned within Indigenous communities are the result of failed attempts to force
Indigenous peoples into a liberal democratic mould” (p.185). Rather than integration in
existing state institutions, he argues that indigenous peoples must establish and
strengthen their own institutions and basis of legitimacy (see also Simpson, 2011;
Borrows, 2010; Palmater, 2011). In this framework, strong, sovereign indigenous
institutions are best equipped to negotiate with states regarding the focus and
distribution of political power and economic activities in their communities (Youngblood
Henderson, 2000). This is a complex and charged terrain of struggle, and one I can only
highlight the broad contours of here. Therefore, without ignoring these controversies, I
shift my focus to proposals that seek to find middle ground in these debates.

In recent years, scholars have sought to reconcile the tensions between the
basis of legitimacy for and implementation of self-determination through proposals drawn
from the epistemological position of social constructivism. Authors like Benhabib (2002)
highlight the multiple, overlapping and fluid nature of collective identities, arguing that
failure to do so can reify socially-constructed boundaries between peoples. Attaching
essentialized characteristics to collective identities accepts the problematic assertion
that peoples and cultures are frozen in time (Downing & Husband, 2005; Hartley &
McKee, 2000). Furthermore, collective identities can set up and reify distinctions
between in- and out-group membership, contributing to an us/them dichotomy (Murphy,
2008; Kymlicka, 2007). Scholars of self-determination that read these challenges
through a specifically indigenous framework see them as a form of ‘strategic
essentialism’ (Spivak, 1999). They recognize that around the world, state governments
require indigenous peoples to ground their claims to self-determination in their legal
status as sovereign peoples rooted in specific places who generate their own laws,
customs, practices, and institutions. Indigenous peoples sometimes employ group
identities to exercise strategic essentialism to underscore the legal basis of their group-
differentiated rights. However, in focusing on processes rather than identities,
inigenous peoples undertaking these activities remain positioned as an epistemic
community linked by shared experiences, distinct values, and a common resistance to
colonialism – all of which change as well as persist over time and so avoid the trap of essentialism (Glenn, 2011; Daes, 2011). At the same time, in their recognition of a multiplicity of processes, these culturally-grounded identities express a ‘ground-up’ or endogenous approach to self-determination. In terms of implementation, this position aims to achieve legal and political reforms that better support indigenous institutions, practices, and values (Cairns, 2005; Borrows, 2010). A quote from Irlbacher-Fox (2009) describing self-government negotiations in Canada’s far north highlights the importance of flexibility in these considerations, and well as their strong links to the lived realities of members of indigenous communities:

“Indigenous peoples’ concepts of self-government do not necessarily describe specific institutional arrangements or the nature of authorities sought. Instead, these concepts provide general policy directions to Indigenous negotiators, providing flexibility to develop innovative mechanisms consistent with the fundamental values, goals, and aspirations expressed through their communities’ visions of self-determination” (p.9).

Reforms to state structures and institutions might, for example, give indigenous peoples more opportunities to engage in substantive decision-making over the laws and policies that impact their lives – a recommendation highlighted in documents from the UNDRIP to the Royal Commission on Aboriginal Peoples in Canada (1996). Concrete examples of such instruments include the creation of reserved parliamentary seats for indigenous representatives in states like Burundi and New Zealand (where the Māori Party was founded in 2004), and subsidies to support indigenous governments and institutions that deliver public services like education, housing, employment, and health (Burger, 2011).

Some scholars frame such reforms as aimed at generating a state “enabling environment”, which conceptually links laws, policies and regulatory frameworks to the ideas, values and practices of participatory development (Rozumilowicz, 2001; Ó Sióchru, 2005; Price & Krug, 2002). This approach draws from work in the late 1990s and early 2000s, when theorists like Sen (1999) argued for the need to re-frame development policies away from a focus on quantifiable measures to better support and account for human agency. Sen encouraged state governments and civil society organizations to avoid conflating the means of development with its ends. He argued that “freedom depends also on other determinants, such as social and economic
arrangements...as well as political and civil rights" (p.20). In this framework, state
enabling environments aim to create the structural conditions to support individuals and
populations carry out their own endogenous development projects.

A number of critical theorists problematized an unreflexive approach to human
development, questioning the ability of existing institutions, practices, policies, and
discourses to achieve an enabling environment that substantively supports the needs of
marginalized individuals and populations. Critics like Escobar (1997) and Rist (1997)
pointed out the danger of symbolic versus substantive models of participatory, human-
centered development that foreground rhetoric at the expense of material
transformation. They viewed the creation of an enabling environment as a form of co-
option rather than transformation, critiquing the process as the imposition of
knowledge and governance structures on indigenous communities (Escobar, 1997). As
Rist (1997) notes “these practices enable the world system to reproduce itself by
expanding the area within its grasp, so that it assures the existence of societies (or
social classes) included within the system, and washes its hands of those excluded from
it” (p.13). Critics also raised concerns over the means of participation available to
members of local communities in the design of enabling environments (Escobar, 1997).
Given the presence of structural inequalities, such participatory opportunities must move
beyond formal channels to incorporate special measures to ensure that marginalized
individuals and populations gain voice and influence. As Young writes:

“Since structural inequalities give political advantage to those groups that also
have social and economic advantage, an inclusive deliberative process must
take special measures to ensure that needs, interests, and perspectives of
relatively marginalized people gain voice and influence in the deliberative
process” (Young, 2007, p.4).\textsuperscript{46}

These critics importantly raised awareness that affected individuals and populations
must actively and substantively participate in efforts to create state enabling

\textsuperscript{46} I discuss these issues with regards to networked infrastructure development policy in Canada
in Chapter 6.
environments (see Held, 1996). As Sen (1999) writes: “capabilities [of persons] can be enhanced by public policy, but also, on the other side, the direction of public policy can be influenced by the effective use of participatory capabilities by the public” (p.35). This recognition extended to the formation of documents like the UNDRIP, which stressed the ability of indigenous peoples to participate in formal decision-making regarding issues that impact their lives and communities. There are many benefits to such an approach. With regards to indigenous self-determination, reforms aimed at generating enabling environments do not necessarily require state governments and indigenous peoples to balance competing rights claims, and also relieve third-party arbiters of the duty of judging the validity of a self-identified indigenous group’s claims to self-determination (Parry, 2011). While they do not address the deeper critique of colonialism (its function as a means to manipulate political and economic structures to secure control over indigenous territories, resources, and populations for the purposes of extraction), enabling environments can open space and opportunity for indigenous peoples to work with state governments to generate laws, institutions, and policy frameworks that better reflect their lived experiences. In short, such reforms can assist in the long-term and ongoing work of decolonization.

3.1. Historic relations: Aboriginal Peoples and the state in Canada

Despite these suggestions, the historical record largely points to a failure of states to achieve truly participatory and open enabling environments. As Weiss (2000) writes, from the late 1980s on, most international development policy instead consisted of powerful donor states and civil society organizations imposing structural adjustment programs on ‘developing’ countries. In many cases, transnational organizations, rather than indigenous institutions, implemented these projects (Ayers, 2006; Stevenson, 2003). For example, the Green Revolution deepened rural poverty in many parts of the world, driving calls for indigenous and endogenous development models. In this section, I argue that this description fits the historical case of uneven development patterns in Canada. I argue that the problematic history of state-Aboriginal relations continues to constrain the abilities of indigenous peoples to exercise their self-determination,
including in attempts to establish an enabling environment for Aboriginal media development.

Indigenous peoples in Canada have marshalled various policies, institutional arrangements, and legal decisions to assert their self-determination in the context of the persistence of colonialism. My overview of this complex history explores how structures and social relations established in Canada’s colonial past continue to define, constrain, and limit the basis and scope of self-determination in practice, despite the federal government’s symbolic calls for a ‘new relationship’ with Aboriginal peoples. Alongside this history, indigenous peoples have continuously exercised their creative agency. They continue to practice an Aboriginal ‘right to a way of life’, as expressed in their customs and traditions, land-based activities like hunting, fishing, trapping, and various endogenous development projects (Asch, 1999). Legally, Section 35 of the Constitution Act (1982) states: “the existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed”. However, the ongoing reality of the extraction of economic resources from indigenous territories by corporate entities without consent, and the paternalistic governance structures still imposed on indigenous peoples, serve as reminders that colonialism continues. Even the phrasing of Section 35 reflects several ambiguities that leave interpretation of the scope and nature of Aboriginal and treaty rights to non-indigenous courts and governments (Cairns, 2005; Culhane, 1998; Morse, 1999). Turner (2011) critiques these ambiguities for failing to recognize indigenous laws, customs, beliefs, and practices. These critiques provide an important and necessary corrective to unilateral attempts by the state to define the limits of Aboriginal and treaty rights.

Despite these challenges, indigenous peoples can and do use administrative and legal mechanisms to support their ‘internal’ self-determination (Tully, 1995; Patrick & Armitage, 2001). While I recognize the shortcomings of this ‘negotiated autonomy’, on a pragmatic level I agree with this position. To this end, in this section I provide an immanent critique of state-Aboriginal relations in Canada. I recognize it is impossible to do justice to the complex interplay of actors, institutions, and social relations involved, and so instead present several key examples to demonstrate the distinction between symbolic and material actions on the part of the Canadian state.
Despite its public rhetoric to the contrary, the Government of Canada has consistently shaped and controlled the scope, nature and application of Aboriginal and treaty rights in practice. As a result, many indigenous peoples continue to point to what they feel is a lack of substantive participation in many decisions that impact their lives, and to a continuation of the unequal social relations established through colonialism. As summarized by Scott (2001b):

“[S]ince the 1960s, we have witnessed a steady surge of Aboriginal political organizing; encouraging, if cautious, progress in Supreme Court jurisprudence; the abandonment of overtly assimilationalist federal policies; increased federal and provincial attention to negotiation Aboriginal and treaty rights; and constitutional entrenchment of these rights. Yet progress on the ground has been glacial....The deeper political and economic structures of assimilation remain largely intact. Meanwhile, conditions of unresolved conflict simmer and periodically erupt” (p.419).

indigenous peoples most recently expressed these tensions during the #IdleNoMore movement of 2012/2013, during which participants utilized social media platforms like Facebook and Twitter to orchestrate offline flash mobs and other events across Canada. They demonstrated against the persistence of paternalistic government policies, the failure of treaty signatories to live up to their stated commitments, and the continuing marginal conditions in many urban and rural First Nations communities (among other issues).47 The unequal relationship protested in these activities in fact extends to hundreds of years of history.

Before the country now known as Canada existed, the government of Great Britain asserted its legal and political sovereignty over the lands and peoples located on that territory, which was a bountiful source of economic resources like lumber, furs, and fish (Drummond, 2001; Miller, 1991). A memorandum issued in 1722 by the Privy Council of Great Britain set out two doctrines that established British sovereignty in these lands (Culhane, 1998). The ‘doctrine of discovery’ concerned circumstances

47 While #IdleNoMore involved a broad array of participants, including both Aboriginal and non-Aboriginal people, much of the organizing and activity involved First Nations.
where land was *terra nullius*: that is, uninhabited by humans. In such cases, the British Crown could proclaim sovereignty and British law became the law of the land. The second approach, the ‘doctrine of conquest’, concerned inhabited lands populated by distinct societies where Britain had to establish sovereignty through actions like military conquest or treaty negotiations.48

In most of Canada, the Crown adopted the ‘doctrine of conquest’, and so negotiated with Aboriginal nations through treaties.49 The character and application of these treaties changed over time. Early ‘peace and friendship’ treaties with the Mi’kmaq and Maliseet in Atlantic Canada became displaced by efforts to dispossess indigenous peoples of lands and resources in exchange for defined treaty rights to land, cash payments, and resource rights on Crown lands (Miller, 1991; Youngblood Henderson, 2000). Those Aboriginal nations that did not sign treaties remained entitled to group-differentiated rights, called Aboriginal rights. Despite these legal protections, in many cases resource extraction activities continued, regardless of the status of Aboriginal or treaty rights. To further undermine these rights, the state deployed complex legal reasoning, making both categories of rights contingent on the Crown’s recognition of Aboriginal peoples as either self-determining sovereign nations or as groups delegated rights by the British sovereign (a distinction articulated in the *Royal Proclamation of 1763*) (Borrows, 1997; Culhane, 1997). The ‘delegated rights’ position viewed Aboriginal peoples as non-sovereign wards of the state, with the Crown retaining authority over

48 When settlers arrived in what is now Canada, they found Aboriginal peoples already living there, and so the ‘doctrine of discovery’ and *terra nullius* did not apply. In an attempt to assert its sovereignty in the face of this discovery, the Crown devised a series of legal tests to distinguish between formally ‘inhabited’ and ‘uninhabited’ lands. The tests, derived from European cultures and traditions, included several ethnocentric proscriptions for what constituted a ‘civilized society’, such as following a Christian religion, practicing agricultural farming techniques, and/or employing commercial transactions (Parry, 2011). If an Aboriginal society did not follow these practices the British Crown deemed it did not legally ‘exist’ and therefore the land remained subject to British sovereignty. If they did, “the rights of the peoples inhabiting the territory under their own customs and usages were presumed to survive” (Drummond, 2001, p.50).

49 In some regions – including much of B.C. and the North – treaty negotiations did not take place and so land remains legally unceded.
their rights (Morse, 1999). The ‘inherent rights’ interpretation viewed Aboriginal peoples as sovereign nations with jurisdiction over their own rights (Jenson, 1999; Mercredi & Turpel, 1993). This position recognized the existence of Aboriginal societies, cultures, spiritual traditions, institutions, histories, and philosophies prior to contact with Europeans. It held these societies should therefore be legally empowered to sustain these customary activities. As a result, this ‘inherent rights’ position became an important driver for subsequent state-Aboriginal negotiations in Canada.

In the nineteenth and early twentieth centuries, British and Canadian officials continued to deploy complex legal and administrative tools to assert their authority over Aboriginal peoples and societies, and secure access to indigenous lands for the purposes of resource extraction (Papillion, 2008). These processes involved imposing restrictions on the autonomy of indigenous individuals, communities, and organizations. For example, the Crown developed formal categories used to classify and administer Aboriginal peoples as Inuit, Indians (now recognized as First Nations), and Métis. In the interest of clarity and brevity, I only provide examples drawn from one of these groups: First Nations.

The *British North America Act* (1867) established the federal government’s jurisdiction over and fiduciary responsibilities to ‘Indians’ and ‘lands reserved for the Indians’, relations further enshrined in the *Indian Act* (1876) (Mercredi & Turpel, 1993). Legislation and court decisions associated with the *Indian Act* imposed various requirements on First Nations, several of which overtly aimed towards their assimilation (Morse, 1999; Rice & Snyder, 2008). For example, the *Gradual Civilization Act* (1857) eliminated the Indian status of Indian women who married non-Aboriginal men; a condition that remained in place until the 1980s (Murphy, 2008). The state also prohibited cultural and spiritual practices like potlatches and sun dancing, and set up residential schools mandated to ‘kill the Indian in the child’ that also resulted in widespread mental, physical, and sexual abuse (Haig-Brown, 2006; Milloy, 1999). The federal government tightly controlled other aspects of the lives of First Nations peoples. A pass system prevented First Nations from leaving their reserves without formal permission from the local Indian Agent. The 1927 *Law on Indians* prevented First Nations people from hiring legal representation (Tremblay & Dufour, 2008). Finally, the
state restricted the ability of First Nations to develop their own political institutions. For example, because of the Law on Indians, a political group called the League of Indians founded after World War One was deemed illegal and so disbanded. The North American Indian Brotherhood, founded in the 1940s, also folded due to limited participation, internal difficulties, and state resistance. Inside First Nation reserve communities, the state attempted to eradicate hereditary political leadership, setting up an elected system of Band councils ultimately accountable to the state. The impacts of these decisions continue to be felt today, with some First Nations people refusing to recognize the authority of elected Band councils.

Throughout this challenging history, First Nations and other Aboriginal peoples continuously resisted the state’s intrusions on their lives. In law courts and political forums, they questioned the validity of the Crown’s implementation of treaties, and called for more recognition of their Aboriginal and treaty rights. In their place-based communities, many of which are located far from the agents and institutions of the colonial state, they continued to practice traditional forms of governance and cultural activities (Simpson, 2011). They organized politically, first underground, and then when the 1927 law forbidding political associations was revoked, in the broader public sphere. These activities increased during in the 1960s and 1970s, when a loose coalition of activists called the ‘New Indians’ helped drive a resurgence in Aboriginal cultural and political activity (Valaskakis, 2005). At that time indigenous peoples founded several national political organizations, including the National Indian Brotherhood, reorganized in the early 1980s as the national Assembly of First Nation, and the Inuit Tapiriit Kanatami (in 1971). These associations, while not free of criticism, nonetheless presented indigenous peoples with a strong voice in their formal negotiations with federal and provincial governments.

State efforts to undermine Aboriginal and treaty rights continued throughout this history. The federal government released its so-called ‘White Paper’ (the Statement of the Government of Canada on Indian Policy) in 1969. The position paper advocated for the dissolution of the unique status and group-differentiated rights of Aboriginal peoples, and the abolishment of the Indian Act (Green, 1995). It catalyzed the resistance and persistence of First Nations. In response, the Indian Association of Alberta submitted its
own ‘Red Paper’ in 1972. The Red Paper rejected assimilation and asserted Aboriginal authority in areas like education, health care, economic development and housing (Tremblay & Dufour, 2008). Its authors argued the Canadian state was failing to live up to its treaty obligations with First Nations, and advocated the need to establish a nation-to-nation relationship between governments (Turner, 2011). They insisted the Indian Act be retained until problematic treaty relationships improved, and the government of Canada recognized and entrenched Aboriginal and treaty rights in the Canadian Constitution (Long, 2010; McMillan & Yellowhorn, 2004). These calls for a new relationship informed 1982 revisions to the Constitution. The addition of Section 35 formally enshrined treaty and Aboriginal rights in the ‘law of the land’. These struggles also took place in the courts, where First Nations and Aboriginal peoples fought against the exploitative activities undertaken by some corporate entities. The Supreme Court of Canada upheld Aboriginal and treaty rights in decisions like Calder (1973), Sparrow (1990), Delgamuukw (1997), and Marshall (1999), to name a few cases.  

By the 1990s, the Government of Canada seemed to be moving towards increased recognition of Aboriginal self-determination, including generating an enabling environment to support this shift. Weaver (1990) described what seemed an emerging paradigm, with the state playing a more developmental role that supported (internal) Aboriginal self-determination alongside its recognition of Aboriginal and treaty rights. The state formally accepted the joint formulation of policies to better facilitate Aboriginal self-government, institutions, joint management systems, and indigenous knowledge. As a response to the failure of the Meech Lake Accord (which was rejected in part due to the actions of a Cree MLA from Manitoba named Elijah Harper, who used a procedural maneuver to block its passing), federal policy statements like the Charlottetown Accord

50 For example, in Calder the Supreme Court of Canada initially ruled the Nisga’a Nation was too ‘primitive’ in the nineteenth century to have held legal concepts of property (Culhane, 1998). The Crown’s case hinged on the ‘frozen rights’ thesis that restricted the basis of Aboriginal rights to those activities and institutions originating in pre-contact cultures. In appeal, the Supreme Court ruled in 1973 Aboriginal title is an inherent right that existed prior to European arrival (Asch, 1997).
(1992) proposed a formal recognition of the inherent nature of Aboriginal and treaty rights (though the Charlottetown Accord also failed to pass a public referendum). In 1995, the federal government articulated an Inherent Rights Policy that recognized Aboriginal self-government and the right of Aboriginal peoples to exercise direct law-making control over their lives (with caveats) (Morse, 1999). These actions reflected a growing de jure consensus among policy makers captured in the comprehensive Report of the Royal Commission on Aboriginal Peoples (RCAP) (1996). The Report proposed self-determination as a means to enable Aboriginal peoples to “govern themselves in certain key matters, to ensure the full and free development of their cultures and the best interests of their people” (Kymlicka, 1999, p.22). In short, these formal statements expressed state support for an enabling environment of internal self-determination.

Several policy statements from the 2000s continued to reflect the Government of Canada’s formal recognition of the inherent rights and self-determination of Aboriginal peoples. The current Conservative federal government stated that it formally recognizes and supports the development of a new relationship with Aboriginal peoples. To this end it launched an Action Plan on Aboriginal Consultation and Accommodation in November 2007. In 2009, First Nations and representative organizations met to discuss the implementation of this action plan. Prime Minister Stephen Harper also made a formal apology to former students of residential schools, an event that took place alongside the establishment of the Truth and Reconciliation Commission (funded from a legally mandated settlement awarded to the victims of residential schools) (AANDC, 2011). In June 2011, the federal government and AFN released the Canada – First Nations Joint Action Plan, in which Aboriginal Affairs and Northern Development Canada (AANDC) and the AFN committed to working together in several priority areas, including education, governance, and economic development. Despite stating its respect for Aboriginal and treaty rights, the Plan reflected a neo-liberal ideology in the ways these strategic goals might be achieved. It called for “effective, appropriate, transparent and fully accountable governance structures”, framing success and sustainability as a means to empower individuals (rather than communities or populations) through economic opportunity. The Plan makes little direct mention of social issues and public services (aside from education).
In 2011, the AFN released its own statement on governance called *Pursing First Nations Self-Determination*, in which it articulated the need to balance the local contexts of First Nations with national solidarity, emphasizing community engagement and dialogue. In its statement, the AFN specified four activities to support the self-determination of First Nations governments (Atleo, 2011, pp.17-23):

1. A First Nation-Crown Relationship that reflects the nation-to-nation relationship established in treaties but denied by the actions of the Crown.

2. New Fiscal Relationships that address the historic and current underfunding of First Nations.

3. Implementation of First Nations Governments in ways that support their capacity to govern their own affairs and interact with other governments, including issues of citizenship, elections and leadership selection, and institutions of public administration.

4. Fundamental reforms within the institutions of the federal government to address structural impediments and better reflect nation-to-nation relationships.

The AFN has since formally met with the federal government several times, including a Crown-First Nations gathering held in early 2012. As of early 2013, many Aboriginal peoples across Canada expressed their frustration over a lack of progress regarding these issues, the persistent socio-economic problems in many of their communities, and their lack of engagement in several pieces of government legislation. Many expressed their dissatisfaction with the status quo through direct actions, which became associated with the #IdleNoMore movement. Reflecting the heterogeneity and division inside indigenous communities, these activities included criticism directed at political institutions like the AFN and elected Band Councils, and reflected the diversity of indigenous peoples living in different regions of Canada (including First Nations, Inuit, and Métis peoples). These activities sparked a new round of meetings between indigenous political organizations and various agents of the state. As of early 2013, the outcome of these meetings, and of the #IdleNoMore activities, is yet to be determined.

In this brief history I sought to illustrate examples of the Canadian state’s *de jure* support and recognition of inherent Aboriginal and treaty rights alongside a well-documented *de facto* history of its historic and ongoing denial of these rights in practice.
As discussed earlier, the continuing extraction of economic resources from Aboriginal treaty and unceded territories, often without substantive consultation or compensation, demonstrates the persistence of colonialism. This challenge is not unique to Canada: Burger (2011) describes how around the world, the implementation of national development projects tends to prioritize access to and exploitation of resources found on indigenous peoples’ lands, often to the detriment of the peoples and communities living there (p.41; see also Stavenhagen, 2011). These exploitative economic relations are accompanied with political challenges. Hylton (1999) describes the bureaucratic and procedural barriers indigenous peoples continue to face in their efforts to exercise self-determination. These include “lengthy delays, ad hoc and disjointed negotiation processes, and shifting government policies” (p.1). For example, the Canadian government’s Comprehensive Claims Policy of the 1980s (ostensibly designed to address dozens of outstanding land claims) moved extremely slowly, with only one claim negotiated at a time in each province or territory. Finally, the state continues to engage in activities that contradict its statements of good faith. For example in 2011, when the federal government formally endorsed the UNDRIP, critics pointed out Canada was one of the last countries to sign the document, only doing so in a highly qualified manner after years of lobbying against its passing.

Resistance to and frustration over these unequal relations is sometimes expressed in direct actions, from Oka and Gustafsen Lake in the 1990s, to more recent activities, like those associated with #IdleNoMore. Colonial-era legislation, including the Indian Act, remains in place (Green, 1995; Papillon, 2008). While most Aboriginal peoples reject the Indian Act in principle, they also resist any attempt by the federal government to unilaterally repeal or reform it. This is due to the paradox that the Indian Act simultaneously offers legislative proof of the ‘special status’ of Aboriginal peoples, even as it imposes conditions on their lives (Atleo, 2011). Negotiations over the implementation of indigenous self-determination in the context of the Canadian state similarly reflect complex and contradictory actions, as various governments work to balance jurisdictional and administrative powers among layers of Aboriginal and non-Aboriginal governments. Reflecting on these processes, scholars identify a dichotomous spectrum between the inherent ‘self-determination’ of sovereign Aboriginal institutions
and a restricted form of ‘self-administration’ dependent on non-Aboriginal institutions (Mercredi & Turpel, 1993; Boldt, 1993). Abele and Prince (2006) summarized several positions along this spectrum that I present in Table 3. These are just a few examples that demonstrate continuing tensions and complexities associated with the recognition and implementation of Aboriginal and treaty rights in Canada.

Table 3: Models of Aboriginal Self-Government in Canada

<table>
<thead>
<tr>
<th>Model</th>
<th>Aboriginal Government Powers</th>
<th>Benefits</th>
<th>Critiques</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-municipality</td>
<td>Limited powers (ex. administration of public services, modest taxation) Delegated jurisdiction from state and provincial governments</td>
<td>Enables Aboriginal governments to build capacity</td>
<td>Not supported by Aboriginal peoples or by formal positions of courts and government. Fails to offer Aboriginal governments appropriate level of autonomy.</td>
<td>Proposal released by B.C. Government in 2002 Treaty Referendum</td>
</tr>
<tr>
<td>Adapted federalism</td>
<td>Creation of new, non-ethnic provincial- or territorial-style governments inside federal system</td>
<td>Offers jurisdiction over large territories. Potential for strong jurisdiction in majority Aboriginal regions.</td>
<td>Challenging to implement given low populations. Non-ethnic territorial governments can undermine indigenous identity.</td>
<td>Government of Nunavut. Kativik Regional Government in Nunavik</td>
</tr>
</tbody>
</table>

51 In Nunavut, all residents (including non-Aboriginal peoples) exercise the same rights and responsibilities. The Inuit negotiators decided on this model due to their overwhelming demographic advantage, and the access to large tracts of land it allowed (Abele & Prince, 2006). The Inuit of Nunavik applied a similar model in the James Bay and Northern Quebec Agreement. The Kativik Regional Government is a non-ethnic geographically-based government with jurisdiction over Nunavik. Abele and Prince (2006) note that compared with Nunavut, the population of Nunavik is too small to support the creation of a new territory, and so will like remain inside the province of Quebec.
### Trilateral federalism

- Full participation of Aboriginal governments in federalism through reforms to existing state structures and institutions.
- Increased support for Aboriginal representation in electoral politics.
- Creation of specialized institutions or seats in Parliament.
- Recognition of Aboriginal values and institutions supported by jurisdictional powers to make laws and policies, deliver programs, and adjudicate disputes.

**Challenges in implementation, like low participation in electoral politics by Aboriginal voters.**

- May encourage the formation of ‘race-based governments’ or ‘ethnic enclaves’.
- May force indigenous governments and institutions to conform to an understanding of self-determination legitimized by European laws, knowledge systems and values.

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### Nation-to-nation arrangements / treaty federalism / two-confederatio view

- Recognizes indigenous sovereignty as an inherent right expressed in a nation-to-nation relationship with the Canadian state.
- The realization of the initial spirit and nature of treaties. Recognizes the Canadian state was founded through agreements between European and Aboriginal governments.
- Many Aboriginal organizations, including the AFN, advocate this model. Recognizes Aboriginal institutions emerge from place-based laws, customs, and practices.

**May emphasize differences between Aboriginal and non-Aboriginal peoples, undermining Canadian unity and co-existence.**

**Practical difficulties of implementation given small, diverse populations.**

| N/A |

In the next section, I turn to a focused consideration of Aboriginal media development, recognizing that it has been shaped by this broader history. The political economy of Aboriginal media sets the stage for my later focus on networked digital infrastructure. I argue that digital self-determination is rooted in these past struggles, but also reflects new patterns associated with the contemporary historical moment, and the affordances of digital technologies. I argue that scholars of media development highlighted indigenous self-determination in terms of cultural representation, and specifically the production, distribution, and consumption of print and broadcast media content (Alia, 2010; Downing & Husband, 2005; Molnar & Meadows, 2001). As Roth (2005) writes: “The aim of First Peoples media – locally, regionally, nationally, and culturally – tends to be political development and community empowerment” (p.9). This history, and the conceptual framework used to explain it, is an extremely important precursor to digital self-determination. However, it does not fully capture the range of activities made possible through the emergence of networked digital infrastructure. I argue this distinction necessitates a shift in analytical and normative scope to reflect the context of
the network society. But before outlining the contours of this shift, I review research on Aboriginal print and broadcast media development in Canada.

3.2. Aboriginal peoples and media development in Canada: From colonial discourses to self-determined media

Indigenous peoples have long struggled for increased self-determination in the production and distribution of media content generated by and for their communities. Their efforts are reflected in pre-colonial practices and continue in contemporary print, broadcast, and digital media (Molnar & Meadows, 2001; Downing & Husband, 2005). But alongside their activities, decades of communications research demonstrates the historic and ongoing misrepresentation of indigenous peoples in mainstream media content, and their lack of involvement in the institutions that produce and distribute it (Roth, 2005). Hall (1995/1996) describes these processes as encompassing the ‘relations of representation’ and the ‘politics of representation’. In his framework, the relations of representation refer to the ability of indigenous peoples to gain access to the means of production of cultural representation, for example as media producers, journalists, or sources. The politics of representation considers the framing of indigenous peoples and issues in media content: for example, whether they are portrayed using negative stereotypes. In this section, I explore both the relations of representation and the politics of representation to argue that indigenous peoples led a shift from colonial discourses to self-determined media, in part supported by a state enabling environment of regulatory conditions and subsidies.

Critical communications scholars show how despite their diversity, ‘mainstream’ media representations of indigenous peoples around the world reflect similar discourses. Authors like Fanon (1963) and Said (1979) theorized these similarities as common strategies undertaken by colonial powers to justify their usurpation of indigenous lands and resources. They argued these discourses appropriate elements of European religious and philosophical thought to this end. For example, Chamberlin (1997) traces the influence of Matthew Arnold’s 1869 book *Culture and Anarchy* in contemporary legal frameworks, describing how it was used to set up a series of dichotomies between

The widespread production and dissemination of these problematic discourses was significantly amplified through the emergence of mass media. In Canada, by the 1860s and 1870s, indigenous people came to be represented in media content as dying cultures. Their rich material and symbolic cultures – expressed through visual arts, crafts, songs, performances, words, and stories – were “collected by non-Natives and widely circulated in mainstream society as popular evidence of ‘primitive’ artifacts and practices” (Roth, 1993, para 2). Over time, mass media representations of indigenous peoples coalesced into “a form of ethnic hegemony, premised on seemingly legitimate ideologies and attitudes, and often tacitly accepted by most members of the dominant majority group” (van Dijk, 2009, p.34; see also Bonilla-Silva, 2001; Chow-White, 2009; Omi & Winant, 2004). Critical scholars argued that such discourses perpetuated an ahistorical, hierarchical, racialized social structure (Jiwani, 2006).

While these discourses change in form and content over time, their underlying meta-narrative consistently presents indigenous peoples as ‘child like’, incapable of self-determination, or dangerous (Harding, 2006/2007; Rice & Snyder, 2008; Boldt, 1993; Lambertus, 2004; Winter, 1992; Valaskakis, 2005). They also reflect the absence of indigenous voices in ‘mainstream’ media, even regarding issues that directly concern their communities (Henry & Tator, 2002; Smith & Brigham, 1992; McMahon & Chow-White, 2011). Media content created in metropolitan centres was typically sent to rural and remote communities through a one-way transmission process that contributed to
assaults on Aboriginal languages, institutions, and cultural practices (Savard, 1998; Valaskakis, 1992). As society became aware of the problems of this ‘cultural imperialism’ (Schiller, 1976), well-meaning parties sought to bring more indigenous peoples into mainstream media institutions. Typically located in southern, urban environments, while these institutions sometimes hired indigenous staff, they often failed to adjust their media production policies and practices to enable new personnel to shape their own media content. For example, Evans (2002/2008) argues that Inuit staff at the southern-based Inuit Broadcasting Organization ended up adapting the content they created to comply with exogenous pressures associated with commercial markets or ‘mainstream’ audiences, rather than generating content that reflects their own indigenous communities (see also Iseke-Barnes & Danard, 2007).

Alongside these mainstream media development processes, indigenous peoples generated their own community-based institutions (Roth & Valaskakis, 1989). Scholars working in the 1990s cautioned that this admirable goal nonetheless involves a ‘Faustian bargain’ (Ginsburg, 1991). While it offers support for indigenous media content, at the same time it contributes to the introduction of ideas, terms, and principles from hegemonic non-indigenous cultures. For example, Valaskakis (1992) identified several negative impacts stemming from Inuit involvement in media context production and distribution. Non-indigenous people acquired authority over Inuit peoples through their control over knowledge of and access to media, and the media content they produced introduced political and economic ideologies that contributed to the erosion of community social and political structures and cultural values. Ginsburg (1991) summarized this paradox:

52 Critics pointed out how “cultural imperialism” had replaced the colonial armies of the previous centuries” (Stevenson, 2003). However, during the 1980s and 90s, subsequent studies in the field of media and communication research also demonstrated the agency of readers and audiences in interpreting media content, problematizing the assumptions of passive media consumption associated with the cultural imperialism thesis. Critics pointed out the thesis presumed a one-way flow of communication and influence from a monolithic conception of the West, as opposed to a recognition of the multi-directional natural of global media flows, ‘glocalization’, hybridity, audience agency, and so on (Curran, 2002, pp.169-70).
“On the one hand, they [indigenous peoples] are finding new modes for expressing indigenous identity through media and gaining access to film and video to serve their own needs and ends. On the other hand, the spread of communications technology such as home video and satellite downlinks threatens to be a final assault on culture, language, imagery, relationship between generations, and respect for traditional knowledge” (p.96).

Acutely aware of these tensions, indigenous peoples expressed their resistance and creative agency in many ways. For example, when English- and French-language radio arrived in Inuit communities in the 1920s, community leaders raised concerns about its potential to contribute to social disintegration and unwelcome cultural hybridization (Valaskakis, 1992; Baltruschat, 2004). Similar arguments arose when television broadcasts arrived in Northern Canada in the 1960s, and some communities voted against the introduction of the technology until Aboriginal content became available (Savard, 1998; Roth, 2005). In my field research, some people I met still remembered the impacts of broadcast media on their cultures and languages. In one person’s words: “Everybody used to speak their own language...But of course you had to learn English to understand what was said on TV” (interview 1005). Those people unable to speak their Aboriginal language expressed regret: “We lost 90% of the language. We’re still trying to recover, pushing to get it back” (interview 1006). Despite these challenges, many people felt optimistic about the future, noting that younger generations are picking up Aboriginal languages from immersion classes, discussions with community members (particularly Elders), and access to Aboriginal-language media content. In a recent consideration of these challenges, Roth (2013) notes that concerns over the preservation of indigenous languages and cultures through broadcasting are of less interest for many indigenous peoples, who instead focus on generating their own digital media or specialty channels. However, many people I spoke to felt these efforts remain an uphill battle:

“There’s a lot of concern. They say because of the TV and the Internet we're losing our language. It's all in English. Even my grandchildren. They're typing away at three years old, four years old. I see that...You can find people who are in their 20s, it's all English. We try to use the Native language at the school, but there’s only certain number of hours per day we expose them to, and when they go home they don’t have anything. It’s a loss. I don’t know. I can't say that the world is completely gone, but when my generation fades away, we will lose the last major use of the language in the community. In my father’s generation, it was all Cree. And with my generation it’s going away” (interview 1011).
Given these challenges, indigenous peoples (and their partners) began questioning not only Western-derived conventions of representation and distribution, but also central issues regarding the ownership and control of the means of media production and distribution. In many cases, they began developing their own local and regional media institutions. They advocated for public sector support of these projects, arguing their group-differentiated Aboriginal rights should include the capacity to produce and distribute culturally-appropriate media content (Roth, 2005). These Aboriginal media institutions often started as local sites of persistence and resistance positioned in relation with the inadequacies and ‘blind spots’ of mainstream media. Over time, through the support of a state enabling environment, many developed into regional, national, and international institutions. Their focus ranged from process-oriented projects like the National Film Board’s Challenge for Change program of the 1970s, to the creation of culturally and linguistically specific media content (Roth, 2013). These institutions, despite their diversity, collectively became a means to produce and circulate alternative discourses of self-determination, build community, support indigenous customs and practices, and reinforce cultural identities (Roth & Valaskakis, 1989; Brown, 2003; Grossman, 2008). They not only reflected the indigenous appropriation of media technologies, but also supported increased intercultural communication with non-indigenous communities, and so helped diversify mainstream media (Roth, 2005).

Throughout their history, indigenous media institutions faced continual pressures to adapt to commercial funding models and the generalized audiences they require (McManus, 2009). These pressures linked to shifting involvement and support on the part of state governments. Indigenous media institutions often relied on a state enabling environment of public subsidies and regulatory support to fund their initiatives (Cottle, 2000). It is challenging for indigenous media institutions to generate a sustainable revenue stream through a commercial funding model, given the geographic dispersion, cultural and linguistic diversity, and relatively low populations of their target audiences and readers. One sad irony is that the same characteristics that make indigenous media content so unique undermine its sustainability in a commercially-oriented, global communications environment (Ginsburg, 1995; Meadows, 1995). Adding to this challenge, government support for indigenous media projects raises other issues. Media producers must strike a balance between the requirements of funders and their freedom
to generate content. For this reason, it is important that government does not take too strong a role in the development of indigenous media. Buckley et al (2008) highlight four key components of a state enabling environment: guarantees of freedom of expression; allowances for access to information; the creation of balanced defamation laws, content rules and limits to free speech; and the regulation of journalists. A state enabling environment can also include material support to establish and sustain indigenous institutions to monitor media, produce and distribute Aboriginal content, and support equal access to content for marginalized groups.

Research has found that the presence of a state enabling environment does not necessarily reflect a direct, clear, or deterministic path for indigenous media development. A flexible policy framework generated in consultation with indigenous peoples can support and sustain grassroots efforts, rather than impose top-down policy requirements. As Downing and Husband (2005) write:

“Formal policy may follow upon actual practical innovation. The space of the possible made available by the absence of state negative constraint may, in some circumstances, be as important as the potential for development made available by active, and positive, state intervention” (p.141).

This quote underscores the point that state enabling environments that are ‘transplanted’ from Western sources must remain flexible and involve affected individuals and groups to encourage endogenous development projects. Rather than imposing a pre-determined set of policies and regulatory conditions, such enabling environments are generated in partnership with indigenous communities. As Price and Krug (2002) write, “the major resource for enhancing the enabling environment is indigenous talent” (p.42).

Examples of such flexible enabling environments that are shaped to incorporate the specific needs of indigenous peoples are in place in several countries. For example, Molnar and Meadows (2001) describe how an Aboriginal broadcasting sector in Australia developed despite (and perhaps because of) a lack of direct involvement from the state government. Canada offers another example of flexible policy supports for Aboriginal media development (Roth, 2005). The country’s size, terrain, and relatively low population density historically justified a degree of government support for and regulation of media development. Raboy and Schtern (2010) describe how this state enabling
environment led to some of the highest levels of telephone, household cable, and satellite television penetration in the world. However, it is important to underscore how this process is historically constituted and subject to negotiations among political actors.

Government’s involvement in this work is guided by a normative conception of the ‘public interest’ that shifts over time (Mazepa, 2007; Raboy, 2005; Napoli, 2011). Historically, the ‘public interest’ included a consideration of social issues, but many critical scholars argue that it has narrowed to focus on economic values (McChesney, 2007; Calabrese, 2004). For example, Van Cuilenburg and McQuail (2003) describe three historical phases of state-supported media development policy in North America and Western Europe:

1) **Emerging communications industry policy** (until World War 2). A largely ad hoc set of measures designed to regulate and facilitate the introduction of telegraphs and telecommunications infrastructure. This phase had no coherent normative goals, and treated media and communications as a primarily technical process.

2) **Public service media policy** (1945-1980s/90s). This phase accompanied the widespread deployment of radio broadcasting. It is informed by deliberations over the assumed political and cultural impacts of radio on society. These debates generated the ‘social responsibility’ theory of media, which introduced public subsidies and regulatory policies to help develop a diverse array of content and institutions, including non-commercial and public media and universal access. After the mid-1970s, this paradigm was challenged by policies of deregulation and privatization.

3) **A new communications policy paradigm** (1980s/90s to present). Recent years reflect the emergence of a new paradigm associated with the characteristics of networked digital infrastructure and an ideological shift among many state governments more economically-oriented policy goals (I discuss this emergent policy context in Chapters 4 and 5).

State governments translate these contending notions of the ‘public interest’ into various policy instruments used to shape an enabling environment for media development. Examples of such tools include public benefit conditions associated with electromagnetic spectrum licenses, subsidies for public-service and not-for-profit media, and restrictions on the concentration of ownership of commercial media. Public and private sector interests, scholars, activists, policy-makers, and other communities of interest debate the forms these policy instruments take. Critical scholars point out these deliberations do not
reflect an ‘equal playing field’. For example, Freedman’s (2006/2008) research on media policy-making in Britain and the U.S. found that although the number of stakeholders increased over time, countervailing trends restricted and constrained the participation of these actors vis-a-vis powerful lobbyists and trade associations. More recently, Crawford (2011/2013) and Wu (2010) make similar arguments in their histories of how commercial telecommunications and cable companies secured control over networked digital infrastructure in the U.S.

These challenges are further compounded by restrictions in the scope and mandate of regulatory institutions in an increasingly converged global media environment. As a result of these conditions, many scholars conclude that state-based policymakers may undertake formal consultations with citizen and consumer advocacy groups, but their decisions are often shaped with corporate interests working ‘behind the scenes’ (Mazepa, 2007; Raboy, 2005). Yet in the face of these various challenges, historically marginalized voices do at times contribute to the formation of state enabling environments. As Roth (2005) writes: “it is a finding of my research that creative and unpredictable, even serendipitous, foundations for new media politics, policies, discourses, and practices can be discovered in the most remote hinterlands and among previously disempowered members of Canadian society” (p.220). In this context, I now turn to highlight two concrete examples of this process: the development of Aboriginal print and broadcast media in Canada. In Chapters 4 and 5, I discuss these issues as they relate to digital self-determination.

In Canada, the state historically regulated print media with a ‘light hand’. Through guarantees of freedom of speech and expression, and support for private initiative, newspaper owners enjoyed freedom from state regulation in exchange for their role in delivering information as a public service (Mazepa, 2007). Raboy and Schtern (2010) argue this approach resulted in several longstanding challenges, including high concentration of commercial ownership, lack of a sustainable community media sector, and the chronic under-representation and misrepresentation of minorities (including indigenous peoples) in media content. That said, at times the federal government did provide support for community print media institutions, including in its treatment of Aboriginal newspapers. Between 1973 and 1990, the Government of Canada’s Native
Communications Program (NCP) supported a national network of 13 Native Communications Societies. These institutions developed a vibrant Aboriginal newspaper and community radio sector (Bredin, 2001; Roth, 2005). By the mid-1980s, $3M in annual allocations to the Native Communications Societies resulted in circulation levels of 46,000 Aboriginal-language newspapers (up from 27,000 in the early 1980s) (Avison & Michaels, 2000). 53

This government support came with strings attached, and funders imposed strict program criteria, funding formulas, and systems of accountability that constrained the development of politicized media content. Unexpected budget cuts during the 1990’s also struck hard, demonstrating the precarious nature of these institutions in a commercial media environment. After the federal government cancelled the NCP’s budget without warning in 1990, commentators predicted the imminent demise of Canada’s Aboriginal press (Demay, 1993). Kainai News in Alberta and Micmac News in Nova Scotia immediately stopped publishing, and a few years later Aboriginal publications in the NWT and Yukon also closed their doors (Zellen, 1998). In total, nine of the Native Communications Societies closed down during the 1990s (Roth, 2005).

Today, several Aboriginal owned and operated newspapers continue to publish, but many have adjusted their content to attract the general audiences and advertisers required to boost circulation. For example, the national Aboriginal newspaper Windspeaker remains owned and operated by the Aboriginal Multi-Media Society, but some commentators noted it was forced to reduce its locally-situated Aboriginal content (Demay, 1993; Institute on Governance, 1999). This process parallels Curran’s (2002) discussion of the demise of the radical press in England in the eighteenth and nineteenth centuries. Conventional accounts of Britain’s newspaper industry contend that the growth of newspaper profits (drawn largely from advertising) helped newspapers free

53 These are not the first Aboriginal print publications in Canada. The Indian, published by the Chief of New Credit Reserve in Ontario between 1885 and 1886, covered local news and political issues (Buddle, 2004).
themselves from the shackles of state control and develop into independent organizations. Turning this argument around, Curran writes that in the case of England’s radical newspapers, rather than ‘liberating‘ the radical press from state regulation, commercialization increased production values (and associated costs). This required the institutions to secure increasingly higher-paying advertising that entailed a shift in content that appealed to their working-class readers in different ways than the more politicized content of the radical press. In this way “advertisers acquired a de facto licensing authority” on content, which Curran argues contributed to a shift in the subjectivity of the workers (p.96-7). I contend this historical trajectory parallels that faced by Aboriginal print media in Canada.

A slightly different history emerges in considerations of Aboriginal broadcasting. In part, these distinctions are associated with the stronger role of state intervention and appeals to ‘public service’ broadcast media. Canada is internationally recognized for its strong tradition of public consultation in broadcast policy development (Raboy, 2005). Broadcasting is more regulated than print media because it utilizes a public resource (electromagnetic spectrum, or publicly subsidized cable and satellite-based carriage infrastructure operated as a regulated monopoly). In Canada, debates over government’s role in broadcast regulation became highly politicized in the 1920s, given the rapid emergence of U.S.-based broadcasters and corresponding fears of cultural imperialism. Arguments around national sovereignty and cultural identity led to a Royal Commission on Radio Broadcasting (the Aird Commission) in 1928, which established the CBC in 1932 to produce and distribute media content reflecting a ‘Canadian culture’ and promoting national unity. To ensure this content reached all Canadians, government instated universal service requirements on the public broadcaster. These normative goals continued, and in the 1980s, the federal government mandated the CBC to distribute broadcasting content to all communities with a population of more than 500 people. The Broadcasting Act (1991) defines broadcasting as a “public service essential to the maintenance and enhancement of national identity and cultural sovereignty” (Raboy, 2010, p.104). This enabling environment played an important role in the development of Canada’s Aboriginal broadcasting sector – but only through the active efforts of Aboriginal peoples and their partners.
Until the early 1990s, broadcast policy did not reference the production or distribution of Aboriginal content. In 1991, revisions to the Broadcasting Act added language highlighting “equal rights, the linguistic duality and multicultural and multiracial nature of Canadian society and the special place of aboriginal peoples within that society” (Broadcasting Act, section 3(1)(d)(iii)). The negotiations leading to these reforms took place in the context of broader tensions associated with state-Aboriginal relations, including direct actions expressed in high profile events like Oka in 1990 (Baltruschat, 2004; Roth, 2005). In my overview of these reforms, I foreground how they provide an example of the development of a state enabling environment that, for a time, reflected and supported the self-determination of indigenous peoples.

In the 1950s, the federal government established a network of radar and microwave radio stations on remote and Northern Aboriginal territories. Aboriginal people quickly began appropriating these technologies: in 1964, two pilots flying over an Inuit community in northern Baffin Island tuned in to a station playing Inuttitut language content (Roth, 1993). In the early 1960s, the Alberta Native Communications Society became Canada’s first formal Aboriginal broadcasting organization (Fraser, 1994). At that time, indigenous peoples also began working with public sector broadcasters, including CBC Northern Service, which incorporated Aboriginal-language programming on a local and regional basis (Roth, 2013). However, when the federal government introduced universal radio and TV services over satellite through its Accelerated Coverage Plan (1974), some indigenous communities saw the one-way diffusion of southern-generated broadcasting content as a potential problem. The federal government mandated the CBC to make its content available in every community in Canada with 500 or more residents, but “most programs were in English and continued to originate in the urban south” (Smith & Brigham, 1992, para 15). Some northern indigenous peoples, concerned about the effects of this sudden influx of southern-based English and French language content, argued that it “reinforced conditions of overriding non-native authority, restricted information flow and promoted cultural replacement” (Roth & Valaskakis, 1989, p.222; Jennifer, 1998). In local-level referenda, people in communities like Igloolik voted against the introduction of satellite television until more Inuttitut-language programming became available (Soukup, 2006).
In response to these concerns, the Canadian government began funding the Native Communications Societies described earlier. By the 1970s, several community FM radio stations were in place, including CKRK (the Kahnawake Mohawk Radio Broadcasting System) and CKRZ (in the Six Nation/New Credit communities) (Smith & Brigham, 1992). Other federal initiatives that supported Aboriginal media production included the National Film Board’s support of Inuit filmmakers during the 1970s through the *Challenge for Change* program (Roth, 2013). With state funding support, community-based broadcasters and filmmakers produced local content in Aboriginal languages, delivered health and education services over broadcast infrastructure, and helped build administrative and media production expertise (Fairchild, 1998; Baltruschat, 2004). Given the success of this work, during the early 1980s the federal government increased funding for the Native Communications Societies (Jennifer, 1998; Fraser, 1994). Around this time indigenous peoples also began to advocate government and the CRTC to ensure that any new state-led communications projects did not unilaterally impose Euro-Canadian content on their communities. They argued that such developments be accompanied with state support for Aboriginal programming and media institutions (Roth & Valaskakis, 1989; Roth, 2005). In short, they began advocating for the creation of a state enabling environment to support Aboriginal media.

These activities helped the Aboriginal institutions build capacity, and also highlighted areas of common benefit and concern. Involved parties began aggregating their local efforts to support larger-scale projects and institutions. For example, in 1981 the CRTC granted a broadcast license to the national Inuit political organization, the Inuit Tapirisat, which used it to found the Inuit Broadcasting Corporation and Taqramiut Nipingat Incorporated (TNI). The Inuit Tapirisat mandated these two organizations to generate and distribute Inuititut language content across Inuit territories (Baltruschat, 2004; Meadows, 1995). While First Nations broadcasters remained less institutionally connected to the AFN, they built links among the Native Communications Societies, some of which networked clusters of local community radio stations. To extend the distribution of their content, some Aboriginal groups also began working with mainstream broadcasters. As a result, by 1983, the *Northern Broadcasting Policy* and the *Northern Native Broadcast Access Program* required the CBC to carry Aboriginal content over their carriage infrastructure. The federal government supported this initiative with $40M
in public funding over four years (1983-87), provided to the Native Communications Societies (Smith & Brigham, 1992; Savard, 1998). This infusion of support resulted in a significant increase in Aboriginal content. In 1983, the 13 Native Communications Societies produced 20 hours of language programming on radio and five hours of television programming each week (Meadows, 1995, para 25). By 1989, after the funding increases, they generated 20 hours of radio and five hours of television per week (although not all of them produced the same amount of content) (Roth & Valaskakis, 1989).

These developments also led Aboriginal broadcasting institutions to build strategic expertise in administration and advocacy. Roth (2013) describes this process as a ‘bridging discourse’ that enabled the regional Aboriginal institutions to mediate relations between unilingual indigenous communities and the federal government. Over time, their work re-framed issues of media development beyond questions of access to more politicized issues such as increased engagement in policy development. To support these goals, the indigenous groups articulated five principles to guide subsequent government policy through the Northern Broadcasting Policy (described in Baltruschat, 2004):

1. Greater access to a range of programming choices in the North;
2. Participation in the CRTC’s decisions over the form, quality, and placement of programming broadcasted in Aboriginal communities;
3. Access to broadcast distribution channels to maintain Aboriginal cultures and languages;
4. Programming featuring Aboriginal issues, and content produced by Aboriginal peoples; and
5. Regular consultations between Aboriginal representatives and government to develop broadcasting policies.

However, despite robust state support of Aboriginal content production, distribution remained a challenge in many remote communities that still lacked access to broadcasting signals and carriage infrastructure. During the 1986 Federal Task Force on Broadcasting Policy, Aboriginal groups proposed a government-funded satellite distribution system to address this gap. Forming a consortium with the CBC and
territorial governments, they gathered empirical research to support their proposal. Their report (published in 1986) found that the 13 Native Communications Societies reached an indigenous audience of some 200,000 people and produced 5,530 hours of regional radio programming and 747 hours of television programming every year (Roth, 2005). While Aboriginal broadcasters and their government champions faced critiques from non-Aboriginal broadcasters concerned about what they perceived as the unfair competitive advantages enjoyed by publicly subsidized Aboriginal media, they resolved these issues (Roth, 2005). In June 1988, the federal government committed $10 million over four years to develop a northern regional broadcast network. This initiative funded Television Northern Canada, which began broadcasting to 96 northern communities in January 1992. But despite these successes, the federal government concurrently withdrew its funding for Aboriginal content production in 1990. This greatly impacted the work of the Native Communications Societies, gutting the Aboriginal print media sector and reducing the NNBAP’s budget by 16 percent. Roth (2005) pointed out the irony of government policies that increased funding for a Northern Aboriginal distribution system while simultaneously reducing the capacity of Aboriginal media institutions to produce their own content.

After a broad public coalition emerged to protest these budget cuts, the federal government agreed to prolong funding to the Native Communications Societies for three months, during which Aboriginal broadcasters pursued alternative funding models. The newly instated Native Broadcasting Policy (1990) relaxed rules around content (lessening requirements for language reinforcement, cultural identity, and Aboriginal perspectives on issues) and advertising (allowing Aboriginal broadcasters four minutes of advertising per hour). The Aboriginal broadcasters leveraged these rules to adopt a more commercially-oriented business model. To attract advertisers, they shifted their content to attract a more general audience. By 1994, the 674 hours of radio broadcasting and 17 hours of television programming produced every week was seen by an approximate indigenous audience of 200,000 people located in 300 communities (Meadows, 1995). Aboriginal broadcasters also expanded to new regions, including southern Canada (Jennifer, 1998). This work was supported by a CRTC hearing in November 1997, when the Aboriginal groups proposed to develop their existing system into a national broadcasting network (the third in Canada, after CBC and CTV). A year
later, the Aboriginal Peoples’ Television Network (APTN) received Category 1 status from the CRTC, making it part of the basic cable package (Raboy & Schtern, 2010).\(^54\)

In 2005, the APTN’s license was renewed another seven years (Roth, 2013). The network continues to broadcast Aboriginal content. Its programs include several focused on Aboriginal issues and concerns, including traditional storytelling, language lessons, interviews with community Elders and leaders, and Aboriginal language content (Baltruschat, 2004). The broadcaster also provides funding and distribution support to indigenous producers located in countries like the U.S., New Zealand, and Australia. Today, the network continues to be funded through a hybrid of subscriber fees, government subsidies, advertising, and contributions from other funders. Roth (2013) notes that it received approximately $32.5M in mandatory subscription fees in 2011 (25 cents per Canadian subscriber through monthly fees).\(^55\)

Despite these successes, APTN also faces the challenges associated with a specialized broadcaster operating in a commercial media environment. The broadcaster made several changes to its content to attract a more generalized, global audience, and expanded its audience linguistically, culturally, and geographically. However, this development involved associated pressures to ‘mainstream’ APTN’s content, with the result that some critics argue the process undermined the organization’s unique relationship with the local indigenous communities and community-based media institutions it emerged from. For example, while Baltruschat (2004) praised APTN’s content, she notes that much of its programming is closer in substance and form to globally appealing media commodities than to locally-oriented, community-based content. She found the number of Aboriginal-language productions on APTN declined

\(^54\) This application was supported by arguments that APTN offers a window into the Aboriginal world, enriches the diversity of Canadian broadcasting, helps ensure Aboriginal people have a voice in the media, and supports local jobs, language and cultural development (Jennifer, 1998).

\(^55\) In early 2013, the APTN was engaged in a license renewal process, and requested an increase of 15 cents per subscriber to support several initiatives, including engaging Aboriginal youth, developing more national content, and increasing its digital media content.
from 2.5% in 2001 to 0.8% in 2003 (p.54). That said, Roth (2013) describes the network as continuing to service its constituent audiences well, having Northernized and indigenized Canadian television programming, along with providing indigenous views with a multicultural snapshot of their communities and interests. My field research indicates these perspectives are also reflected by people living in remote indigenous communities. Many told me they enjoy APTN’s programming, but would like more access to locally-oriented Aboriginal language content. As one local leader in Ivujivik noted:

“Community radio and television in the region [of Nunavik] has only a few hours per week to effectively talk to the people. We wish that it would be more hours, more exposure, but we do with what we have...We would like to fight for our heritage and culture. Because we are going to start losing it, if we’re not careful” (interview 4045).

Another challenge that APTN faced relates to content distribution. Rather than the CBC’s mandate to broadcast to all communities of more than 500 people, the broadcaster cannot justify expenditures to extend its distribution infrastructure to reach audiences that lack access to digital cable and satellite signals. As a result, in the mid-2000s a significant portion of the on-reserve Aboriginal population (approximately 35 percent of Aboriginal people in Canada) could not yet access APTN programming (Roth, 2005). Since then, technical innovations and infrastructure upgrades undertaken by telecommunication and cable companies made this media content more available, but it is important to note these developments took place independent of APTN. That is, Aboriginal institutions did not develop, nor do they own or operate, the carriage infrastructure for APTN’s media content. Furthermore, Roth (2013) suggests that Aboriginal broadcasting is no longer the most powerful or only tool of cultural and informational dissemination, and many indigenous peoples – particularly youth – turn to digital media instead. Despite these challenges, APTN continues to play a valuable role in supporting the production and distribution of Aboriginal content, and is considering increasing its digital media output and presence to match these emergent trends. A speech on September 12, 2009 from the CRTC celebrating APTN’s 10th anniversary sums up the organization’s many achievements:
“[M]ore than just earning praise and the recognition of your peers, APTN has truly advanced the goals of the Broadcasting Act to preserve and foster the cultural identity of Aboriginal peoples, and promote their special place within Canadian society” (Cugini, 2009, para 4).

As of spring 2013, APTN faces a challenging future. Its content remains popular, particularly regarding news and information on Aboriginal issues. For example, traffic to the network’s website spiked during #IdleNoMore (by almost 4,000 per cent during the movement’s early days) (Ladurantaye, 2013). At the same time, the network is still unable to support itself through commercial advertising alone, and ran a $3.6M deficit in 2012 (more than the $2.7M it earned through advertising) (ibid). During the CRTC’s review of basic cable service in 2013, APTN stated that it requires an increased subsidy of 40 cents (from 25 cents) per household through mandatory subscription fees in order to continue to broadcast Aboriginal content, give voice to Aboriginal youth, and expand its digital media operations. At time of writing (spring 2013), the CRTC had yet to release its decision on this issue, and so the future of APTN’s subsidies remains uncertain.

3.3. Conclusion

In this chapter I described the theoretical and normative basis of digital self-determination. I argued that to challenge the unequal social relations associated with past and continuing impacts of colonialism, digital self-determination must support place-based, sovereign indigenous communities and their inherent, group-differentiated rights. The United Nations Declarations on the Rights of Indigenous Peoples (UNDRIP) and its four categories of participatory rights offers one blueprint for how indigenous peoples and the governments of the states they reside in might work together to decolonize existing economic and political structures. Although it is a set of guidelines rather than a binding document, the UNDRIP provides suggestions for states to undertake reforms that support the laws, practices, beliefs, and institutions of indigenous peoples. It contends that indigenous peoples are best positioned to support their own needs and aspirations, and advises state governments to build an enabling environment to support their institutions, laws, and policies.
My discussion of state-Aboriginal relations in Canada presented some of the challenges indigenous peoples face in securing the right of self-determination in practice. Canada’s historic and continuing experience of colonialism, expressed in the ongoing economic, political, social, and cultural marginalization of indigenous peoples, shapes and constrains these activities. Examples of these challenges include the persistence of resource extraction projects alongside a lack of compensation and consultation, and de jure support for Aboriginal and treaty rights alongside the state’s attempts to dictate their terms and scope. In this context I discussed how indigenous peoples continually resist these processes, and persist in asserting their self-determination. They continue to practice their own laws, customs, and traditions, and over time founded a variety of institutions to secure increased control over the decisions that impact their lives.

My consideration of Aboriginal media development offered a concrete example of how this process unfolded in the context of struggles over cultural representation. I argued that over time, colonial media that was produced and disseminated by mainstream organizations gave way to a multiplicity of self-determined indigenous media projects supported by a state enabling environment of subsidies and regulatory conditions. Over time, community-based print and broadcast institutions networked to form larger associations that spanned the country, enriching the mainstream public sphere in the process. However, as government withdrew its support, economic challenges threatened to undermine the community-based nature of these institutions, a process exacerbated by the specific characteristics of the political economy of Aboriginal media. At present, while Aboriginal print and broadcast institutions continue to enrich Canada’s media system and provide community-specific content to their diverse audiences and readers, they face continual pressures to commercialize and ‘mainstream’ their content. As a result, these institutions negotiate a precarious development path situated in the uncertainty of a globalized, commercially-oriented media environment.

This history offers important lessons for socio-technical institutions engaged in projects of digital self-determination. As indigenous socio-technical institutions develop networked digital infrastructures and online applications, they face similar economic, political, and cultural pressures. Given its role in enabling indigenous peoples to control
their involvement in the network society, the ownership and control of these infrastructures and applications becomes a key site of negotiation. In the next chapter, I outline the access divides facing rural and remote indigenous communities. Situating my analysis in the history of the Northern Indigenous Community Satellite Network (NICSN), I describe how indigenous socio-technical institutions are addressing access divides through an enabling environment of public and private sector support. Situated in the long-term historical trajectory described in this chapter, I argue that this process reflects a similar dialectic of colonialism and self-determination. In short, it reflects a vibrant, if precarious, example of digital self-determination.
4. Access Divides and Remote Aboriginal Peoples: Canada’s Enabling Environment for Digital Self-Determination

The ways that remote indigenous peoples in Canada connect to networked digital infrastructures are profoundly linked to ‘offline’ contexts, including the persistence of colonialism and their assertions of self-determination. Research on the network society demonstrates that marginalized communities and individuals are increasingly left outside of transnational flows of goods, services, resources, information, jobs, and technologies (Castells, 2009/2010a; Van Dijk, 2005). Scholars like Crawford (2011/2013) and Wu (2010) show how the political economy of networked digital infrastructure development is shaped by powerful corporate and state interests. In this context, those nodes valorized as ‘valuable’ by dominant actors attract various forms of capital, while those who are not face exclusion and structural irrelevance (Tongia & Wilson, 2011). In short, unequal social relations shape the formation and persistence of access divides in the emergent network society (Raboy & Schtern, 2010; Schiller, 2007; Nakamura & Chow-White, 2012; Smeltzer & Paré, 2011). In this environment, indigenous peoples are interacting with processes of networked digital infrastructure development in ways that reflect the colonialism/self-determination dialectic described in previous chapters. This process demonstrates one facet of digital self-determination: how indigenous peoples leverage state enabling environments of supportive and regulatory policies to bridge the digital divides facing their communities.

Most literature on access divides presumes that a material connection to the network society is inherently beneficial (Graham, 2011). However, while physical or material access is required to connect, integration is not in and of itself adequate. Indigenous peoples have a historically ambivalent relationship to the diffusion of newly available information and communications technologies, and in several cases rejected them until they secured a measure of control over their appropriation. In Chapter 3, I
situated these negotiations with reference to a broader history of activities in fields like law, politics, and media development. I focused on indigenous efforts to establish and utilize a state enabling environment to support their print and broadcast media institutions. In line with this historical trajectory, in this chapter I argue that indigenous peoples are now leveraging the state enabling environment to secure control of networked digital infrastructures. Working from conditions of scarcity, indigenous peoples in Canada are resisting the reproduction of colonial social relations and working to build their own digital futures. Longford, Clement, Gurstein and Shade (2012) write that “many communities at risk of being excluded from the information society are far from passive spectators to socio-technical transformation” (p.4). In this chapter, I outline how the endogenous development projects undertaken by indigenous peoples are the result of both creative agency generated at the ‘margins’ of the network society, and the flexible enabling environment of regulatory conditions and public subsidies that supports this work.

Beginning with an overview of the access divides currently facing remote and rural indigenous communities in Canada, I analyze the state enabling environment to help bridge them. I describe the suite of funding initiatives that began with the Connecting Canadians policy agenda and extends to the present through initiatives like the First Nations Infrastructure Fund and Broadband Canada. I also provide an overview of the regulatory conditions shaping these projects, and specifically those associated with satellite-based connectivity services (given their role in the Northern Indigenous Community Satellite Network). My analysis of these policy frameworks outlined how over time, an enabling environment that supported the development of community-based indigenous socio-technical institutions shifted to one that supported infrastructure projects undertaken by private sector telecommunications and cable providers. I contend that these changes undermined the efforts of indigenous peoples to generate their own socio-technical institutions and connect to the network society on their own terms. In

56 For examples of recent work exploring the state enabling environment for networked digital infrastructure, see Helberger (2011) and Hitchens (2011).
short, although existing research points to the efforts and desire of indigenous peoples to connect, the lack of a state enabling environment to support and sustain this work circumscribes their efforts, and so threatens to miss an opportunity to decolonize our digital future.

4.1. Access divides and broadband infrastructure diffusion

Access to networked digital infrastructures is unevenly distributed around the world. In his classic work on the ‘diffusion of innovations’, Rogers (2003) identified several phases in the adoption of new technologies. He argued they diffuse throughout a population in a bell curve, starting with slow uptake among early adopters, followed by rapid adoption among the majority, and ending with ubiquitous diffusion. Puzzled by the continuing persistence of access divides in a context of seeming abundance, some researchers challenged Rogers’ model for failing to incorporate the dynamic nature of technologies and social relations (Van Dijk, 2005). But despite these critiques, many researchers continue to measure the diffusion of networked digital infrastructure, drawing on data like connectivity penetration statistics or access to physical devices like computers or mobile phones. This research provides a quantitative baseline from which to measure the emergence and persistence of access divides over time. For this reason, I reference several diffusionist studies here to establish evidence of clear and ongoing access divides faced by remote and rural indigenous communities in Canada.

Van Dijk (2005) identified five reasons why it is inappropriate to measure digital access divides using a model derived from Rogers’ work. First, it employs an unclear definition of what constitutes the technology being measured, failing to capture the modular, continually shifting nature of digital ICTs. Second, the model applies a methodology designed to measure the ‘eyeballs’ of broadcast media audiences, rather than the fragmented, overlapping ways that users engage with digital media. Third, Rogers measured technological diffusion according to disparate, self-contained processes of appropriation (such as ownership of a computer or email address), rather than the abilities of people to use or afford ICTs. Fourth, Rogers employs a deterministic approach to the stages and rates of diffusion, presuming it proceeds in a linear, predictable fashion. Fifth and finally, Rogers conceives of diffusion across whole populations, rather than considering how partial or targeted groups might appropriate technologies in different ways, for different reasons.
Most quantitative research on the diffusion of networked digital infrastructure deploys a binary consideration of access (connected/disconnected). Scholars like Graham (2011) map this diffusion onto geographic terrains, arguing: “The concept of a ‘digital divide’ should thus be pluralized, localized and grounded in more appropriate spatial frameworks” (p.220). In the early 2000s, researchers identified emergent geographic digital divides both between and inside nation-states (Norris, 2001; Castells, 2010a; Hudson, 1998). These geographic access divides not only persisted over time, but in many cases appear to be growing (Van Dijk, 2005). As the pace of socio-technical development increases in many countries, those individuals and communities left behind are becoming further marginalized, particularly in a context of declining state enabling environments and the rise of commercial practices that ‘redline’ unprofitable network customers (Danna & Gandy, 2002; Tongia & Wilson, 2011). A 2011 study conducted by the International Telecommunications Union (ITU) found continuing access discrepancies between so-called developed and developing countries, and also between urban and rural regions inside nation-states (Johnson, Zhelava, Belding & Parks, 2012). Recent research confirms the persistence of rural/urban divides developed countries, including in the U.S. (Crawford, 2011) and Canada (Imatiuk, 2011; Fiser, 2010a). Research also demonstrates clear digital divides between racialized populations in North America, where Indigenous peoples, Blacks and Hispanics all face lower access rates compared to Whites (Servon, 2002; Van Dijk, 2005; Nakamura & Chow-White, 2012; Morris & Meinrath, 2009).

In Canada, rural and remote indigenous communities face significant access divides. Typically explained as arising from a lack of private sector investment, this condition also reflects the persistence of the colonial processes I described in Chapter 3. For example, while these communities remain disconnected from the network society (among other core infrastructures), resource extraction activities undertaken by highly profitable

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58 This statement is tempered with a recognition of the lack of available connectivity data from rural and remote Aboriginal communities (Fiser, 2010a). No conclusive or comprehensive connectivity data archive exists, and researchers working in this area face difficulties in reaching isolated communities to collect and verify data. Organizational challenges further restrict local data-gathering efforts.
corporations (many of which build their own infrastructures) continue in their territories. Recognizing the need to address these challenges, the Government of Canada measures these access divides, utilizing a 2001 definition of ‘broadband’ as a 1.5Mbps symmetrical connection (National Broadband Task Force, 2001, p.10). (In 2011, the CRTC established targets of 5 Mbps downstream / 1Mbps upstream by 2015, but this so-called “15 by 15” rule is not yet linked to any regulatory requirements or policy initiatives (Hudson, 2011a). Furthermore, according to one interviewee, the Broadband Canada program defined “broadband Internet” speed as 1.5Mbps download and 384kbs upload (not symmetrical), reflecting a regression in the application of this standard in government policy (interview 4034)).

Based on this 1.5Mbps standard, academic and government researchers consistently find evidence of a demonstrable access divide between typically densely populated, urban non-Aboriginal communities, and typically rural and remote Aboriginal ones (Tapia, Powell, & Ortiz, 2009; O’Donnell, Milliken, Chong & Walmark, 2010).59 Indian and Northern Affairs Canada (now Aboriginal Affairs and Northern Development Canada or AANDC) found that in 2002, only 12% of Aboriginal communities could access broadband (1.5Mbps) Internet services, compared to 20% of all communities in Canada (INAC 2002). The agency also found discrepancies between regions in Canada (high levels of diffusion in PEI and Yukon; low levels in Nunavut, NWT and Alberta) and among different-sized communities (larger communities had faster and cheaper access to connectivity services than smaller ones). The report’s authors concluded “it is safe to assume that a viable business case may never be

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59 Access divides also persist among Canada’s general population. In 2005, Canada was among the top six OECD countries in broadband subscriber rates, with 19.2 subscriptions per 100 Canadians (Raboy & Schtern, 2010). In December 2008, OECD statistics indicated that Canada remained a leader in broadband penetration (Shade, 2010). However, in recent years these successes stalled, and by December 2009 broadband uptake among Canadians dropped to 9th among OECD countries (Middleton, 2010). Researchers also identify clear internal access divides between Canada’s rural and remote regions, or faced by households headed by lower-income, less-educated and older Canadians (Longford, Clement, Gurstein & Shade, 2012; Shade, 2010).
made for the extension of Internet services” to remote indigenous communities, and suggested government intervention was necessary to address the problem (p.1).

In 2006, Industry Canada conducted a follow-up broadband mapping exercise using the same 1.5Mbps standard, and found evidence of continuing access divides. The National Broadband Map aggregated broadband access data (defined as 1.5Mbps) into 64 Geographic Service Areas based on Statistics Canada’s 2006 Census Divisions. Fiser (2010a) used this data to map broadband deployment across 866 occupied First Nations census subdivisions, 52 Inuit communities (in Inuvialuit, Nunavut, Nunavik, and Nunatsiavut) and 60 Northern municipalities. He concluded that just over half (59%) of these communities could access some form of Internet infrastructure (data transmission rates of 256kbps or higher).

Finally, in 2011 the CRTC determined that 80% of areas with population densities lower than 400 persons per square kilometre (which includes many rural and remote indigenous communities) can access 1.5Mbps Internet service, but only 39% can access transmission rates of 5Mbps (CRTC 2011a). At present, the Government of Canada continues to monitor diffusion in rural and remote indigenous communities. It still uses the 1.5Mbps standard (which AANDC acknowledges may soon be insufficient). Furthermore, neither Industry Canada nor the CRTC presently differentiate between advertised throughput speeds and actual throughput speeds. Research by the Federal Communications Commission in the U.S. determined that throughput speeds during peak usage times are around half of the advertised rates (interview 4034).60 AANDC monitors access speeds through measuring several variables, including: capacity, latency, reliability, capital costs, operational costs, last-mile (local) networking technology, and backhaul (transport) infrastructure. The agency presents aggregated data gathered in May 2010 in an interactive

60 This figure is based on numbers provided in the National Broadband Plan in the U.S., which states that the median advertised broadband ‘up to’ speed in that country is 7Mbs, but the median actual throughput is 3.1Mbs (Federal Communications Commission, 2010c, p.21).
map that also shows planned infrastructure builds to 2012. While it is outside the scope of my dissertation, available data indicates that Canada’s urban Aboriginal peoples also face digital divides. For example, Thiessen and Looker (2008) found despite high availability of broadband in cities, a gap exists between Aboriginal and non-Aboriginal urban residents.

This clear and ongoing evidence of access divides in remote and rural indigenous communities provided a strong empirical case for federal government support for networked digital infrastructure development. In the late 1990s and early 2000s, this project measured connectivity at the First Nation community level (measured at the point-of-presence through backhaul to household, and so does not take into account factors like the affordability of household connections). Figure 2 represents this map, the original version of which is available here: http://www.aadnc-aandc.gc.ca/eng/1352214337612/1353504776242.

Figure 2: AANDC Connectivity for Aboriginal and Northern Communities in Canada: Map of Ontario First Nations (captured April 12, 2013)

This clear and ongoing evidence of access divides in remote and rural indigenous communities provided a strong empirical case for federal government support for networked digital infrastructure development. In the late 1990s and early 2000s, this

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62 This data was researched, collected and validated by multiple stakeholders, including federal departments, provincial ministries, private sector and First Nations organizations. While my dissertation focuses on community-level rather than household-level access, I will note that available research determined that access costs for residential connectivity are higher in Aboriginal than non-Aboriginal communities (Fiser, 2010a; Fraser, 2007; Imatiuk, 2011). People in communities I visited told me about the high costs they paid for residential Internet access and for devices like computers, networking equipment, and tablets.
evidence merged with the federal government’s political will to push a comprehensive national agenda to connect all Canadians. These conditions led government to create a state enabling environment of regulatory conditions and public subsidies designed to bridge these access divides. Importantly, this enabling environment allowed indigenous socio-technical institutions as well as private sector entities to apply for capital and operational funding. These opportunities led indigenous peoples to build their own endogenous networked digital infrastructure. In the remainder of this chapter, I describe the formation of this enabling environment, and some of the funding initiatives and regulatory conditions associated with it. This sets the stage for Chapter 5, which provides a case study of an indigenous development project that leveraged these policy instruments: the Northern Indigenous Community Satellite Network.

4.2. State funding initiatives: from Connecting Canadians to Broadband Canada

The Government of Canada’s networked digital infrastructure development policies are guided by its recognition that access divides persist in rural and remote regions in part due to a lack of private sector investment (Longford et al., 2012). Companies have little incentive to develop and manage networked digital infrastructure in remote, sparsely populated regions, given the projected low returns on investment and high capital costs (Bredin, 2001; CRTC, 2010; McIver, 2010; Wilson, 2008). Remote indigenous communities in Canada are often located far from existing transportation, electrical, and telecommunications infrastructure, and in regions like Nunavut and Nunavik, little terrestrial infrastructure exists at all. There is also at present no regulatory requirement for incumbent telecommunications companies to provide broadband (1.5 Mbps) access to these regions. In short, high sunk costs, combined with an absence of regulatory pressure, contributed to a lack of networked digital infrastructure development in many rural and remote indigenous communities (Fiser, 2010b; Mignone & Henley, 2009; Imatiuk, 2011).

In some cases, these conditions led to the emergence of self-organized indigenous socio-technical development projects. In this section, I illustrate how these
initiatives are supported by public funding. Around the world, state intervention in networked digital infrastructure development typically focuses first on building core infrastructure, before addressing access gaps in targeted regions and populations, and ending by filling any remaining penetration gaps (Kim, Kelly & Raja, 2010). In Canada, the federal government’s activities during the 1990s and 2000s followed this general trajectory. Consolidated under the Connecting Canadians initiatives, this work was administered by Industry Canada’s Information Highway and Applications Branch (IHAB). I learned about IHAB’s mandate from one of its senior administrators, who told me:

“We believed you cannot live in 21st century without access to Internet and broadband. And it’s been proven we were right. Because you need access. Whether you’re in mining, in forestry, in remote communities – even if you are in the fishing industry, you’ve got to have access...There is need for humanity to be connected, without a doubt. It’s a question of who provides service, who pays, and what government’s role is” (interview 5061).

To determine answers to these questions, the Government of Canada convened a National Broadband Task Force in 2001. Their report, titled The New National Dream: Networking the Nation for Broadband Access, proposed two approaches to address persistent access divides in rural and remote communities: the Infrastructure Support Model and the Community Aggregator Model (Industry Canada, 2001). The Infrastructure Support Model offered subsidies to incumbent service providers to extend infrastructure to unserved and underserved regions. This approach involved an exogenous development trajectory driven by the incumbent telecommunications providers that also managed resulting connectivity services. Critics argued that along with failing to address the needs of user populations, this proposal overlooked the social dimensions of broadband adoption (Gangadharan and Byrum, 2012). In some regions it was applied in, it also resulted in insufficient service levels over time: once (subsidized) infrastructure was built, there was little incentive for the profit-oriented service providers to maintain and operate it (unless government provided ongoing operational subsidies) (Imaituk, 2011). For example, in Decision 2010-274 (Northwestel Regulatory Framework Hearing), the CRTC singled out Northwestel for failing to provide its Basic Service Objective in the Yukon territory, despite receiving significant public subsidies to do so since the 1970s (CRTC 2011b). In its investigation, the CRTC determined that between
2007 and 2011, Northwestel received more than $20M annually to support service provision in remote communities. However, while the company’s service and infrastructure to remote customers deteriorated, its annual income from operations nearly doubled.

The Task Force’s Community Aggregator Model took a different tack. Targeting network end-users, it proposed that government make subsidies available for not-for-profit regional or community intermediary organizations to manage networked digital infrastructure development projects themselves. Ideally, this model aimed to drive an endogenous development process that supported local or regional ownership, management, and control of resulting infrastructure (Fiser, 2010b). It was partly inspired by historical examples of rural and remote telephone development cooperatives in Canada and the U.S. (Babe, 1990). I suggest it also reflects an approach to digital self-determination that supports projects grounded in place-based indigenous communities. To make this case, I discuss several examples of how indigenous socio-technical institutions operationalized this model in Chapter 7. Briefly, these community-based institutions brokered partnerships between network users and service providers, aggregating demand and revenues from network anchor tenants (often public service delivery organizations) and residential/business Internet customers to construct a viable business case. This model theoretically allowed local governments more involvement in decision-making and long-term operations and maintenance, and in some cases stimulated economic development opportunities. However, it also required the under-resourced not-for-profit institutions to demonstrate sufficient market demand and manage complex funding arrangements and partnerships themselves (Fiser, 2010b).63

The concrete policy initiatives that IHAB developed under Connecting Canadians drew on both development models. Between 1998 to 2006, the branch provided close to

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63 The indigenous socio-technical institutions I focus on in this dissertation not only attempted to operationalize this Community Aggregator model, but also helped articulate it, as seen in KO-KNET’s involvement in the Task Force and projects like the K-NET Satellite Bandwidth Third Party Management Proposal (2001).
$600M in six broadband initiatives: the Community Access Program (CAP); SchoolNet/First Nations SchoolNet; Library-Net; VolNet (aimed at charitable and not-for-profit organizations); SMART Communities; Canadian Content On-line; and Government Online. (At the end of this section I describe associated infrastructure funding initiatives, including Broadband for Rural and Northern Development Pilot Program (BRAND) and Broadband Canada). Many of the Connecting Canadians initiatives deployed the Community Aggregator model, allowing community intermediary institutions a degree of flexibility to shape program delivery (Fiser, 2010b). For example, the Community Access Program (CAP) granted funding for public Internet access sites. Between 1995-96 and 2006, approximately $337 million was invested in the program (Moll, 2012). Local institutions applied to CAP for up to $30,000 to pay for equipment, staff and connectivity costs, and provide training and skills development. Some of these local projects worked with intermediary institutions to aggregate funding, administration, and development support across a region. By 2003, 499 CAP sites existed in First Nations, often in public institutions like schools or community centres. While usage levels varied, several reports describe the positive impact of these sites in providing access, training, and economic development opportunities (Pacific Community Networks Association, 2006). In late 2010, I interviewed the CAP administrator in Nunavut to learn how the program worked in that region’s 25 (primarily Inuit) communities. The regional CAP program provided connectivity services to 21 of Nunavut’s 25 communities via satellite-based infrastructure provided by Qiniq or NetKaster.64 I learned that CAP sites are so popular that administrators have to limit Internet access to 15 minutes. Along with surfing the Internet, people use these sites to take ICT courses, access technical resources, and even set up businesses. For example, I heard some people use them to work as

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64 While CAP sites located in a government-funded organization accessed bandwidth at no extra charge through subsidies from the territorial government, those in community service buildings like drop-in centres purchased bandwidth from the commercial service providers (the highest service plan cost around $450 a month). After monthly bandwidth allocations associated with commercial service plans were used up, access scaled down to dial-up speeds, which happened at least a few days a month at many sites (interview 5065).
photographers or video editors for the Igloolik-based film and digital media production company, IsumaTV (interview 5065).

Despite its popularity and success across Canada, the CAP program faced ongoing challenges to its long-term sustainability. By 2004, IHAB narrowed its funding and mandate, refocusing to target ‘at risk’ communities (including Aboriginal peoples) (Pacific Community Networks Association, 2006; Smith, 2008). After 2007-2008, CAP no longer appeared in Industry Canada’s annual departmental performance reports, and in the 2009-2010 fiscal year, government transferred funds allocated for the program from the $225 million Broadband Canada: Connecting Rural Canadians program (rather than from Industry Canada’s Regional Operations branch). This reflected a budgetary shift towards funding CAP as a short-term project, rather than an ongoing service (Moll, 2012). In March 2010, CAP administrators located less than 25 km from a public library received letters from Industry Canada terminating their funding (Middleton, 2010). After a public outcry, Industry Canada Minister Tony Clement renewed funding another year, but federal funding was finally withdrawn in 2012. As of early 2013, in some regions (including Nunavut), territorial governments (or other funders) continue to support the program.

Another Connecting Canadians initiative that benefitted remote First Nations (but not Inuit) communities was SchoolNet. This initiative funded connectivity, equipment, content development, software, and helpdesk services in schools across Canada. In 1995, IHAB launched a First Nations targeted component of SchoolNet called First Nations SchoolNet (FNS) (Carpenter, 2010). At its peak, FNS supported some 600 First Nations schools and learning centres, 5,000 teachers, and 80,000 students (AFN Chiefs Committee on Economic Development, 2010). The program also supported capacity building in indigenous socio-technical institutions. In 2002, IHAB decentralized

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65 While First Nations schools are under federal jurisdiction, AANDC did not have the mandate or budgetary capacity to support connectivity in the mid-1990s, and so IHAB took on that responsibility (Fiser, 2010b).
FNS program administration to a network of First Nations regional management organizations that gained control over program design and delivery. These organizations also set up a national network that regularly convened to discuss challenges, best practices, and strategic development.

As was the case with CAP, despite positive evaluations from government funders and support from user communities, FNS faced continual funding challenges. By March 2004, annual funding levels for the general SchoolNet program decreased from $45M to $25M, and in fiscal year 2005-06 its budget was further cut in half. Of the remaining budget of $12.5M, around half ($6.68M) was allocated to FNS (Indian and Northern Affairs Canada, 2009). With funding scheduled to end after fiscal year 2006/07, FNS was transferred to AANDC’s jurisdiction (government saw it as an education service rather than an economic development initiative) (interview 5061). AANDC renamed the program New Paths in Education, and a departmental reallocation in fiscal year 2007-2008 brought funding levels up to $9.78M. In fiscal year 2008/09, funding dropped to $6.9M (Indian and Northern Affairs Canada, 2009). At present, the long-term sustainability of New Paths in Education remains uncertain. The national network of FNS regional management organizations do not meet as regularly as they once did, though many remain in contact through the AFN’s ICT Working Group (described in Chapter 6).

Alongside Connecting Canadians, the federal government launched several short-term funding initiatives targeted at infrastructure development. These included the Broadband for Rural and Northern Development Pilot Program (BRAND), National Satellite Initiative (NSI), and Broadband Canada. These initiatives encouraged private-public partnerships between community intermediary organizations and incumbent telecommunications providers. For example, BRAND was a $105M, three-year initiative. Its first round of funding in October 2003 provided $44M to support infrastructure development in 433 rural, remote and First Nations communities; the second round (in May 2004) provided an additional $35M to support 116 First Nations (Smith, 2008). BRAND funded technology-neutral projects, and dispersed funds according to the merit of submitted proposals (CRTC, 2005). It became the blueprint for several subsequent broadband initiatives funded by Industry Canada. For example, Broadband Canada, launched in 2009, pledged $225M over three years as part of the federal government’s
economic stimulus package. As of late 2012, this initiative had provided approximately $122M to fund 84 public-private partnerships focused on networked digital infrastructure development (AANDC, 2012a). The initiative required half of a project’s matching funds to come from non-federal sources (with First Nations eligible for a higher federal contribution) (Industry Canada, 2010a; Shade, 2010). In many cases, private sector partners (such as incumbent service providers) assumed ownership, operations, and maintenance of the infrastructure built through these publicly funded projects. That said, some examples do exist of regional and local indigenous socio-technical institutions retaining ownership and control of elements of Broadband Canada projects.

Parallel to, but institutionally separate from, these Industry Canada initiatives is an infrastructure development fund administered by AANDC. Available to First Nations (not Inuit) communities since 2009, the First Nations Infrastructure Fund (FNIF) is a 5-year, $131M component of the broader Building Canada initiative. In practice, it often combined projects associated with Broadband Canada.66 Connectivity became part of the FNIF portfolio partly given its necessity in supporting remote water treatment plants. This reflects AANDC’s formal position that connectivity is required for First Nations governments to support services like e-commerce, remote banking, e-health, online education, and program reporting (interview 5067). According to the Government of Canada: “it is imperative that the majority of Canada’s Aboriginal communities have access to reliable high-speed internet”, particularly as more government services and businesses move online (AANDC, 2012b).

FNIF’s proposal-based funding model follows that established in initiatives like BRAND and Broadband Canada. While this approach allows applicants some flexibility,

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66 FNIF did not initially address broadband, but began as a proposal-driven program aimed at improving on-reserve infrastructure (INAC, 2007). There is no legislative or legal obligation for the federal government to fund infrastructure in First Nations. However, since the 1960s AANDC has funded areas like water/wastewater, electricity, roads/bridges, and capacity-building. The majority (75%) of FNIF’s annual budget of approximately $1B is used for ongoing administrative and operations and maintenance costs, leaving few funds for new projects, which partly explains its close linkages with Broadband Canada (interview 5067).
it also tends to encourage short-term, discrete projects rather than long-term strategic growth (interview 5063). All FNIF projects involve public-private partnerships between government, private sector entities, and a technical or political First Nations organization. Later, I discuss several examples of how the NICSN partners leveraged *Broadband Canada* and FNIF funding in their regions. Table 4 provides an overview of several FNIF projects (as of late 2012).

**Table 4: Some FNIF Projects and Regional Partners as of Winter 2012**

<table>
<thead>
<tr>
<th>Province</th>
<th>Partners</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic</td>
<td>Membertou Mi'kmaw Kina'matnewey with support from Atlantic Policy Congress and AANDC</td>
<td>To connect 27 First Nations to Fibre optics <a href="http://firstnationhelp.com/fibre/">http://firstnationhelp.com/fibre/</a></td>
</tr>
<tr>
<td>Quebec</td>
<td>First Nations Education Council, Health Canada and AANDC</td>
<td>To connect 20 First Nation communities to fibre optics [<a href="http://www.cepn-f">http://www.cepn-f</a> nec.com/projects.aspx](<a href="http://www.cepn-f">http://www.cepn-f</a> nec.com/projects.aspx)</td>
</tr>
</tbody>
</table>

67 FNIF is managed by AANDC’s National Office, which delegates project management to regional offices. AANDC currently prioritizes infrastructure builds (fibre optics when feasible), and plans to examine issues of network sustainability and capacity in the future (interview 5067).
4.3. Regulatory conditions: ‘Public Benefits’ and satellite systems

Along with these funding initiatives, Aboriginal socio-technical institutions leveraged several regulatory conditions associated with Canada’s satellite industry. These conditions are linked to the socio-technical configuration utilized by satellite transmission systems. Satellite systems consist of two components: ground infrastructure and space segment. The satellites (colloquially referred to as ‘birds’) I discuss here are geostationary orbit (GEO) systems that occupy a fixed position on the so-called geostationary arc, a slice of orbital space in the earth’s atmosphere. Since satellites utilize a public resource (electromagnetic spectrum) and access a limited number of delegated orbital slots, they are regulated by state governments. While many of these regulations are technical in nature (requiring the use of standardized protocols and so on) state governments also use them to meet defined policy objectives (Industry Canada, 2012). In Canada, these include a 2% public benefit ‘tax’ on satellite revenues, or the provision of satellite services to underserved regions.

In this dissertation, I focus on C-band spectrum, because it is the type of space segment utilized by the Northern Indigenous Community Satellite Network (the focus of my field research). In Table 5, I compare C-band spectrum with KU-band and KA-band. Transmission capacity on a satellite is organized into left and right polarized signals (A and B), each divided into various transponders. (A transponder is one complete microwave channel of transmission). For the C-band satellites I discuss here, a total of 36 MHz of usable frequency is available per transponder (not including 8 MHz reserved

68 GEO systems experience longer transmission delays (latency) than low earth orbit (LEO) systems, but also enable fixed ground antennas that access space segment from anywhere inside a transmission footprint. LEO systems require expensive tracking Earth stations and multiple satellites to provide continuous service. GEO systems orbit synchronous to the earth’s rotation, and so appear stationary from earth.
as a ‘guard band’ against interference). Satellite providers sell this ‘raw’ transponder space – called space segment – by the MHz on a contract term to network managers.

**Table 5: Comparing Satellite Frequencies**

<table>
<thead>
<tr>
<th></th>
<th>C-Band</th>
<th>KU-Band</th>
<th>KA-Band</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Years</strong></td>
<td>Introduced in 1970s</td>
<td>Growth started in 1980s</td>
<td>Growth started in 2000s</td>
</tr>
<tr>
<td><strong>Frequency range</strong></td>
<td>3.7-4.2GHz</td>
<td>10.95-11.2GHz</td>
<td>17.7-21.2GHz</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>Minimally affected by</td>
<td>Small dishes</td>
<td>Small dishes (2 – 5’ diameter)</td>
</tr>
<tr>
<td></td>
<td>atmospheric conditions</td>
<td></td>
<td>Short wavelengths allow for</td>
</tr>
<tr>
<td></td>
<td>Large footprint</td>
<td></td>
<td>multiple spot beams that</td>
</tr>
<tr>
<td></td>
<td>Reliable</td>
<td></td>
<td>concentrate satellite power</td>
</tr>
<tr>
<td></td>
<td>Low-level ‘noise’ interference</td>
<td></td>
<td>into small geographic area</td>
</tr>
<tr>
<td></td>
<td>Equipment availability</td>
<td></td>
<td>Does not interfere with</td>
</tr>
<tr>
<td></td>
<td>Inexpensive equipment due to</td>
<td></td>
<td>terrestrial wireless</td>
</tr>
<tr>
<td></td>
<td>competition and high-volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>production for global market</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Challenges</strong></td>
<td>Large dishes (7.5 – 24+ foot</td>
<td>Atmospheric effects,</td>
<td>Shortest wavelength, so most</td>
</tr>
<tr>
<td></td>
<td>diametre)</td>
<td>particularly in tropics and</td>
<td>affected by atmospheric effects,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rain/snow face</td>
<td>rain/snow fade</td>
</tr>
<tr>
<td></td>
<td>Same frequency as terrestrial</td>
<td>High power requirements</td>
<td></td>
</tr>
<tr>
<td></td>
<td>microwave radio relay (need</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>to restrict power to avoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>interference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shared with terrestrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>radio services so chance of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>interference (addressed by</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>‘shielding’)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market conditions</strong></td>
<td>Mature in most markets</td>
<td>Growing rapidly in most world</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>regions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mature in North America and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Europe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Major consumer broadband</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>services in N Am and Europe</td>
<td></td>
</tr>
</tbody>
</table>

Ground infrastructure in a satellite system consists of a network operations centre (NOC) and associated earth stations. At the operations centre, network managers process space segment into usable bandwidth and distribute it to various user nodes. At these

---

69 Every satellite is custom built, and may have a varying payload of C-band, Ku-band, Ka-band, S-band, or X-band frequencies, depending on its intended purpose. The number of MHz per transponder also varies, usually in 36, 56, or 72 amounts, although some Ka-band transponders on new satellites go as high as 500 MHz (interview 4034).
nodes, local cable, fibre optic, or wireless networks connect points of service like telephone switching offices and households.\textsuperscript{70} Finally, a physical facility (head end) houses earth station equipment, supplies power, and controls temperature and humidity. In the NICSN network, these facilities range from Nunavik’s custom-built tech shacks to ad hoc structures set up in spare rooms (or even bathrooms). The technicians that take care of earth stations in remote and isolated communities face many practical challenges. Off-grid communities that rely on diesel generators need to find reliable power sources, and maintaining ground infrastructure is difficult when transportation is unreliable and expensive. That said, as earth station equipment became smaller, tougher, and cheaper over time, smaller organizations like the three NICSN partners could set up and operate it themselves (Elbert, 2008; Dankberg, 2009; Jelly, 1993).

As noted earlier, since satellite systems utilize a public resource, they are subject to certain regulatory requirements. State governments first became involved in satellite regulation in 1964, through a U.S. government organization called Intelsat (Sachdev, 2009a; Elbert, 2008). As technology improved, other governments – particularly in countries like Canada with populations spread over large geographic areas – began developing their own domestic satellite systems. Policy makers in Canada saw satellites as means to support national security and sovereignty, and to connect with remote and Northern communities. To this end, the federal government (in collaboration with Intelsat) began developing a domestic satellite system in the 1960s, outlining their plans in a 1966-7 report called \textit{A Space Program for Canada} (Jelly, 1993). While the government initially faced resistance from incumbent telecommunications carriers that saw satellites as a competitive threat, Canada’s satellite system was developed as a public good (Babe, 1990). A 1968 white paper titled \textit{A Domestic Satellite Communications System for Canada}, recommended the federal government establish a

\textsuperscript{70} A fixed terminal (the antenna or dish) links ground infrastructure to a satellite through monitoring and control equipment. This equipment can be set up to allow varying degrees of control between local staff and a central network operations centre. (I discuss how NICSN organizes this distribution of control in Chapter 7).
Crown corporation to administer it. At year later, Parliament established Telesat Canada (Telesat) as a public-private organization tasked with generating a domestic satellite system in Canada (Kowalik, 2009).71

In November 1973, Telesat launched the world’s first geostationary domestic communications satellite, Anik A1 (Anik is the Inuttitut word for ‘little brother’). To support this system the federal government funded earth stations and brokered service contracts with several network anchor tenants, including the CBC, the Canadian National/Canadian Pacific Telecommunications, and Bell Canada. While some indigenous communities initially rejected the extension of satellite services in their communities (given the lack of Aboriginal media content; see discussion in Chapter 3), the project was described as a success:

“It was a giant leap forward in the quality of telecommunications services for isolated points in Canada, particularly for its northern communities. For the first time, reliable, interference-free, dial-up service was suddenly available between points anywhere in Canada, at a quality equivalent to that among major cities in the south” (Kowalik, 2009, p.59).

In the following years, Telesat continued to develop Canada’s satellite system. In the 1970s, it launched Anik A1 (1972), Anik A2 (1973), and Anik A3 (1975), and began building its Anik B-series and Hermes fleet. Even at this early stage, government used the system to support the delivery of public services to isolated and remote communities. However, the system’s capacity remained under-utilized – in the 1970s Telesat was only leasing eight of 36 available channels (with the CBC subscribed to three). Telecommunications carriers threatened to end their leases with the system unless Telesat conceded more control over ground infrastructure to them (Babe, 1990). But despite the absence of demand, Telesat continued to develop and launch new satellites,

71 Telesat was ostensibly jointly owned by federal government, telecommunications carriers, and the public. But the public had no active role in governance and no public shares were issued. While terrestrial carriers did not own or operate Telesat’s control system, they did gain priority access to leased space segment (non-carriers prepared to lease full transponders on five-year terms could also lease space segment) (Babe, 1990).
and in the late 1970s released three new Anik C birds (introducing full commercial Ku-band services in Canada). In the mid-80s, two Anik Ds joined the fleet. Throughout the 1990s and 2000s Telesat continued developing satellites, and in the mid-2000s launched two Anik F satellites designed to provide increased coverage in Canada’s North.\textsuperscript{72} These are the two satellites utilized by the NICSN consortium. I compare them in Table 6, and illustrate their C-Band coverage areas in Map 6 and 7.

Throughout this history, Telesat’s capacity remained under-utilized, and so in 1981 and 1984, the CRTC ordered the company to start leasing partial channels and reselling excess capacity to non-incumbent carriers and broadcasters. This set the stage for the introduction of new entrants in the satellite industry, and also reflected broader regulatory trends towards privatization and an increased focus on ‘market forces’. During the late 1990s and 2000s, Industry Canada changed its approach to regulating fixed satellite services, reforming its regulatory structure to comply with the 1997 World Trade Organization’s \textit{Agreement on Basic Telecommunications}.\textsuperscript{73} Among other changes, the new policy framework ended Telesat’s monopoly on fixed satellite facilities for domestic and Canada-US traffic, which opened Canada’s satellite market to international competitors that did not have to comply with the universal coverage requirements established by the Government of Canada (Industry Canada, 2005).

\textbf{Table 6: Comparing Anik F2 and Anik F3}

<table>
<thead>
<tr>
<th></th>
<th>Anik F2</th>
<th>Anik F3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orbital slot:</td>
<td>111.1° WL</td>
<td>Orbital slot: 118.7° WL</td>
</tr>
<tr>
<td>Transponders:</td>
<td></td>
<td>Transponders:</td>
</tr>
</tbody>
</table>

\textsuperscript{72} Emerging in the 1990s (initially with Ku-band frequencies and later incorporating C-band and Ka-band), satellite broadband initially faced market challenges. After a short boom, several companies went bankrupt in the 2000s, including OmniGlobe Networks, which was contracted by the First Nations Technology Council and First Nations Emergency Services Society to connect 21 remote First Nations in B.C. (with \textit{Broadband Canada} funding).

\textsuperscript{73} In 1992, Telesat was fully privatized. When Bell Canada sold its stake in the company in 2006, the two principal shareholders became Canada’s Public Sector Pension Investment Board and the US-based Loral Space & Communications Inc. (a US-based equity fund).
• 45 Ka-band spot beams - used for internet access in the U.S. (Wildblue) and Canada (Xplornet)
• 32 Ku-band @ 27MHz
• 24 C-band @ 36MHz

• 1 Ka-band spot beam
• 32 Ku-band @ 27MHz
• 24 C-band @ 36MHz

Launched: July 17, 2004
In-service date: October 2004

Launched: April 9, 2007
In-service date: April 2007

Map 6: Anik F2's C-Band Coverage Area
(Satellite coverage map courtesy of Telesat Canada)

Map 7: Anik F3's C-Band Coverage Area
(Satellite coverage map courtesy of Telesat Canada)
But despite these regulatory changes, Industry Canada still required Telesat (and other domestic satellite carriers) to provide certain public benefit obligations as a condition of their orbital licenses. For example, satellite companies that utilize the four orbital positions that the International Telecommunications Union made available to Canada on the geostationary arc had to provide service coverage of all regions in Canada, including the far North (Industry Canada, 2005). Telesat's two Anik F-series satellites occupied two of Canada's four orbital positions, and the NICSN partners leveraged the public benefit obligations associated with their licenses to support their cooperative satellite network. In the next chapter, I describe how the partners gained access to space segment provided through these regulatory conditions, while at the same time securing government funding support for ground infrastructure. I argue this process not only enabled these socio-technical institutions to set up an inter-provincial satellite system, but in doing so, also retain a degree of ownership and control over resulting infrastructure.

4.4. Conclusion

In this chapter, I described the state enabling environment of public funding and regulatory conditions that Aboriginal organizations leveraged to develop their cooperative satellite network. I began by outlining evidence of the persistent access divides faced by rural and remote indigenous communities in Canada, which are typically explained as the result of the failure of private sector entities to establish infrastructure in regions that lack a viable business case. Drawing on recent research that outlines the negative impacts that can accompany structural exclusion from the emergent network society, I argued that in itself, access is not enough: indigenous peoples desire control and ownership over the socio-technical systems that connect their homes and communities, a position seen in past examples of print and broadcast media.

74 As of early 2013, consultations are underway that may further reform these regulations.
Building on this argument, I outlined how these conditions led the Government of Canada to establish an enabling environment to bridge access divides in remote and rural communities. Along with providing funding supports to private sector service providers, the government established regulatory conditions and funding initiatives that indigenous socio-technical organizations could access to drive their own endogenous development projects. This enabling environment proved precarious, due to the shifting notions of the public interest applied by successive federal administrations. However, it also provided a starting point for indigenous institutions to build not only physical infrastructure to connect their communities, but also the technical and administrative expertise that proved useful in later advocacy initiatives.

In the next chapter, I provide a case study of the endogenous development process leading to the Northern Indigenous Community Satellite Network (NICSN). Framing this process as an example of digital self-determination, I analyze how the three NICSN partners leveraged various funding initiatives and regulatory conditions to address the access divides facing their constituent communities from the ground up. This process enabled the regional not-for-profit cooperative, and its member communities, to retain a measure of ownership and control of resulting infrastructure. Over time, this normative goal was further developed through the political activities, organizational structures, and online applications undertaken by these indigenous socio-technical institutions – themes I explore in later chapters. In this sense, the NICSN project showcases examples of digital self-determination both of and through networked digital infrastructure.
5. The Formation of the Northern Indigenous Community Satellite Network

I remember writing it and thinking this is the biggest project. This is what I’m saying: we built the railway (interview 3019).

The formation of the Northern Indigenous Community Satellite Network, or NICSN, helps bring to life the concept of digital self-determination. It shows how a group of indigenous socio-technical institutions worked together to establish a cooperatively managed satellite infrastructure that provides connectivity and broadband-enabled public services to some of the most isolated and remote communities in Canada. This case study illustrates some of the innovations taking place at the so-called margins of the network society. It also shows how the involved institutions worked with public and private sector partners to leverage the enabling environment described in the previous chapter to bridge the access divides facing their primarily First Nations and Inuit constituents. This provides an example of a decolonization approach to socio-technical development. Building from local contexts and foregrounding the importance of community ownership and control of infrastructure, the development process I describe reflects a complicated bricolage of opportunism, determination, creativity, and luck. It offers a concrete example of how indigenous peoples are working with government and private sector partners to assert their digital self-determination in Canada’s far north.

I frame this case study as part of the long history of indigenous self-determination outlined in Chapter 3. I argue it showcases an endogenous development process that emerged from the efforts of community-based indigenous socio-technical institutions. This discussion draws from the field of Community Informatics (CI), which examines how communities are involved in the design, administration, and ‘effective use’ of ICTs (Gurstein, 2012). CI researchers describe how groups of people united by factors like geography, shared challenges, or common experiences, appropriate ICTs to meet their
needs. CI research and practice is critiqued for being insufficiently theorized and overtly normative (Adria, 2008). However, its proponents share my research goal: to investigate how development projects consider “the design of the social system in which the technology is embedded as well as the technology system in which it interacts” (Gurstein, 2000, p.2).

CI projects in Canada that reflect strong ties with indigenous communities include the Canadian Research Alliance for Community Innovation and Networking (CRACIN) and Research on ICT with Aboriginal Communities (RICTA). CRACIN utilized CI theory and methodology to consider broadband deployment in Canada’s remote communities, including indigenous communities (Longford et al, 2012; Fiser & Clement, 2012). RICTA built a network of Aboriginal community members, academics, and policy-makers interested in how technology might be used to deliver public services in rural and remote indigenous communities (Walmark, O’Donnell & Beaton, 2005). Other recent CI partnerships with Aboriginal peoples include the VideoCom project (see: http://videocom.firstnation.ca) and the First Mile project (introduced and summarized in a footnote on p.66). Figure 3 shows the home page of the First Mile website. These initiatives are now unified as sister projects under the First Nations Innovation Project, where I hope to start my post-doctoral work (see: http://fn-innovation-pn.com). They focus on First Nations engagement in local ownership, control, development, and management of networked digital infrastructure, and aim to support First Nations self-determination in technology development.

The CI orientation of these projects is distinct from most networked digital infrastructure development work. For example, in a history of telecommunications infrastructure in North America, Wilson (2008) describes how most broadband networks in Canada and the U.S. developed from privately owned and operated legacy telephone infrastructure. More recently, Crawford (2011/2013) provides a similar overview of infrastructure built and managed by cable companies.
Critics argue these development patterns often result in persistent access divides among those regions and populations that fail to generate profits for commercial service providers. CI initiatives instead seek to identify community-based alternatives to regulated monopoly cable and telecommunications infrastructure. This focus sometimes involves a consideration of development processes. For example, proponents of the First Mile argue that an endogenous approach to socio-technical development can support network sustainability, capacity-building, economic development, and public service delivery among user communities (Strover, 2000; Paisley, & Richardson, 1998). Rather than depending on network design choices that originate in metropolitan centres
and are imposed on users at the ‘last mile’, local leaders and community members
generate their own First Mile infrastructure and technology development projects.75

Over the past 20 years, various groups have deployed the First Mile concept in an array
of projects. In the early 1990s, artist and network designer Richard Lowenberg used it in
several community networking projects in rural New Mexico. His work continues through
a website (www.1st-mile.com) and listserv. In the late 1990s, the United Nations Food
and Agriculture Organization facilitated telecommunications development in rural Africa
through a First Mile framework (Paisley & Richardson, 1998). Drawing inspiration from
the American rural telephone development cooperatives of the early 20th century, the
UN First Mile project employed a ‘communication for development’ approach to support
rural community engagement with policy-makers and network developers. Community
members used media technologies like film, radio, video, digital media, and public
forums to express their ideas and concerns regarding telecommunications infrastructure
development to policy-makers (Dymond, 1998). More recently, a 2011 article in the New
York Times described a burgeoning tech start-up scene that emerged in America’s rural
Midwest through access to open access fibre optic networks as “Silicon Prairie” (Eligon,
2012; Crawford, 2013).

In the specific context of digital self-determination, such locally-driven
development initiatives offer indigenous governments and their constituents increased
opportunities to control and mediate their engagement with the network society. But
although research from around the world demonstrates that indigenous peoples are
indeed driving their own access to networked digital infrastructures, these projects are
not always successful or sustainable. For example, Landzelius (2006) writes of “cases of
indigenous-run ICT networks used to boost civic infrastructures at the local level, yet in a
normative fashion that largely converges with the dominant order of things” (p.9). I
recognize that indigenous peoples face many challenges in their attempts to build and

75 The ‘last-mile’ is the technical term used to describe local infrastructure that connects a
subscriber to a teleco service provider via a Point of Presence (PoP).
operate First Mile infrastructure, and this recognition is reflected in my analysis of indigenous socio-technical organizations in Chapter 7. In line with the challenges faced by Aboriginal media development projects, First Mile projects often depend on externally-administered public or private sector funding, lack organizational, technical and administrative capacity, and must contend with a lack of engagement on the part of their constituent users.

That said, those projects that do endure sometimes reflect uniquely indigenous processes of socio-technical appropriation (Srinivasan, 2007). For example, a satellite-based network set up in the mid-1990s connected four remote indigenous communities (Yuendumu, Kintore, Lajamanu, and Willowra) in the Tanami Desert near Alice Springs, Australia. Funded by member communities, government, and non-governmental agencies, the Tanami Network encoded a degree of indigenous control in the management and protocols of the socio-technical network. As a result, "local areas are the centre from which information emanates, a reversal of the European model that sees the urban cities as the center and the remote communities as the periphery" (Ginsberg, 1995, p.131; Meadows, 1995; see Taylor, 2012 and McCallum & Papandrea, 2009 for other examples from Australia). Another example of an indigenous network from the U.S. is the Tribal Digital Village (TDV) in California (Sandvig, 2012; Srinivasan, 2007). A federation of 19 Indian Tribes built and continue to manage this solar-powered regional wireless network, using it to deliver on-reserve public services and provide Internet access. In building the Digital Village, member Tribes faced high capital costs, a lack of capacity, dangerous work conditions, and ongoing reminders of their peripheral location in the network society (including a lack of an ‘installed base’ of telecommunications, transportation, and electrical infrastructure). Despite these challenges, the TDV leveraged start-up capital from public and private sector contributors to build the network, and use federal government e-Rate subsidies to support ongoing operations and maintenance costs. A second example from the U.S. is a satellite-based network built by the Navajo Nation in 2003 to connect five communities in their Alamo Chapter (Landzelius, 2006; Cullen, 2005). Called the Southwest Virtual Alliance, this project supported local ownership and control of infrastructure – goals articulated in the group’s Local Governance Act of 1998. The project later expanded to interconnect other Navajo communities, through funding from the U.S. Department of Commerce and the Bill and
Melinda Gates Foundation. Member communities used the network to support various online applications, including several associated with self-government and public services. But despite these efforts, a 2012 article from the Huffington Post noted that 60 percent of Navajo homes still did not have basic telephone service, and most still face significant access divides (Smith, 2012).

Despite their diversity, these examples collectively illustrate some of the significant challenges faced by First Mile development projects. As with Aboriginal media, the small, diverse, geographically dispersed nature of their users makes such projects reliant on an externally-provided enabling environment of subsidy and regulatory support. Many staff working in constituent communities also lack the technical and administrative capacity required to manage and develop their own networks. Finally, in all cases, the projects needed to overcome the formidable challenge of a lack of an installed base of electrical, transportation, and communications infrastructure.

Similar projects also developed in Canada. In the next section, I provide a sustained consideration of one of these projects through a description of the Northern Indigenous Community Satellite Network (NICSN). NICSN leveraged the state enabling environment of public subsidies and regulatory initiatives described in Chapter 4 to address the access divides facing remote indigenous (and some non-Aboriginal) communities. Throughout this process, the three partners sought to encode a degree of ownership and control of resulting infrastructure. In this way, the cooperative satellite network reflects a strong example of digital self-determination.

The formation of NICSN is a history of negotiation between three indigenous socio-technical institutions: Keewaytinook Okimakanak’s K-Net Services, Keewatin Tribal Council (with network management responsibility later transferred to Broadband Communications North), and the Kativik Regional Government. Working from very different contexts, these three institutions each undertook an endogenous development process that converged over time to benefit from cooperative economies of scale, network efficiencies, and partnerships across a complex geographic and administrative terrain. As time passed, this socio-technical network coalesced into a not-for-profit cooperative serving 43 remote communities in Ontario, Quebec, and Manitoba.
5.1. Early years: Establishing networked digital infrastructure in the three regions

The NICSN story begins in Ontario, with KO-KNET. The Keewaytinook Okimakanak Tribal Council (which means ‘Northern Chiefs’ in Oji-Cree) represents six remote First Nations, two of which still did not have basic phone service in the early 1990s. The KO chiefs mandated their Tribal Council to connect their communities, establishing KO-KNET Services in 1994 to take on this project. Several federal and provincial government funders, in particular the Federal Economic Development Initiatives for Northern Ontario (FedNor), supported the new socio-technical institution. Launched in 1987, in the mid-1990s FedNor’s regional economic development mandate encouraged the provision of networked digital infrastructure to communities in the region. As part of this mandate, the agency funded the Northern Ontario Telecommunications Working Group (NOWG) to assess the baseline of existing infrastructure in the 48 First Nations in the region. The resulting Needs and Gap Analysis Telecom Report identified significant access divides that NOWG used to lobby the federal and Ontario governments for funding support (Bredin, 2001; Fiser, 2010b). As a result, NOWG secured $20M for the regional incumbent telecommunications provider (Bell Canada) to improve its existing networks. However, Bell Canada did not use this funding to build any new infrastructure to the unserved First Nations, citing the lack of a business case or regulatory obligation to provide services in these so-called 'high cost serving areas' (Fiser, 2010b). (I discuss NOWG’s efforts to advocate the CRTC to pressure the teleco to service these communities in Chapter 6.)

The commercial teleco’s failure to provide services illustrates the correlation between the logic of profit-driven infrastructure development and the geographic features of access divides. It also reflects the productive opportunities for digital self-determination that sometimes arise from these conditions. The situation pushed the First Nations and organizations like KO-KNET to get involved in networked digital infrastructure development themselves. As the NOWG engaged in advocacy work, KO-KNET began building its own infrastructure. Supported by FedNor, the organization networked its Sioux Lookout office with a 56Kbps line from Lakehead University. The Tribal Council not only completed this work ahead of schedule and under budget, but
also shared its project management and technical expertise with other First Nations in the region. As a result, FedNor supported an additional application to AANDC for funding to extend connectivity to the six KO member communities. The resulting Ku-Ke-Nah Network – named after the Oji-Cree word for ‘everybody’ – connected these communities through a 14.4Kbps bulletin board system (BBS). Shortened to K-Net, the BBS connected communities to remote ISPs over long-distance analogue infrastructure. The system initially failed, given the limits of existing technology, but became the blueprint for future networks made possible through digital infrastructure.

At that time, many First Nations in northern Ontario unable to connect to existing terrestrial infrastructure instead accessed a satellite system funded through a $45M project between Bell Canada and Telesat that combined MSAT phones and DirecPC connectivity. KO-KNET used this system to extend its BBS to 11 remote First Nations between 1996 and 1998. Though it faced frequent data transmission failures and high long distance charges, usage spiked and communities quickly used up available bandwidth (Fiser, 2010b). When Industry Canada launched Connecting Canadians, KO-KNET began using the MSAT/DirecPC infrastructure to deliver services associated with First Nations SchoolNet (FNS) and the Community Access Program (CAP). In 1997, the organization became the Help Desk for all 144 participating First Nations schools in Ontario. KO-KNET staff combined the FNS and CAP funding (with additional support from FedNor) to pay connectivity costs, create online health and education applications, and establish local networks in schools and public access sites. One interviewee from Sachigo Lake remembered how popular her community’s CAP site was at that time:

“Getting Internet was just awesome...There were not enough computers. I think they had six. And that was not enough...We made the CAP site bigger – 12 computers – and it was still not enough...A good six months after the 12 computers came in, we actually got Internet in homes, but not too many people had computers yet so they still used the CAP site” (interview 1008).

76 The MSAT/DirecPC system supported a 4.8Kbps symmetrical connection (later doubling to 9.6Kbps through a second MSAT link).
Around this time, Bell Canada was upgrading its terrestrial infrastructure, replacing the DirecPC/MSAT system with higher-capacity T1s and DSL technology. Due to the efforts of NOWG and KO-KNET to lobby the CRTC, third-party organizations could access this upgraded digital infrastructure, which enabled KO-KNET to expand its overlay network and develop its own services and applications. The teleco did not financially support KO-KNET’s efforts to leverage this infrastructure for community development purposes.

Available data at that time indicated Bell would not contribute to the cost of local loops in the First Nations, and required 100% of capital up front before starting local builds (Fiser, 2010b). KO-KNET encouraged communities to fund their own local networks, and helped them apply to FedNor for funding. To ensure community networks could afford to access backhaul connections, Bell Canada, KO-KNET and FedNor signed a ‘Gold Circle Partnership’ that aggregated communities into a regional service cluster that supported economies of scale and bulk purchases. This partnership reflected KO-KNET’s application of the Community Aggregator development model outlined by the National Broadband Task Force and described in Chapter 4.

While the Gold Circle Partnership allowed First Nations to mediate their local connections to the network society, it did not reach those First Nations – including the KO member community of Fort Severn – that could not connect to Bell Canada’s terrestrial infrastructure. These communities required a satellite link to bridge their access divides. When Industry Canada launched the SMART Communities program in 1999, KO-KNET saw the initiative as an opportunity to connect Fort Severn.77 The organization proposed to use SMART Communities funding to upgrade infrastructure in all six KO member communities: Deer Lake, Keewaywin, North Spirit Lake, Poplar Hill, McDowell Lake, and Fort Severn (Rowlandson, 1999; KO-KNET, 1999b). Despite differing local contexts (in particular Fort Severn’s requirement for a satellite-served

77 Associated with Connecting Canadians, SMART Communities provided funding to 12 not-for-profit organizations across Canada to establish research and development oriented broadband development projects. Out of 115 proposals, 19 came from First Nations organizations, and KO-KNET was the only one funded.
connection), the KO Chiefs agreed to use the SMART Communities funding to develop a cooperative regional network. The project application highlighted several normative goals: to provide equitable connections to the network society regardless of size or location, and to provide opportunities to appropriate infrastructure in ways that reflect indigenous values. According to the application:

“Our goal is to use Kuh-ke-nah to re-construct the protocols of work and service delivery in our communities, to re-articulate local standards of living, and to re-determine our socio-economic interface with Canada and the world...Ku-ke-nah reaches back at the same time that it moves forward. It engages Indigenous concepts such as open systems/non-linear thinking and recontextualizes traditional processes such as lifelong learning” (KO-KNET, 1999a, p.3).

At that time, Fort Severn considered purchasing commercial space segment from Bell Canada (via Telesat). However, given the high costs of such service, KO-KNET began looking for a more affordable solution. They approached staff at the Government of Canada’s Communications Research Centre (CRC) and Telesat’s Research and Development department, who suggested applying to Industry Canada to gain access to public benefit space segment. KO-KNET’s capacity and strong community support impressed the federal agency, which identified an available block of Public Benefit space segment that Telesat Canada had made available as a condition of one of its orbital licenses. KO-KNET and its partners proposed to use this space segment to network three remote First Nations (Fort Severn and Slate Falls in Ontario, and Anaheim Lake in B.C.) (KO-KNET, 2001). To support this project, KO-KNET leveraged some of its SMART Communities funding to finance ground infrastructure at the Sioux Lookout hub,

78 At that time the terrestrially-served KO communities paid $1840 + Internet for services through DirecPC/MSAT, while Fort Severn would have paid $3,750 + Internet (for less than half the terrestrial link of 1.5Mbps) (Fiser, 2010b, p.296). Bell Canada offered to provide KO-KNET free satellite bandwidth for a year to subsidize these high fees, but KO-KNET turned down the offer, since the data transfer costs over Bell’s terrestrial infrastructure between Montreal and Sioux Lookout ended up being higher than the value of the donated bandwidth.

79 “The Communications Research Centre of Canada is the federal government's primary laboratory for research and development in advanced telecommunications and ICTs. It employs 400 staff, including 240 research staff, and has an annual budget of approximately $50M (http://www.crc.gc.ca/en/html/crc/home/home).
and earth stations in Fort Severn and Slate Falls. I spoke to one member of the construction crew in Fort Severn, who told me:

“[We] cemented the foundation – put it in place, got the bolts put in. Some of the bolts were kind of bent. The Band gave me a couple of guys to work with. We had a skid steer to use to put in the mast, and we put it [the satellite dish] all together in one piece. Took the frame, hoisted the frame onto it, and laid the stuff on top, and bolted them in. It was laying down so it was pretty easy to bolt them in. We pulled it right up and put the feeds on. During the winter, the snow was already in when they came to align the dish...Once that was done it was up and running” (interview 1003).80

Planning for this early satellite system was supported by consultations in Fort Severn that revealed the importance that community members placed on local ownership and control of the network, and their desire to see it used to deliver public services (Jansen & Bentley, 2004). Based on these recommendations, KO-KNET staff designed and built the network’s control system in Sioux Lookout, but worked closely with technicians and administrative staff in the First Nations. Working with SSi Micro, a commercial satellite operator, the team used dynamic CDMA bandwidth management techniques to carve half a transponder (18MHZ) of R&D space segment into three 128Kbps data feeds (linked to Fort Severn, Slate Falls and Anaheim Lake) and a shared 512Kbps channel for video. (In 2002, the team switched to TDMA technology). Map 8 illustrates this early satellite network.

80 For photos of this project, visit: http://media.knet.ca/gallery2/v/fortsevernvsat/?g2_page=5
In Fort Severn and Slate Falls, KO-KNET worked with Band leadership to develop their local networks. Reflecting their orientation towards a focus on community rather than household or individual connectivity services, these parties interconnected public buildings through a wireless local loop centered at a PoP in the community schools. (Over time they replaced these wireless networks with more reliable cable systems). A local Telecommunications Management Committee governed local bandwidth allocations, set network usage policies, and managed technical and financial matters. Thrilled with the project’s successes, government agencies like Health Canada, INAC/AANDC, and Industry Canada provided funding to develop broadband-enabled public service applications that became network anchor tenants (I discuss these arrangements in Chapter 8).

After the conclusion of SMART Communities, the Fort Severn and Slate Falls Bands took over full ownership of their local networks, and continue to operate them as of early 2013. Band-owned ISPs sell Internet and VoIP services to residents and businesses, using revenues to fund network operations and local staff (I described the case of Slate Falls in Chapter 2). KO-KNET continues to assist with regional administration, bandwidth management, and operations and maintenance, partly through revenues generated through network anchor tenants (typically health and education
service providers). As a result of this work, the First Nations soon housed bustling CAP sites, broadband-enabled eHealth and online education applications, and even VoIP phones (Keewaytinook Okimakanak Research Institute, 2005). However, high demand for these services, coupled with scarce space segment, quickly chewed up bandwidth. As well, other First Nations soon began requesting connectivity services. KO-KNET began looking at ways to expand their satellite cooperative, and when Anaheim Lake left the partnership, they focused their efforts on other First Nations in Northern Ontario.

Around this time, the federal government was ramping up Connecting Canadians. In 2001, the federal government’s Throne Speech re-stated its goal of ensuring universal access to high speed Internet, and boosted funding to meet these goals. This suite of policy initiatives provided funding for several connectivity programs, including the Community Access Program, First Nations SchoolNet, and various infrastructure funding initiatives (see discussion in Chapter 4). This policy framework provided a key component of the enabling environment for networked digital infrastructure development in Canada. Along with targeted funding to private sector service providers, it also enabled community intermediary organizations – including KO-KNET – to access funding for capital and operational expenditures (KO-KNET, 2001). This Community Aggregator model enabled KO-KNET to set up its own endogenous development projects.

Parallel to this infusion of funding, the federal government instated several regulatory conditions that further supported KO-KNET in bridging the access divides facing First Nations in northern Ontario. Working with private and public sector partners, the organization leveraged this aspect of the enabling environment to secure a key resource for its development projects: satellite space segment. In 2000, Industry Canada announced a competition for a new orbital position license (118.7 degrees West). As a condition of securing this license, Telesat agreed to contribute one full Public Benefit transponder (36MHz) on its Anik F2 satellite – a value of approximately $20M over the
satellite’s 15-year life (Czerny, 2004). That year, Telesat secured the orbital license and committed the Public Benefit transponder space to Industry Canada. However, the transponder sat unused for almost a year until representatives from Telesat and FedNor suggested it be allocated to KO-KNET. The indigenous socio-technical institution offered satellite infrastructure, technical and project management capacity, a suite of public service applications to attract anchor tenants, and status as a not-for-profit regional network servicing unserved and underserved communities (Fiser, 2010b).

Industry Canada approved this plan, and in 2001 KO-KNET gained access to a portion of the Public Benefit Transponder, which provided space segment to 11 satellite-served First Nations in northern Ontario (portions of the space segment was also shared with the territorial governments of NWT and Nunavut). To build ground infrastructure in the 11 First Nations and upgrade its satellite hub, KO-KNET received $5.5M through Broadband Canada.

To ensure this Public Benefit space segment would not be used to compete with private sector carriers, recipient organizations could not use it to support the sale of residential or commercial Internet services (though the onus was on carriers to raise concerns). Telesat Canada was firm that the Public Benefit be used to provide public services, but remained flexible in the context of rural and remote communities, given the lack of a business case for commercial ISPs to lease space segment to sell in those areas. The company also saw the potential for long-term business development: over time a satellite network serving remote and rural communities might develop into paying customers. This prediction proved well-founded, since the government of Canada purchased several transponders from Telesat through Broadband Canada.

The proposal was further supported with letters from two other SMART Communities Demonstration projects that benefitted from KO-KNET’s work (SMART Labrador and the Headwaters Project in Northern Saskatchewan). KO-KNET also agreed to document and share its development plans and expertise with other remote communities across Canada.

During this process, the governments of Nunavut and the NWT requested access to the Public Benefit space segment. As a result of their interventions, Industry Canada divided the transponder between KO-KNET (15MHz), the Government of Nunavut (15MHz), and the Government of NWT (6MHz) (Fiser, 2010b). Once the transponder space was allocated, the parties learned the usable capacity was 30MHz rather than 36MHz (since 6MHz was required for a ‘guard band’ against interference). As a result, the final capacity allocated to each party was 12.5MHz for KO-KNET, 12.5MHz for the Government of Nunavut, and 5MHz for the Government of NWT. Rather than join KO-KNET’s cooperative, the two territorial governments decided to develop independent network organizations and infrastructure, and worked with a commercial provider, SSI Micro, to set up Qiniq in Nunavut and AirWare in the NWT.
Industry Canada’s BRAND initiative (Keewaytinook Okimakanak Research Institute, 2005). Working with local champions and regional Tribal Councils, KO-KNET connected the First Nations of: Cat Lake, Weagamow (Round Lake or North Caribou Lake), Kasabonika Lake, Muskrat Dam, Koocheching, Sachigo Lake, Webequie, Landsdowne House, Fort Hope, Ogoki Post, and Peawanuck. I illustrate this stage of KO-KNET’s satellite cooperative in Map 9.

**Map 9: NICSN Member Communities Circa 2002 – KO-KNET**

As a condition of this Public Benefit agreement, KO-KNET set up a formal governance structure for their cooperative network (I discuss this process in Chapter 7). The organization internally cross-subsidized revenues and space segment to ensure its member communities gained equitable access to the satellite resource, and could sustain operations and maintenance costs. Member communities also received economic development and capacity-building opportunities associated with local ISPs. The project impressed Industry Canada staff, including the former ADM in charge of IHAB, who told me:

“[KO-KNET] demonstrated they could do it themselves. We were very happy to have local people using public transponder space to actually deliver connectivity.
to the schools. That was part of Connecting Communities. It all fit together as part of the program. We were determined to connect all libraries and schools. Here the community could do the job for us. It was terrific. I wanted to spread this to all Aboriginal communities” (interview 5061).

To promote their satellite network cooperative model and invite other communities to join for mutual benefit, KO-KNET hosted a conference in Winnipeg to celebrate the conclusion of the SMART Communities project in April 2002. At that time, two other Aboriginal socio-technical institutions expressed an interest in joining KO-KNET’s satellite cooperative: Keewatin Tribal Council (KTC) from Manitoba and the Kativik Regional Government (KRG) from Nunavik. All three organizations heard Telesat Canada and Industry Canada planned to make available a second C-Band Public Benefit transponder, and at the conference discussed submitting a joint application. I describe this activity after an introduction to early-stage infrastructure development initiatives undertaken by KTC and KRG.

As in Northern Ontario, remote First Nations in Manitoba faced significant access divides. The province’s incumbent telecommunications provider MTS Allstream provided dial-up Internet service in some communities, but service was slow, expensive, and unreliable. Unlike Ontario, the federal economic development agency in Manitoba, Western Economic Diversification, was not as interested in funding technology development. As a result, less funding was available to support infrastructure projects. However, some similarities existed between the regions, including the type of institution driving infrastructure development work. Like KO, KTC is a regional Tribal Council. It represents 10 remote First Nations, eight of which are considered ‘isolated’ since they can only be accessed by air or winter road. These communities mandated KTC to address their access divides. Also similar to KO-KNET, KTC became Manitoba’s regional management organization for First Nations SchoolNet and the Community Access Program when Industry Canada decentralized the administration of Connecting Canadians in the early 2000s. The responsibilities and funding associated with this new role prompted KTC to launch a connectivity needs assessment (discussed in Chapter 7). Combining data from user surveys, focus groups, and interviews with local broadband champions, the Tribal Council established a baseline of existing infrastructure in the province’s northern regions. Most communities faced extremely low connectivity rates,
and those with access connected through a mix of parallel DirectPC, dial-up, DSL, and satellite. To address these conditions, KTC created ‘connectivity report cards’ specific to each First Nation, integrating them into a regional strategic development plan. Industry Canada approved the plan and provided additional funding through FNS and CAP, which was accompanied with infrastructure funding from Health Canada’s First Nations and Inuit Health Branch (FNIHB) and AANDC (through end-of-fiscal-year slippage dollars). KTC used part of this funding to build infrastructure in its remote satellite-served communities, where local schools acted as Points of Presence and housed CAP sites. Over time, KTC’s hybrid terrestrial-satellite infrastructure spread to 84 schools and adult learning centres and 51 CAP sites. KO-KNET staff assisted with this development work – so much so that KTC considered re-branding itself as ‘K-Net Manitoba’. But despite these successes, KTC faced an array of logistical, staffing, funding, and governance challenges (discussed later). As a result, Manitoba’s satellite-served communities remained disconnected for several years.

In the Nunavik region of Quebec, KRG was also engaged in efforts to build its own networked digital infrastructure. This work began after more than a decade of failed

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84 In the absence of consolidated Points of Presence (PoP) in many communities, businesses and public service organizations invested in their own standalone systems and technical support personnel. For example, the hospital in Norway House contained multiple PoPs, each associated with a different service provider, including Health Canada and Manitoba Telehealth.
attempts to connect the territory. Despite these challenges, Nunaviammuit expressed strong interest in accessing Internet and data networks. Regional public service delivery and administrative organizations associated with the JBNQA also required connectivity services when they re-located their head offices from Montreal and Quebec City to Nunavik in the early 2000s. To prepare for this transition, in 1999 KRG approached the regional incumbent, Bell Canada, to discuss networking plans for the region. As was the case in Ontario and Manitoba, the teleco did not intend to service the region given the high costs and low profit margins involved. As a result, the regional government decided to take on the networking project, supported by its legal jurisdiction over communications development in Nunavik, as defined in section 351 of the Provincial Act Respecting the Kativik Regional Government and the Northern Villages (the Kativik Act).

KRG recognized the danger of an ad hoc development pattern that might leave pockets of the region unserved, and was cognizant of the economic risks of a fragmented consumer market. As a result, the organization worked towards a regional development model that combined Nunavik’s 14 villages and territorial public service providers like the Nunavik Regional Board of Health and Social Services and the Kativik School Board. Network operations and maintenance could be further supported by the sale of residential and business Internet. At that time, KRG planned to encourage local enterprise by leasing satellite backhaul to community ISPs (similar to KO-KNET’s

In the late 1980s, a rudimentary data network interconnected four adult education centres (in Kuujjuaq, Puvirnituq, Salluit and Kuujjuarapik) through Bell Canada’s 110-baud Envoy 100 email system (KRG, 2002). In 1994, the Inuit Broadcasting Corporation’s Connecting the North Symposium connected 400 participants in Iqaluit (including representatives from Nunavik) with Aborigines in Australia over a symmetrical (two-way) satellite video link. The event faced technical challenges, but demonstrated the potential of connectivity to the Nunaviammuit. The regional Native Communication Society, Taqramiut Nipingat Incorporated (TNI), subsequently partnered with the land claims organization Makavik (through its subsidiary Unaaq Inc.) and Industry Canada’s Community Access Program to set up Nunavik Net in 1996. The project established public access sites in the region’s three largest villages: Salluit, Puvirnituq, and Kuujjuaq. These sites received connectivity via 33.6Kbps links through long-distance dial-up access to Bell Canada’s satellite telephone infrastructure (KRG, 2002). However, the regional ISPs paid high long distance bills to use the service and faced a small customer base. The project ended one year after it launched and TNI withdrew from future infrastructure development initiatives (Blair Christensen, 2003; KRG, 2002).
model). In August 2000, it presented these plans to the Katutjiniq Development Council Board of Directors, which provided unanimous support for the project (KRG, 2002). With a clear mandate to move the project forward, KRG contracted two satellite companies (SSi Micro and Advanced Projects International) to build the network and install ground infrastructure. This work began with a pilot project in KRG’s head office in Kuujjuaq funded by Economic Development Canada (EDC) and the Government of Quebec in 2001.

However, when KRG approached its funders to help roll out the network throughout the region, they faced competition from another regional institution, the Federation of Cooperatives (FCNQ). In the 1990s, FCNQ built a digital cable TV network in seven villages, and used it to launch Internet services over Ku-band satellite backhaul.86 Faced with this competing project – called Ilagi – KRG conducted two studies to assess its network’s technical and economic potential. The two studies presented the government agencies with evidence that KRG’s plans better met the long-term strategic needs of Nunavik, and provided $3.79M through the Regional Strategic Initiative contribution agreement in 2003-2004. While KRG proposed to lease backhaul to FCNQ so local cooperatives could manage and sell Internet services, the organization declined this offer and shut down the Ilagi network in 2004.87

Between 2002-2004, construction crews cycled through Nunavik’s villages to install KRG’s infrastructure. Local loop infrastructure utilized 2.5GHz licensed wireless spectrum leased from Inukshuk Corporation, a consortium of telecommunications service providers (later consolidated in a Joint Venture between Rogers and Bell

86 FCNQ’s network was set up in partnership with Quick Link, a Calgary-based satellite access provider. According to posted rates on Ilagi’s website, the cooperatives proposed to offer residential Internet services for $79/month (or $59/month for FCNQ cable customers) for unlimited usage of “high-speed cable” (capped at 1 GB of downloaded data per month, with $0.25 charged per additional MB) plus a $10/month or one-time $300 equipment fee (Fruitman, 2002). See also http://www.ilagi.ca/en/residential.html.

87 To learn more about Ilagi, visit: http://www.ilagi.ca/
Aliant). As they set up the NextNet system, the construction crews battled harsh weather, erratic transportation schedules, and a lack of spare parts. Once, they arrived in town to discover a satellite dish was being used as the backstop for the local baseball diamond. Despite these snags, the networking equipment was quickly installed, albeit in a somewhat ‘hacked’ fashion:

“We didn’t do it like the telecos or Bell would do it...We had our equipment in some places in a great location, but in other places, we were in an attic on top of the police station. Another place was in a shack outside with holes in the walls. Another place we had a closed rack with AC, but the AC unit would never work. We went through all kinds of problems and issues” (interview 4032).

As KRG completed this work, KO-KNET offered excess space segment from its Public Benefit transponder to get the Nunavik sites online. This assistance proved invaluable when INAC/AANDC unexpectedly withdrew $500,000 from KRG’s satellite development initiative in April 2003. Partly due to these interactions with KO-KNET, KRG began taking a more active role in network design, construction and management.

These various regional initiatives came together in 2002, when staff from the three socio-technical institutions met at the SMART Communities conference in Winnipeg. At the meetings, they discussed forming a cooperative satellite network to bridge the access divides in all three regions. Given their shared frustration with private sector solutions, and their collective goal to build and leverage cooperatively-managed networked digital infrastructure, the three organizations decided to work together. The

88 This was because bi-directional cable was unavailable (given high costs and transportation fees), and unlicensed Wi-Fi (802.11) resulted in difficulties around line-of-sight, reliability, data security, and interference with snowmobile traffic. Until 2004, some public service buildings linked to 2.4GHZ point-to-point Wi-Fi that interconnected to southern ISPs over commercial satellite infrastructure. This system was removed once the NextNet system was installed. The NextNet licensed wireless offered strong reliability and high capacity (up to a 1.5 Mbps link), and was also accessible to users travelling throughout the region through portable modems. Another benefit of using the licensed spectrum was that as a condition of the license, Industry Canada required Inukshuk to provide a Learning Plan, which provided funding for some of the local base stations (since the Learning Plan obligation ended in 2011, the company did not subsidize base stations associated with Broadband Canada funding). Inukshuk’s spectrum rights expire in 2014, at which point the license will go back to auction.
enabling environment of regulatory and subsidy mechanisms to put this plan in action coalesced through the two rounds of the federal government’s National Satellite Initiative. This Initiative built on the proposal-based funding model associated with Connecting Canadians and the regulatory conditions utilized by KO-KNET to secure Public Benefit transponder space from Telesat. It provided two rounds of capital and operational funding support to several indigenous and non-Aboriginal socio-technical institutions, with the stated goal to bridge access divides in Canada’s remote northern communities. In the next section, I describe how the NICSN partners accessed funding and in-kind support from private and public sector organizations to leverage the National Satellite Initiative to establish a cooperative Joint Venture that provides connectivity services to 43 communities on a not-for-profit basis.

In undertaking this endogenous development process, the three partners faced significant challenges as they struggled to build and maintain a resilient and reliable networked digital infrastructure in spite of difficult geographic, organizational, financial, and administrative conditions. Along with demonstrating their successes in asserting digital self-determination, this process also reflects the persistence and impact of structures and relations rooted in Canada’s colonial past and continuing to the present. In this sense, it illustrates how the colonialism/self-determination dialectic played out in the construction and maintenance of the NICSN project.


With the construction of their ground infrastructure underway, the three Aboriginal institutions met in Winnipeg to discuss how they might form a mutually beneficial cooperative satellite network. Despite their jurisdictional, institutional, and infrastructural differences, they collectively sought to secure access to satellite space segment that was too expensive to purchase independently. Their discussions led to an informal agreement to apply for Public Benefit space segment (planned for release by Telesat as a condition of the orbital position license associated with satellite Anik F3). To undertake this work, KTC and KRG set up socio-technical institutions that operated independently from the Tribal Council and regional government. In Nunavik, Tamaani Internet (which
means “Here” in Inuititut) was initially housed in the regional government’s IT section before staff restructured it as its own department. In Manitoba, KTC set up Broadband Communications North (BCN) as an independent not-for-profit cooperative governed by a board of directors drawn from all member communities. KO-KNET continued operating inside the organizational structure of the KO Tribal Council. (I discuss these three organizational structures in Chapter 7).

The three institutions shaped a proposal for a jointly managed inter-provincial cooperative satellite network (National C-Band Benefit User’s Group, 2004). They requested funding for space segment and ground infrastructure through an initiative launched in early 2004. Administered by Infrastructure Canada and the Canadian Space Agency, the National Satellite Initiative (NSI) was “created to specifically address the high cost of broadband access for communities in the mid to far North and in isolated and remote areas of Canada where satellite technology is the only reasonable means of providing broadband access” (CRTC, 2005, p.82). It provided support for not-for-profit organizations to access Public Benefit space segment on Anik F2 made available as a condition of the Anik F3 orbital position license. According to one government administrator involved in shaping this initiative, applicants adhered to a demanding set of criteria:

“[Applicants] had to come up with a plan, it had to be viable. And for it to fly had to be of interest to a service provider that with demand and our subsidy made it [economically] viable. That’s a lot of moving parts that had to fit together” (interview 5061).

In their NSI application, the three NICSN partners argued that in remote First Nations and Inuit communities, satellite systems can be used to deliver essential public services and support economic development initiatives (such as local ISPs). To support operations and maintenance, their business case employed a Community Aggregator model that consolidated revenues generated from anchor tenants (and in Tamaani Internet’s case, the sale of Internet services). Member communities assisted with local network operations and maintenance, and participated in the cooperative’s governance through representative boards. Framing access to space segment as a capital cost, the partners argued that 15 years of pre-paid Public Benefit access (2004-2019) was necessary to meet their strategic development needs. Their proposal was further
supported with a positive evaluation of KO-KNET’s use of its existing Public Benefit space segment, published in November 2004. The report indicated that KO-KNET’s project not only provided fast and reliable access, but also supported broadband-enabled public services and economic development opportunities in member First Nations (Keewaytinook Okimakanak Research Institute, 2005). Community leadership and various regional and national Aboriginal organizations, including the Assembly of First Nations, KRG’s Executive Committee, and the NAN in Ontario, further supported NICSN’s application.

In 2004, Industry Canada approved the application, and the three partners became not-for-profit stewards of Public Benefit space segment on Anik F2. Contributions and matching funds from government agencies and private sector organizations supported the construction of ground infrastructure (including a powerful new 7.3m satellite dish for the Sioux Lookout hub). Telesat’s contributions covered 100 percent of the space segment: the equivalent of one full transponder for 15 years (ending in 2019). Additional funding extended ground infrastructure to 35 communities: 14 in Quebec, 11 in Ontario, and 10 in Manitoba. At this time, KO-KNET and KRG also decided to end their contracts with SSi Micro and take over management of their portion of the space segment themselves. As I discuss later, KTC in Manitoba continued to face financial and administrative challenges, and so its satellite network was not yet operational at that time.

89 Along with NICSN, the NSI supported projects in Nunavut ($7.83M for 25 communities) and the NWT ($7M for 31 communities) (CRTC, 2005). As of 2005, the NSI funding totaled $155M, with $85M contributed from the Canadian Strategic Infrastructure Fund, and the balance from Canadian Space Agency ($50M in satellite capacity) and Telesat Canada ($20M in satellite capacity).

90 KO-KNET wanted to access technical services that SSi Micro was unable to provide at that time, and determined it would be easier and cheaper to lease infrastructure and manage the network themselves. According to one KO-KNET network manager, at the time SSi Micro was charging $12,000 in monthly fees, compared to the estimated $8,000 it would cost KO-KNET to run the network from Sioux Lookout (interview 1002). KRG made the decision to end its contract with SSi Micro for similar reasons: to gain more control over infrastructure and save money on management services by doing it themselves.
The three partners developed a shared network management plan to govern their distribution of space segment among member communities. Each partner brought something to the cooperative. KO-KNET managed the network from its gateway in Sioux Lookout, and continued contributing knowledge and technical expertise to the venture. For example, KO-KNET staff developed several techniques to more efficiently manage the limited space segment. KRG and KTC also initially paid KO-KNET to manage their network services as they built up administrative and technical capacity. KRG offered the partnership financial and organizational backing, given its stable structure as a regional government. While KTC lacked organizational, technical, or financial resources at that

91 KO-KNET staff worked out how to utilize the full 36MHz available on a transponder, including the 6MHz usually reserved as a ‘guard band’.
time, it strengthened the cooperative through the addition of 10 satellite sites, and through revenues from its public service anchor tenants. In dividing up the space segment, the partners agreed to follow the cooperative model already utilized by KO-KNET: all member communities received equitable access to the shared space segment, regardless of location or size (I discuss this arrangement in Chapter 7). Table 7 presents a summary of the NSI Round 1 space segment allocations.

Table 7: NSI Round 1 Allocations (circa 2004)

<table>
<thead>
<tr>
<th>Partner</th>
<th>Allocation</th>
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</thead>
<tbody>
<tr>
<td>KO-KNET</td>
<td>15 MHz (through R&amp;D network)</td>
</tr>
<tr>
<td>KRG</td>
<td>11 MHz</td>
</tr>
<tr>
<td>KTC</td>
<td>3.5 MHz</td>
</tr>
<tr>
<td>Grassy Narrows</td>
<td>0.5 MHz</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36 MHz organized into 1 full transponder = 31 Mbps of usable bandwidth</strong></td>
</tr>
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In 2005, the partners publicly announced “the first inter-provincial community-owned and operated broadband satellite network in Canada” (National C-Band Benefit User Group, 2005). (Archived information about this event is available at: http://smart.knet.ca/satellite). Soon after their connectivity services came online, all three regions experienced massive demand from users in their member communities. For example, when Tamaani Internet launched residential Internet services in December 2004, during the first two weeks of operation, staff completed 120 residential installations and villages quickly ran out of modems. By the end of 2006, NICSN provided Internet services to almost 10% of the territory’s combined population (KRG, KO-KNET & KTC).

Although Industry Canada did not allocate the new space segment equally (KRG received 11MHz; KTC 3.5MHz; and Grassy Narrows First Nation 0.5MHz), KO-KNET worked with Telesat to combine these allocations, and the existing allocation for Ontario (15MHz), into a single transponder. The network operators shaped this transponder into one Digital Video Broadcast over Satellite (DVB-S) carrier and eight TDMA channels (deployed in a mesh topology). Network managers in Sioux Lookout translated this space segment into dedicated links to communities and a shared pool of 2Mbps of two-way (symmetrical) bandwidth that members of the cooperative could use for videoconferences.
2007). But despite this demand for bandwidth, limited space segment and delays in the construction of ground infrastructure meant that fewer than half of the 43 NICSN member communities could access residential and business Internet services at that time. In fact, 21 communities in the cooperative did not yet have local infrastructure. Given these conditions, the NICSN partners immediately began looking for funding opportunities to expand their network.


Luckily for the NICSN partners, they soon learned the federal government was contemplating a second round of NSI Funding. The three organizations collectively approached Industry Canada with a request for an additional $70M to expand their network and access to space segment. At first, their overture was rejected – Industry Canada stated that given limited resources and demand from other regions, NICSN was not eligible for any new funding. The partners kept pushing, arguing that according to Industry Canada’s minimum criteria for high speed Internet (512Kbps at the time), communities in all three regions remained under-served. Industry Canada came around, initially proposing to subsidize five years of additional space segment (purchased from Telesat at commercial rates of approximately $4,500 per MHz). With FedNor and Telesat’s support, the partners convinced Industry Canada to extend its offer to 10 years of funding. Telesat agreed to contribute an additional year of space segment, for a total of 11 years of fully-subsidized space segment.

In 2006, Industry Canada formally launched the RFP process for NSI Round 2. Led by KRG, the partners submitted their Letter of Intent in May. Staff in all three regions worked together on the 600-page, 50MB business case, sharing the file over a 64Kbps link – a process that took hours but failed to curb the enthusiasm of the authors. As one person recalled: “I remember writing it and thinking this is the biggest project. This is what I’m saying: we built the railway” (interview 3019). Building on their established NICSN cooperative, the partners requested funding for two additional transponders
(purchased through Telesat at commercial rates, a value of $25M over a period of 11 years).\textsuperscript{93}

The NSI Round 2 proposal also formalized the governance of the NICSN partnership into a Joint Venture (KO-KRG-KTC, n.d.). KRG became lead partner accountable for administering the project. KO-KNET was named the Managing Partner responsible for general operations and finances, including the management of a contingency fund and consolidated financial statements. While KTC had no specified obligations, their inclusion greatly supported the project: “The critical mass of having the whole Canadian shield on this network...gave it enough gravitas” (interview 4034). The partners agreed to continue to pool space segment, equitably distributing bandwidth to all member communities with any unused capacity made available to all without compensation. Table 8 provides an overview of how the partners proposed to set up the three transponders in their network.

\textit{Table 8: Proposed Transponder Allocation (NSI Round 2)}

| Transponder 1 |
| South-to-north |
| Data & Video |
| 1 X DVB-S2 carrier |
| 43 X DVB-S2 receivers |
| 64.5Mbps |
| 48 Mbps for Internet |
| 16 Mbps for Real Time applications |
| Dynamically managed (burstable) |

| Transponder 2 |
| South-to-north |
| North-to-south |
| Data |
| 8 X 3.25MHz TDMA carriers |
| 43 X Linkway TDMA modems |
| 16Mbps / 8 carriers |
| 2 Mbps per carrier for Internet |
| Bandwidth divided between communities based on population |
| Dynamically managed (burstable) |

\textsuperscript{93} The NSI Round 2 proposal initially projected demand at 283MHz (the equivalent of 10 transponders) but given the group’s dynamic bandwidth management techniques, determined three transponders sufficient. For the two new transponders, Telesat proposed two pricing options: a prepaid 10-year lease ($22.7M for two transponders) or an monthly lease rate for a total of 120 months ($250,000 for two transponders). Prices do not include federal and provincial taxes. This results in a price of approximately $3,472 / month per MHz of space segment, assuming 36 MHz per transponder.
The Joint Venture’s business case built on the cooperative’s existing Community Aggregator approach (KO-KRG-KTC, n.d.). Operations and maintenance costs continued to be supported through revenues generated from public service anchor tenants and the sale of Internet services, with any excess accumulating in a Public Benefit contingency fund (I discuss this arrangement in Chapter 7). The partners requested that Industry Canada formally re-define ‘acceptable bandwidth use’ to include the sale of Internet services to support local economic development through Band-owned ISPs and Tamaani Internet’s regional model, which the agency approved. The Joint Venture proposal also requested funding to upgrade ground infrastructure, including local network construction in five Ontario communities and 16 Manitoba communities, and upgrades at the hub in Sioux Lookout. At that time, all Nunavik communities could access up to 256 Kbps to the home, and 512 Kbps for businesses (interview 4034). Table 9 provides an overview of the NICSN member communities that benefitted from these ground infrastructure upgrades.

Table 9: Constituents Served by NSI Round 2 Infrastructure Upgrades

<table>
<thead>
<tr>
<th>Partner</th>
<th>Communities</th>
<th>Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>KO-KNET</td>
<td>13 (8 unserved and 5 underserved)</td>
<td>11,000</td>
</tr>
</tbody>
</table>

94 Following the conditions of the NSI Round 1 agreement, this transponder can only be used to deliver public services. To ensure the technical configuration of the NICSN network met this normative requirement, the three partners dedicated it to videoconferencing services. Videoconferences requested by public service providers are scheduled through KO-KNET’s online booking system, which ‘forces’ traffic through this transponder.

95 Industry Canada approved the request in part because the two transponders would be purchased from Telesat at commercial rates rather than specified for public benefit use.

96 The NICSN partners drew on one of Industry Canada’s published definitions of ‘unserved’:
### Table 1: Number of Communities under and Unserved

<table>
<thead>
<tr>
<th></th>
<th>Number of Communities</th>
<th>Funding in CAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>KTC-BCN</td>
<td>16 (underserved)</td>
<td>23,000</td>
</tr>
<tr>
<td>KRG</td>
<td>14 (unserved)</td>
<td>11,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong> (8 underserved and 35 unserved)</td>
<td><strong>45,000</strong></td>
</tr>
</tbody>
</table>

Later that year, the partners learned that Industry Canada approved their application. KRG Chair Maggie Emudluk and the Federal Minister of Transport, Infrastructure and Communities, Lawrence Cannon, announced the news during the 2007 Katimajit Conference in Kuujjuaq. Minister Cannon noted the two new transponders and ground infrastructure would help enhance the quality of life of Nunavik residents, stimulate economic development, and provide public services (KRG, 2007). Behind the scenes, given various administrative requirements and setbacks, the three partners ended up waiting almost two years for their NSI Round 2 funding. Challenges included difficulties in raising matching funds, a process that reflected disparities among the regions. These institutional and policy frameworks constrained the partners’ efforts to secure digital self-determination.

In Ontario, KO-KNET easily secured matching funds, given the organization’s past success with networked digital infrastructure development projects, and the provincial government’s support. KO-KNET quickly secured funding from the Northern Ontario Heritage Fund Corporation’s Emerging Technology program (Northern Ontario Heritage Fund Corporation, 2007). It used this funding towards the cost of the two

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An unserved community currently must have no publicly available broadband infrastructure which is capable of meeting its broadband needs. Typically, these are communities where Digital Subscriber Line (DSL) or cable modem access is not already available to the public. Priority will be given to First Nations, northern, rural and remote communities (cited in KRG, KO-KNET & KTC, 2007, p.16).

The NICSN partners defined ‘unserved’ communities as: “requiring bandwidth capacity and local loop”, while ‘underserved’ communities only required bandwidth capacity, since they already had local DSL or Cable infrastructure in place.
transponders, to build local infrastructure in five satellite-served and four terrestrial-served First Nations, and to fund training and salaries (a full-time network technician in each partner First Nation and two satellite network technicians in Sioux Lookout).

The situation in Manitoba was much different, and KTC/BCN faced many challenges in securing matching funds for their project. These issues are linked to the institutional arrangements and political economy present in the province at that time, as well as internal tensions in the organization. While ground infrastructure was in place in 10 communities from the 2004 BRAND-funded project, KTC/BCN required an additional $5.6M for upgrades, and to set up new infrastructure in six additional communities: Saint Theresa Point; Red Sucker Lake; Wasagamack; Granville Lake Indian Settlement; Mosakahikan Cree Nation; and Bloodvein. 97 While Industry Canada agreed to provide KTC/BCN with $2.7M (via BRAND) for the project, the federal agency required matching funds from the province. Efforts by KTC and BCN staff failed to gain the support of the provincial government, even after their project was backed by groups like the Assembly of First Nations and Assembly of Manitoba Chiefs. In part, this was due to a lack of confidence in BCN, given its significant internal challenges at the time (discussed in Chapter 7). Some of the First Nations in BCN’s operating region also did not support the project (interview 3019). Finally, the province lacked support from the provincial government: as a ‘have-not’ province, Manitoba was struggling to balance competing infrastructure priorities, and so had little money to spend on broadband projects. Interviewees also speculated the province’s decision may have been informed by conflicting jurisdictional responsibilities:

97 This project would have ended up costing closer to $7M (One interviewee confirmed this number as $5.6M. This person noted the contract required that cost savings from reduced numbers of communities or technical changes could be re-allocated to the tax liability, an arrangement supported by both Canada and Manitoba. Consequently the project did not exceed the $5.6M allocation (interview 3052)). According to one interviewee, the initial estimate failed to consider sales taxes: an assumption was made that because a First Nation-owned company was doing the work, they did not have to pay provincial sales taxes, which was incorrect (interview 3052).
“I suspect it had to do with the fact these were First Nations communities and not Métis communities. Now the Métis communities are served by the province, but the First Nations are served by the feds. I think what may have happened is the province recognized that this was too good to pass up for the feds. And given the fact they [the federal government] were kicking in something like $28 million [for NSI Round 2], that the project would go through anyway...They didn’t say that [it was a jurisdictional issue]. They just didn’t do anything about it” (interview 3052).

As a result of these challenges, BCN’s project stalled for a year, and BCN and KTC risked losing their federal BRAND funding. Industry Canada kept extending its deadline, and KTC finally found a supporter through the federally-administered Manitoba Rural Infrastructure Fund (MRIF). Despite this contribution, KTC required an additional $1.8M, which KRG provided from an envelope of funding originally put aside for a network gateway and interconnection hub in Montreal (KRG, KO-KNET & KTC, 2007). To date, the province of Manitoba has not invested any money in BCN’s networked digital infrastructure (although provincial agencies like Manitoba Telehealth do support the network by purchasing bandwidth as anchor tenants, as I discuss in Chapter 8).

Compounding these financial challenges, throughout this process BCN faced significant problems during the construction of its ground infrastructure. The project’s

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98 MRIF is allocated by Western Diversification, a federal economic development agency. After a personal meeting with the Secretary to the Cabinet’s Community Economic Development Committee, KTC convinced MRIF to approve their funding request (interview 3019).

99 In its terrestrial network, BCN faces a complex web of interconnectivity options that take a lot of time and resources to navigate. It accesses Manitoba Hydro’s fibre optic network, which connects generating stations, dams, and office locations across the province. BCN tapped into this fibre network’s excess capacity, which was easy to arrange thanks to Manitoba Hydro’s policies towards interconnectivity. In comparison, BCN faced more difficulties in interconnecting with the commercial ILEC in the province. MTS Allstream’s Carrier Services division treats BCN like a competitor, and as a result does not engage in joint planning, and is more challenging to interconnect with (interview 3028). While BCN has not yet formally approached the CRTC to request the regulator to open access to the incumbent’s network, they considered it at one point given MTS Allstream’s history of indirect tactics to discourage interconnection, such as delaying responses to interconnection requests so long that associated projects become unfeasible, or charging excessively high connectivity rates (interview 3028). The two backhaul providers also offer different service tiers, which further complicates bandwidth arrangements. MTS Allstream sells BCN small packages of 2MB, 5MB, 10MB or 20MB backhaul, while Manitoba Hydro sells backhaul in bulk, for example in 100MB chunks, which allow BCN to distribute bandwidth according to needs (interview 3028).
original contractor, Aboriginal Business Communications (ABC), faced conflicts of interest given its close ties to BCN’s Board of Directors, and also hit technical challenges in its plans to deploy long-distance wireless infrastructure over the swamps and muskeg of rural northern Manitoba. Making matters worse, during construction the contractor company went bankrupt. Faced with the possibility of their project’s termination, BCN revised its bylaws and restructured its governance model to address these issues (described in Chapter 7). The re-constituted organization convinced the federal government to let them salvage the project and KTC issued a second RFP, stipulating in the contract that the chosen vendor would turn ownership of the completed network over to BCN.\footnote{KTC added two clauses to the contract: they limited the contract price so it would not exceed $5.6M (with the contractor paying any additional costs); and any cost savings from communities that left the project would be removed (interview 3052). The winning contractor insisted the Appendices to the contract take precedence over standard construction industry contract clauses. The funding cycle was coming to a close, and so BCN approved the contract. However, the contracted manufacturer’s design specs did not meet engineering requirements and so BCN halted construction. To complete the project, BCN employed legal and other strategies, including arbitration.} During the build, BCN faced further challenges that ended in legal arbitration, which was ongoing as of summer 2012. Ground infrastructure in Manitoba was finally completed in 2007. Local networks consisted of a fixed wireless system that uses radios installed on the outside of buildings.\footnote{These wireless systems resulted in some challenges. Community technicians can tinker with network configurations and adjust speed settings. In recent years BCN addressed this issue.} KTC formally transferred ownership of the satellite network to BCN and lit up the network.\footnote{In 2008, Broadband Canada provided funding to improve BCN’s ground infrastructure, boosting capacity and supporting several local ISPs. The socio-technical institution also proposed a second Broadband Canada infrastructure project in November 2012 to transition five First Nations in the KTC/Interlake region from satellite to long-range microwave, although this project was not funded. As of late 2012, BCN’s terrestrial and satellite infrastructure served a total of 41 rural, northern and remote communities, including 38 of the province’s 64 First Nations (17 of which remain satellite-served). After foreseeable upgrades, BCN estimates six or seven communities will remain on satellite for the next decade.}

In northern Quebec, KRG also faced significant challenges securing matching funds for its NSI Round 2 project. These challenges are associated with provincial
regulatory requirements rather than a lack of funding support. The regional government received a funding commitment from the province’s *Villages Branches* program, which supported connectivity projects in schools and rural municipalities. However, KRG’s legal status (mandated by the *Kativik Act*) requires it to secure permission from the province any time it receives funding from a federal agency – a process that can take up to a year. 103 Due to the public announcements made about NSI Round 2 in 2007, Tamaani Internet’s customers expected a much faster and more reliable network, and they quickly became frustrated with the network’s slow, congested, and unreliable services. When the commercial provider Xplornet launched competing Internet services in 2006, many customers migrated over. Public service delivery institutions like the Nunavik Regional Board of Health and Social Services also remained skeptical about signing on to Tamaani Internet as long-term anchor tenants. As one network administrator recalled: “[Tamaani Internet] was non-functional. It was practically useless. I think we lost a lot of credibility” (interview 4034). After a year of waiting, KRG managed to secure $2.2M in funding from *Villages Branches*. Tamaani Internet announced a Christmas present for its residential customers: one free month and doubled speeds (to 512kbps). The offer cost Tamaani Internet around $70,000 but was deemed necessary after years of service disruptions. KRG launched the new and improved ‘Tamaani Internet 2.0’ with an extensive marketing strategy – “still remote, but no longer isolated” – that included a redesigned website and active presence on community radio and social media (see Figure 4). 104

103 Like all public institutions in Quebec, KRG is subject to a law that prevents any public organization more than 50% funded by the provincial government from signing any contract or agreement with the federal government without formal permission.

104 Tamaani Internet also made several organizational changes, hiring staff and streamlining its operations. As of late 2012, the network offered 459 points of service to businesses and organizations, and provided 2,142 residential subscribers with Internet access (KRG, 2012; KRG, 2011). Limited regional competition is available through Xplornet, which offers residential and business Internet (regional market penetration is estimated at 10 percent) (KRG, 2012). Local competition exists only in Kuujjuaq, where an entrepreneur set up Nunavik Communications in 1994, and starting selling Internet services in 2005 over digital cable infrastructure.
The start of 2008 marked successes for all three NICSN partners. They finally secured access to the NSI Round 2 funding, having raised a total of $27M (summarized in Table 10). With this funding in place, the partners hosted an event in Kuujjuaq to celebrate and launch the NICSN Joint Venture. They used the NSI Round 2 funding to purchase two full transponders for 11 years at commercial rates (2008-2019), increasing their space segment to a total of 108MHz, equitably shared among the 43 member communities. To access the two new transponders (located on Telesat’s Anik F3 satellite), NICSN partner staff and local technicians repositioned ground infrastructure to point local antennas to the new satellite. They also upgraded equipment in the Sioux Lookout hub and in regional hubs in Kuujjuaq and Winnipeg.\footnote{105}

\footnote{105 They switched their bandwidth management technology from TDMA back to SCPC, and installed Newtec, DVBS 2, and SilverPeak devices to boost efficiency.}
At the conclusion of NSI Round 2, the NICSN partners could access enough bandwidth to deliver residential and commercial Internet and a full suite of broadband-enabled public services to their member communities. Their network supported applications like telehealth, e-learning, e-justice, video conferencing, VoIP telephony and more (described in Chapter 8). Map 11 presents the NICSN cooperative network at that time. The conclusion of the two rounds of NSI funding did not spell the end of the NICSN cooperative’s efforts to address access divides. In fact, between 2009 and 2011 all three partners secured additional funding through Industry Canada’s Broadband Canada initiative. However, given the scope of my dissertation I am unable to discuss those developments in detail at this time. Instead, I bracket my history of NICSN here, and shift my focus in the next chapter to analyze in more detail another facet of digital self-determination: the political and advocacy efforts of indigenous peoples and organizations to shape state enabling environments for networked digital infrastructure.

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**Table 10: NSI Round 2 Funding Contributions**

<table>
<thead>
<tr>
<th>Region</th>
<th>Funder</th>
<th>Amount (M$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>Industry Canada (via Infrastructure Canada)</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Telesat Canada</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>NICSN partners</td>
<td>0.03</td>
</tr>
<tr>
<td>Manitoba</td>
<td>Manitoba Rural Infrastructure Fund (Federal Economic Development Program)</td>
<td>0.5</td>
</tr>
<tr>
<td>Ontario</td>
<td>Northern Ontario Heritage Fund Corporation</td>
<td>1.8</td>
</tr>
<tr>
<td>Quebec</td>
<td>Villages Branches</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>27.41</strong></td>
</tr>
</tbody>
</table>

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106 One of Industry Canada’s requirements was that applications submit a separate proposal per Geographic Service Area, so there was no advantage for the partners to apply jointly (interview 4034).
5.4. Conclusion

In this chapter, I used an empirically-grounded case study of the Northern Indigenous Community Satellite Network to demonstrate how indigenous socio-technical institutions worked to overcome the access divides facing their communities from the ground up. Moving beyond a diffusionist model of access, I elucidated a social shaping approach to networked digital infrastructure development that illustrated this project as an expression of digital self-determination. However, I also showed the persistence of colonialism alongside these endogenous processes of socio-technical appropriation. Framed as example of First Mile infrastructure, the NICSN project reflects a multiplicity of complex and contradictory factors at play.

In Canada, many remote and rural indigenous communities lack an installed base of infrastructure, and so remain at the margins of the emergent network society. A body of research clearly identifies the persistence of these access divides over time, and
their negative economic, political, social, and cultural impacts on both communities and the people living in them. In Canada, the federal government recognizes these access divides will probably never be addressed by commercial service providers, and so shaped an enabling environment of public funding and regulatory conditions to help develop infrastructure in sparsely populated rural and remote regions (see discussion in the previous chapter). In this challenging context, residents of remote and rural indigenous communities have self-organized to drive their own networked digital infrastructure development initiatives.

In this chapter, I told the story of innovative projects undertaken by three indigenous socio-technical institutions: two Tribal Councils of federated First Nations and a regional government created as an outcome of a land claims agreement in the Inuit territory of Nunavik. These organizations leveraged the enabling environment established by the federal government to move forward this work. They utilized the regulatory conditions associated with satellite orbital position licenses, and funding initiatives associated with the Connecting Canadians policy cycle, to assert their digital self-determination. Yet shadows of colonialism traced this process, constraining their efforts. As they negotiated funding and regulatory frameworks, the three socio-technical institutions faced a complicated matrix of fiduciary responsibilities and jurisdictional requirements. While not all of these barriers directly trace to Canada’s legacy of colonialism, many link to it through existing policy frameworks. As a result of these structural conditions, despite their desire to form cooperative partnerships to bridge access divides, the NICSN partners had to contend with a staggering array of institutional complexities.

In the next chapter, I discuss some of the political negotiations that shape the forms these administrative and jurisdictional structures take. Focusing on struggles over decision-making regarding the shaping of state enabling environments, I explore how these activities reflect the interplay between structures of colonialism and countervailing practices of self-determination. In this political arena, digital self-determination involves not only the activities of autonomous indigenous organizations engaged in building networked digital infrastructure, but also their broader efforts to decolonize the social relations and structures governing socio-technical development. Since the earliest years
of the network society, indigenous peoples and their partners have worked to secure more substantive involvement in decision-making over the enabling environments guiding their connections to the network society. During these activities, these political actors utilize these infrastructures as platforms of engagement. Digital platforms allow indigenous peoples living in sparsely populated, geographically dispersed communities to participate in the shaping of policy frameworks that often takes place in metropolitan and urban centres located far from their everyday experiences. But as with efforts to address access divides, these participatory and consultative activities are structured in dominance and link to the normative goals of powerful elites as well as affected individuals and communities. In the next chapter, I argue that they reflect another facet of digital self-determination.
6. The Formal Politics of Digital Self-Determination

At the contemporary historical moment, political actors are positioning themselves in the emerging global ‘network society’ (Castells, 2009; Fuchs, 2009; Sandvig, 2006; Schiller, 2007). In a context of increasing corporatization and technical convergence, their activities involve considerations over the enabling environment that supports and constricts networked digital infrastructure development (Crawford, 2013; Wu, 2010; Schejter, 2009; Helberger, 2011; Hitchens, 2011). The discourses these actors draw on reflect differing conceptions of the normative values that justify the role of state intervention, private interests, and other issues in these processes. My argument in this chapter reflects on these negotiations. Informed by work on the critical political economy of the network society, I also consider how contending visions of the utopian and dystopian potential of emergent socio-technical ensembles influences the structural frameworks guiding digital self-determination (Leiss, 1990; Mosco, 2005).

Throughout history, technological boosters have promoted “the exciting possibilities that information and communication technologies (ICTs) held for almost everything” (Hassan, 2004, p.8). Many described ‘cyberspace’ as a place free of boundaries; of unthinkable complexity with few or no social or cultural differences that enabled open and equal avenues of participation for everyone (Blair Christensen, 2003; Graham, 2011). And it is true that at the contemporary moment, networked digital infrastructures do offer certain affordances that support public engagement and democratic potential. For example, compared to print and broadcast media, the decentralized structure, inexpensive costs, and wide diffusion of digital media holds fewer barriers to the production, distribution and consumption of political content (Raine & Wellman, 2012; Howard, 2011; Castells, 2012). Taking a critical stance regarding these claims, in this chapter I explore how the political processes of conflict, negotiation, engagement, and compromise frame the state enabling environments shaping
networked digital infrastructure development. In previous chapters, I used past research to demonstrate how the digital divide faced by indigenous communities in Canada “arises from and contributes to the historical underdevelopment of Native communities by the dominant society” (Bredin, 2001, p.192). I argued that lack of access to and control over the means of integration in the global network society threatens to reproduce and deepen existing social relations of inequality, including those associated with the persistence of colonialism. At the same time, I showed how indigenous peoples and their partners are mobilizing to push forward their own agendas of digital self-determination. These endogenous development projects arise autonomously, but are also supported by state enabling environments of funding initiatives and regulatory conditions. In this chapter, I focus on the process leading to the formation of the policy frameworks shaping these tools.

Roth (2005) writes that political struggles over the normative paths of socio-technical development are in part about indigenous peoples “having the power to frame, finance, and implement their own national agenda and priorities without the state’s appropriation and control of the parameters of that evolution” (p.14). Through their substantive involvement in the shaping of state enabling environments, indigenous peoples are engaging with efforts to decolonize policy frameworks and institutional arrangements. In this chapter, I show how these negotiations reflect efforts to shape these structures in ways that recognize and support another facet of digital self-determination. In this context, the putatively technical choices that support networked digital infrastructure development in fact mask underlying political struggles. As Bendrath and Mueller (2011) write: “The challenge for technology-aware policy research is to empirically link the specific capabilities of new technologies with an analysis of the concrete conflicts and interactions around its usage and governance” (p.1150). Research demonstrates a general trend in how design characteristics, rather than laws and policies, are increasingly used to regulate the ways that people interact with networked digital infrastructures (Sandvig, 2006; Peha, Lehr, & Wilkie, 2007; Bendrath & Mueller, 2011; de Beer, 2009). For example, TCP/IP is recognized as the universal system of codes and protocols underlying the Internet. Through the TCP/IP protocol, packet-switching techniques break digital information into packets, organizes them under a meta-tag called a header, transmits these packets over a network, and then
reassembles them at their destination. TCP/IP’s designers consciously coded the protocol to support interoperability among a multiplicity of users and devices, and for this reason it is described as inherently ‘open’ (Benkler, 2006; Hall, 2011). However, as a constructed socio-technical ensemble, TCP/IP is in fact the result of social actions: compromises, negotiations, and struggles between political actors (Hassan, 2004). Wilson (2008) lists several examples of other seemingly technical issues that are sites of struggle over normative values such as public service, private property rights, centralized control, and user engagement. His list includes:

- Flow classification, a traffic management technique that enables network managers to shape data flows according to factors like the size of packets in a stream and the amount of time between consecutive packets.
- Deep packet inspection, which allows network managers to discern the type of information being transmitted through applications like music, video, and games.
- Asymmetrical bandwidth, which shapes download speeds as faster than upload speeds, supporting more control for network service providers rather than users.
- Peering agreements, which allow network operators to give preferential treatment to one another’s traffic.
- Latency sensitivity, which allows network operators to provide Quality of Service for high-bandwidth applications.
- Negative discrimination, which allows network operators to shape traffic to manage collective bandwidth according to their decisions, such as slowing down peer-to-peer file-sharing to stop so-called ‘bandwidth hogs’.

Authors like Benkler (2004) and Lessig (2004) describe similar struggles over open source or commons-based applications and private property rights. To demonstrate the range of these projects, Fuchs (2009) provides a taxonomy of open-source principles: a neoliberal position that aims to subsume and commodify open access and open content; a social democrat view that aims at a dual economy that guarantees an information commons alongside informational commodities; and a critical or radical view that sees information as a common good.
Critical scholars recognize these processes reflect sites of struggle involving issues of ownership, control, and contending visions of the public interest. They draw on these examples to point out the countervailing forces that temper the utopian discourses of the information society (Mosco, 2005; Dean, 2009). For example, in his early work, Castells (2010b) described a loop wherein technological development, diffusion, and use feed one another. He saw in this context the potential for a renaissance of locally-emergent, democratic governance practices and institutions (see also Stalder, 2006). However, he also recognized that these developments are accompanied by powerful countervailing trends that contribute to the further marginalization of individuals and groups relegated to the ‘black holes of informational capitalism’. In his early work, Castells described these tensions by highlighting the persistence, and in some cases deepening, of inequalities brought about through the emergence of a globalized network society. He has since refined this position, exploring more closely the unequal power relations and structural inequalities embedded in the logic and structure of components of the network society, from social movements to organizational structures (Castells, 2009/2012). In his 2009 work, Communication Power, Castells further examined the politics of these activities, arguing that “the process of formation and exercise of power relationships is decisively transformed in the new organizational and technological context derived from the rise of global digital networks” (p.4). Specifically, Castells analyzes these processes through analyzing four types of power in the network society: networking power; network power; networked power; and network-making power (pp.42-50). His 2012 book, Networks of Outrage and Hope, specifically outlines how the social movements of the network society apply multiple types of power in an attempt to transform cultural, political, and economic structures.

Other scholars working in this area focus on discourse, pointing out how political struggles and inequalities are often masked by Enlightenment values of ‘progress’ and ‘modernity’ that arise from a teleology of linear progress. For example, through her notion of ‘communicative capitalism’, Dean (2009) argues that the failures of participatory democracy and the entrenchment of elite interests are obscured through the neo-liberal veneer of participation encoded in Web 2.0 discourse (see also Fuchs, 2011; Held, 1996). Critical scholars seek to demonstrate that while new socio-technical ensembles do not determine social relations, they can contribute to the maintenance and
deepening of inequalities (Boyd-Barrett, 1982; Mattelart, 2000; Schiller, 2007). They explore how the technical and bureaucratic rationality underlying socio-technical development sometimes reflects and perpetuates material inequalities (Ellul, 1964). In this context, socio-technical ensembles risk becoming the material artifacts of a cultural and discursive system that constitutes the world as an object of control. As a result, some frame strategies of reform as simply reinforcing existing structures of oppression, and argue that deeper, more radical change is needed (Morozov, 2011; Dean, 2009).

While these observations are an important and necessary corrective to the naive claims of technological utopians, they can also undermine the creative capacity of active agents, and fail to consider the productive role of lived cultural practices and subjective experiences (Roth, 2005). As Feenberg (2002) cautions us, “an exclusive focus on political economy tends to overestimate the rationality and coherence of capitalist strategies and underestimate the significance of resistances, innovations, and reforms” (p.23). Many scholars are working to acknowledge structural challenges but also identify and highlight alternatives (Dyer-Witherford, 1999). For example, in his most recent work on this topic, Castells (2012) argues that the social movements of the network society in some cases succeeded in transforming political and economic structures in ways that reflect increased democratization and participatory engagement in decision-making. He outlines significant changes in Iceland’s political and economic institutions following the collapse of the financial system in that country (Castells, 2012). He describes examples of other networked social movements springing up around the world; one prominent example from North America is Occupy Wall Street. However, Castells notes that in most cases, these movements have yet to achieve ‘revolutionary’ change, at least in terms of substantially re-shaping existing political and economic structures into new forms. Instead, he frames their activities as leading to social and cultural change, with any structural or institutional changes arising from the pre-set agendas of political elites (p.235). As Crawford (2013) points out, alongside these efforts, the corporate consolidation of political and economic power continues.

My intention is not to disparage these social movements. Instead, like Castells, I see them as productive fields of agency that generate ideas and proposals that can be adopted to reform political and economic structures. With this focus in mind, my approach in this chapter entails a clear and direct engagement with existing institutional and regulatory frameworks.
Drawing on Foucault (1995), power in this context is framed as simultaneously oppressive and productive: “an order of ideas and practices that creates a network of constraints and opportunities within which individual and collective subjects emerge as actors” (Feenberg, 2002, p.70). In the context of transnational informational capitalism, political actors jostle for control in a complex eco-system of strategic alliances, compromises, and conflicts. This messy environment is the site where indigenous political actors assert digital self-determination. The contests they participate in are highly restricted and structured in dominance: around the world, public engagement in policy-making is increasingly less transparent and open (Bennett, 2003; Hesmondhalgh, 2007; Freedman, 2008; Longford et al, 2012). Policy development is seen by many as the restricted domain of technocratic elites or powerful corporate entities. Critics argue neoliberal rhetorics of ‘transparency’ and ‘participation’ mask the lack of opportunities for citizens to substantively engage in these activities (Zhao & Hackett, 2005; McChesney, 2007; Raboy & Schtern, 2010; Dean, 2009). Yet I argue these conditions also reflect spaces of creative agency and participatory engagement that might trigger structural reforms.

Similar to the development of past infrastructures like telegraphs, telecommunications, and broadcasting systems, networked digital infrastructure has so far proceeded in a relatively complex, fragmented, and open fashion (Wu, 2010; Castells, 2010). For example, global Internet governance is not overseen by any centralized formal regulatory authority, but rather continually shaped and re-shaped by a multiplicity of decentralized actors (Cottle, 2009; Couldry & Curran, 2003). Inside liberal-democratic states, the governance of networked

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108 This is a long-standing challenge. For example, Babe (1990) describes how in the late 1800s, alongside opportunities for public engagement in regulatory activities, corporate entities established a (regulated) monopoly over telecommunications infrastructure. He frames these processes as beginning with the development of telegraph networks in the late 19th century and extending to the launch of satellites and deployment of fibre optic networks. The techniques employed by corporate entities to consolidate their control followed similar patterns over time, and included: the formation of coalitions of owners, refusal to interconnect with competitors, consolidation of ownership through mergers and acquisitions, predatory pricing and internal cross-subsidization to prevent the emergence of independent networks, political advocacy to shape regulatory environments, and vertical integration (Babe, 1990). For an updated example of a similar argument, see Crawford (2013).
digital infrastructure development is linked to the activities of national governments accountable to their elected constituents. As a result, the enabling environment supporting these activities is both the source and the locus of agentic action (Thorpe, 2008; Sandvig, 2006). Put differently, digital self-determination in this context involves efforts to democratize the policy frameworks guiding infrastructure development (Howard, 2011).

Indigenous peoples are engaged in political negotiations to establish funding and regulatory support for their own socio-technical development projects. Working against the dominant logics of ‘mainstream’ technological, political and economic agendas, some of their efforts support the creation of alternatives grounded in the specific contexts of their diverse communities – reflecting indigenous self-determination (Slowey, 2008). As I argued in Chapter 3, in Canada a long and problematic history of state-Aboriginal relations shapes these activities. I showed how this relationship has contributed to the persistent lack of access to core infrastructures, public services, and economic development opportunities in many indigenous communities. At the same time, these conditions led indigenous peoples and their partners to undertake their own self-organized development projects, often supported by a state enabling environment of public subsidies and regulatory requirements. In some cases, their activities reflect a re-articulation of the normative goals expressed in the policy frameworks used to support Aboriginal broadcast media. As Roth (2013) notes:

“In reflecting upon the history of First Peoples’ media in Canada, what strikes me is the current revival of NFB debates about product, process, access, infrastructure, grass-roots community participation, and how important it has become for First Peoples to be actively engaged in a range of political, cultural, and economic self-expressive activities in order to have a public identity” (p.386).

The First Mile initiatives I described in Chapters 4 and 5 illustrate how a productive agency can and does emerge from conditions of oppression. In this chapter, I explore in more detail how indigenous peoples and their partners have reformed policies, laws, and institutions to better reflect their laws, customs, values, and institutional arrangements. This culturally and territorially grounded approach seeks to better reflect the specific needs and cultural specificities of indigenous peoples. I frame it as an attempt to decolonize existing institutional frameworks as a form of negotiated autonomy inside the context of the existing state apparatus. Focusing on the enabling environment for networked digital infrastructure development, I explore activities at global, national, and regional levels. Drawing on examples
from the United Nations, the United States, and Canada, I outline how indigenous peoples working from diverse contexts are all asserting their digital self-determination by re-shaping policies and regulatory conditions to support their endogenous development projects.

Focusing on the efforts of Inuit and First Nations political organizations in Canada, I show how since the earliest days of the network society, these groups advocated for increased participation in decision-making regarding the development of networked digital infrastructure. But despite their efforts, the historical record points to a failure on the part of state institutions to incorporate these suggestions at a substantive level. In recent years, the failure of policy frameworks to adequately incorporate First Nations and Inuit input has increased, as reflected in initiatives like consultations over the proposed (but not yet released) national digital strategy, and a re-framing of public broadband funding away from community-based socio-technical institutions, towards a renewed focus on projects carried out by private sector entities. Given this context, I conclude that the state enabling environment in Canada is not yet decolonized, and much work remains to be done.

6.1. Indigenous involvement in international and state enabling environments

Indigenous peoples are engaged in international debates over the governance of networked digital infrastructure development. During the United Nations World Summit on the Information Society (WSIS) (held in 2003 and 2005), indigenous parties argued that state enabling environments for socio-technical development projects must balance equitable access with a recognition of indigenous rights, cultural identities, traditional territories, and resources (Fiddler, 2008; Salazar, 2007). WSIS participants concluded that indigenous peoples are best positioned to decide when and how they access and use new technologies, and to this end articulated an *International Indigenous e-Strategy* for the consideration of UN member states (Aboriginal Canada Portal, 2005). The UN agency also launched an International Indigenous Portal to consolidate resources and create an online gathering space to support these goals.

In 2010, the UN’s Food and Agriculture Organization published an overview of progress to date (United Nations, 2010). The report, called *Indigenous Peoples’*
Communication for Development, noted the creation of several indigenous online platforms, highlighting work from South America (the Latin American Indigenous Peoples’ Communication Platform) and North America (KO-KNET). The report reiterated that despite their contextual diversity, indigenous peoples continue to work with the UN to collectively shape policy environments supporting emergent ICTs to increase access to knowledge and information, support participation in governance, and enhance capacities for self-determined development (United Nations, 2010). In January 2013, the UN released a subsequent document in preparation for WSIS +10 (a conference to assess progress one decade after the original WSIS meetings). The document, which was produced as a discussion paper by the UN, noted continuing work undertaken by diverse indigenous peoples to leverage state support to creatively appropriate ICTs in their local, regional, and national contexts, while resisting the potential of such activities to reproduce social relations tied to colonialism and undermine community-based traditional knowledge and intellectual property (Borrero, 2013).

The paper presents seven recommendations for consideration at WSIS +10. One suggestion is for emerging programmes and policies to “enable Indigenous Peoples to develop, control, and maintain culturally appropriate approaches to ICT usage, on their own, or in partnership with other stakeholders” (ibid, p.5). This document, and the enabling environments that it highlights, demonstrates how diverse indigenous peoples continue to work together to advocate at the international level for increased engagement and participation in state policy frameworks guiding network digital infrastructure development.

Along with these international initiatives, indigenous peoples working in various national contexts are involved in formal negotiations with state governments over the shaping and governance of networked digital infrastructures. For example, they participated in the development of national broadband development strategies in countries like Australia, New Zealand, and the U.S. These initiatives reflect the different contexts of state enabling environments, as well as the distinct needs of indigenous communities, but also include common references to the need for policies that support universal broadband access and recognize group-differentiated indigenous rights. While a description of these efforts is outside the scope of my dissertation, I do provide one example through a discussion of indigenous involvement in the development of the National Broadband Plan in the United States.
In the late 2000s, Native Americans undertook a well-organized campaign to contribute to that country’s broadband development strategy (McMahon, 2011). After years of government and industry claims of high broadband diffusion across America (Dunbar, 2010), a series of studies published in 2010 described patterns of low and decreasing broadband penetration on Tribal lands (Benkler, 2010; Cooper, 2010; Federal Communications Commission, 2010b; Atkinson, 2007; Tapia et al., 2009; Pruner, 2009). As of 2009, broadband deployment in “Indian Country” still had a penetration rate of less than 10%, explained as the failure of market-based telecom development policies (Morris & Meinrath, 2009; Sandvig, 2012; Federal Communications Commission, 2000). When the federal government conducted public consultations about its draft National Broadband Plan (Gangadharan, 2009) Native American groups and their partners submitted various proposals. They grounded their efforts in a clearly articulated “government to government” relationship between the federal government and tribal governments (expressed in the Federal Communications Commission’s (FCC) Statement of Policy on Establishing a Government-to-Government Relationship with Indian Tribes) (2000; see also Federal Communications Commission, 2007; Bredin, 2001). The FCC did house a department – Indian Telecommunication Initiatives – that consulted with tribal governments prior to implementing regulatory actions or policies that affect Native peoples, their lands, or their resources. However, Native Americans critiqued these consultations as more symbolic than substantive, and restricted by an overly complex regulatory environment (Morris & Meinrath, 2009; Federal Communications Commission, 2007).

As a result of these conditions, many Native American communities built (and continue to administer) their own infrastructure projects, such as the Tribal Digital Village in California and the network connecting the Navajo Nation (Sandvig, 2012; Srinivasan, 2007; see discussion in Chapter 4). When the FCC released its draft National Broadband Plan (2010c) for consultation, Native American institutions argued for more coordinated, sustainable federal support of these initiatives. Two organizations led these efforts: Native Public Media and the Native American Broadband Association. Together, the two groups developed a baseline of empirical evidence and concrete policy proposals aimed at the FCC (Morris & Meinrath, 2009). They proposed a Tribal Broadband Plan within the National Broadband Plan, assisted individual Tribes with their broadband funding applications, and advocated changes to the Plan’s language (Native American Broadband Association, 2009).
For example, the proposal redefined the term “remote” so that “remoteness is defined not by distance from a town but by the availability of things such as electricity, phones, paved water and water supplies” (Pruner, 2009, p. 7). These proposals aimed to reshape policy frameworks to reflect the specific circumstances of many Native American communities, which are not necessarily located in isolated geographic regions but nonetheless face significant challenges stemming from their marginal access to core infrastructures.

As of late 2012, it appears these efforts have been a qualified success in reforming the state enabling environment in the U.S. In 2010, FCC Chairman Julius Genachowski announced several reforms to the Plan in an address to the National Congress of American Indians (remarks cited in Native Public Media, 2010; see also Federal Communications Commission, 2010a). The FCC created several new funding programs (including a Tribal Broadband Fund) and made several institutional reforms (creating Tribal seats on the Federal-State Joint Board on Universal Service and the USAC Board of Directors, and a new Office of Native Affairs and Policy inside the FCC) (Nagesh, 2010; Federal Communications Commission, 2010a; Savchuk, 2011). That said, a 2011 press release issued by the Media Action Grassroots Network notes that the following year, only six tribes received Broadband Technology Opportunities Program funding, leading some to question whether the FCC’s moves are merely symbolic (Yu, 2012). An article published by the Huffington Post in 2012 pointed to the ongoing access divides faced by Native America communities like the Navajo, as well as the persistence of overlapping jurisdictional and administrative frameworks and the challenges they pose for developments on Tribal lands (Smith, 2012). In 2012, the National Congress of American Indians, in collaboration with the FCC’s office of Native Affairs and Policy, hosted the Tribal Telecom 2012 Conference to discuss these challenges and steps forward (see www.tribaltelecom2012.com). At present, the implications of these initiatives remain unclear.

109 This funding was set up as part of the 2009 American Reinvestment and Recovery Act, and was designed for broadband development projects.
6.2. First Nations and Inuit projects in Canada

indigenous peoples in Canada engage in similar political advocacy activities. However, the historical record points to the persistence of access divides in many remote and rural communities (see discussion in Chapter 4). In part, these challenges may be due to a failure on the part of government to address the concerns raised by Aboriginal leaders and socio-technical institutions regarding the state enabling environment for networked digital infrastructure development. In their consultations with governments, indigenous peoples have consistently raised concerns over their ability to determine the direction of discussion, the terms within which discussion is to occur, and the range of acceptable alternatives they can propose (McDonnell & Depew, 1999; Borrows, 2010; Murphy, 2008). Their appeals are further complicated by the outcomes of historical and modern treaties and self-government agreements that set the terms of the relationships between Aboriginal peoples and the state (Long, 2010). By the 1850s, the Crown sought to use treaties to secure access to First Nations lands for the purpose of settlement and resource extraction, while signatory First Nations viewed treaties as means to sustain their sovereignty through nation-to-nation relationships with the state (Youngblood Henderson, 2000; see my discussion in Chapter 3). These challenges are further compounded by ongoing relations of economic exploitation, including through the continuing extraction of resources from indigenous territories without adequate compensation and consultation, alongside the chronic under-development of infrastructures in the regions where these peoples live. Furthermore, many people living in remote indigenous communities remain disconnected from the platforms that might enable them to participate in democratic decision-making – which is also often framed in complex, confusing, and legalistic discourses that further exacerbate these challenges (Richardson, 1998). The implementation of multiple treaty, land-use, resource-sharing, and self-government agreements continues to be fraught with disagreements.110 Although providing

110 Complicating the situation further, in some regions, including much of the Canadian North and British Columbia, First Nations and Inuit parties never signed historical treaties, and as a result a complex edifice of comprehensive and specific land claims, ‘modern treaties’, litigation, and out-of-court settlements developed over time.
more than this brief description is beyond the scope of my dissertation, I want to acknowledge it as an important influence on the ability of indigenous peoples to engage in the formation of the enabling environment shaping networked digital infrastructure development in Canada.

Yet these formidable challenges did not stop indigenous peoples from getting involved in negotiations over policy frameworks and regulatory conditions in this area. This process began in 1993, when Industry Canada merged with the Department of Communications, Ministry of Corporate Affairs, and Investment Canada. The newly amalgamated agency guided the subsequent work of the Information Highway Advisory Council (IHAC), launched in 1994 to direct national broadband development policy. IHAC’s subsequent activities reflect negotiations over the normative paths that networked digital infrastructure development could take. While IHAC’s action plan, *Building the Information Society: Moving Canada into the 21st Century* (1996) supported universal, affordable and equitable access to infrastructure, critics argued it offered few concrete suggestions on how to overcome socio-cultural barriers (Bredin, 2001; Shade, 2010). That said, the ambiguity of newly developing digital technologies did allow IHAC some flexibility in developing an enabling environment. The federal government’s political will, as expressed in its stated goal to make Canada the world’s most connected nation, further supported this work.

To this end, in 2001 Industry Canada launched the National Broadband Task Force described in Chapter 4. Although dominated by representatives from industry and government, the group did include some civil society organizations, including a few Aboriginal groups. I interviewed several members of this Task Force to learn how they developed their summary report *The New National Dream: Networking the Nation for Broadband Access*. In their debates over the normative values guiding their policy recommendations, the Task Force agreed that networked digital infrastructure could support social as well as economic goals. As a result, they set a definition of ‘broadband’ as a high-capacity, two-way link capable of supporting full-motion, interactive video (at that time a 1.5Mbps symmetrical link). In part, this decision was made so the infrastructures might be used to deliver public services like health and education. The group also debated government’s role in deploying infrastructures to areas that lacked a business case for private sector-led development. They presented two approaches to development, captured in the Infrastructure Support and
Community Aggregator models described in Chapter 4. According to one party to these discussions:

“We had to make some basic decisions as to whether we were going to have a couple of islands in Canada that were going to be super fast, high speed Super Nets, or whether we were going to continue with the [universal service] policy [used in telecommunications and broadcasting]” (interview 5062).

With notable exceptions (including representatives from KO-KNET and Nunanet), Aboriginal organizations remained peripheral to these deliberations, which went on to inform the basis of Canada’s enabling environment for networked digital infrastructure development (as articulated in Industry Canada’s Connecting Canadians initiatives and various regulatory conditions). As a result, many First Nations and Inuit governments and socio-technical institutions perceived the Connecting Canadians initiatives as generated in isolation from the needs and requirements of their constituent communities. Faced with this lack of consultation, Aboriginal parties mobilized in other forums. At the 1999 Indigenous Peoples Summit of the Americas, AFN National Chief Matthew Coon Come delivered a speech that noted the challenges that indigenous peoples face in the emerging digital environment, and their need to appropriate emerging technologies to meet their needs as self-determining nations. That year, the AFN began working with federal, provincial and territorial departments to develop the Aboriginal Canada Portal, launched in 2001 (Alexander, 2001; O’Donnell, Perley, Warkmark, Burton, Beaton & Sark, 2009; Alexander, 2009). The Portal made available Aboriginal content, as well as information from more than 25 federal departments and agencies. However, due to the lack of infrastructure in remote and rural communities, many Aboriginal people could not access this resource (Alexander, 2005).\footnote{The Aboriginal Canada Portal closed on February 12, 2013. At that time data and content formerly available through the website was re-published on several different websites, including: Industry Canada’s Aboriginal Business Directory; the Aboriginal Bursaries Search Tool; Connectivity and Partnerships; First Nation Profiles; and Service Canada’s JobBank.gc.ca. The Portal’s closure notice is available here: http://www.aboriginalcanada.gc.ca/acp/site.nsf/eng/ao35176.html}
To address the access divides that persisted in many First Nations communities, the AFN released early plans for its own national broadband strategy, which envisioned a network connecting all First Nations in Canada. Consultations held between 2002-2004 during three national *Connecting Aboriginal Canadians* forums explored how to move this plan forward, in part through federal government support (Aboriginal Connectivity Portal, 2006). Involved parties concluded that while the federal government could act as an enabler for their work, development initiatives must be driven by communities, and offer opportunities for local engagement and control (O’Donnell et al, 2010). They also identified several challenges that communities faced in achieving this goal, including low awareness and planning capacity, unsustainable local networks, and a lack of technical capacity. Policy challenges identified in these consultations included tensions stemming from conflicting jurisdictional responsibilities, and the continuing inability of First Nations governments to drive policy development themselves (AFN Chiefs Committee on Economic Development, 2010). Lack of a robust economic base in many communities, and a preoccupation with more pressing social challenges, further precluded progress.

Critics argued this lack of progress demonstrated that state-led initiatives to establish an enabling environment for networked digital infrastructure development in indigenous communities decontextualized technological systems from socio-political, economic, and cultural contexts, and reflected “a lack of awareness and/or appreciation for the challenges within Aboriginal communities” (Alexander, n.d., p.4). Rather than support community efforts, policy frameworks forced communities to compete with one another for scarce, short-term funding (see Gibson, O’Donnell & Rideout, 2007; Bredin, 2001; Fiser & Siebel, 2009; Imutia, 2011). Subsequent research indicates these problems persist today. For example, in late 2010 I worked with a team of university-based researchers and members of indigenous socio-technical institutions to conduct interviews with 23 key informants involved in indigenous broadband development in Canada. We conducted interviews about their perceptions of challenges associated with the existing federal enabling environment of broadband development policy. Table 11 presents an overview of their critiques (McMahon, O’Donnell, Smith, Woodman Simmonds, & Walmark, 2010, pp.101-119).

Table 11 outlines several challenges identified by key informants as restricting their ability to undertake endogenous broadband development projects. These themes illustrate
the persistence of a colonial relationship between state institutions and indigenous socio-technical institutions, as seen in political and funding uncertainty, jurisdictional challenges, and the lack of community participation in policy development. Related challenges include a lack of support for community-based projects, a failure on the part of funders to consider the diverse contexts of First Nations and Inuit communities, and a lack of community input in socio-technical design choices. This summary reflects many of the same themes highlighted in the history described above. Aboriginal parties consistently and clearly raised concerns over the federal government’s failure to provide opportunities for consultation and support regarding the shaping of Canada’s enabling environment for networked digital infrastructure development.

**Table 11: Challenges associated with federal broadband policy initiatives for First Nations and Inuit communities**

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<th>Theme</th>
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<tr>
<td>Ineffective Government</td>
<td>Lack of support for community-based broadband infrastructure and connectivity projects</td>
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<td>Inappropriate Funding</td>
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<td>Unequal Government to</td>
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Inuit political organizations also have a history of advocacy regarding the enabling environment shaping networked digital infrastructure in their territories. In 1994, the Inuit Broadcasting Company hosted a symposium to discuss if, how, and why the Canadian Arctic should be connected to the global network society (Blair Christensen, 2003). Through consultations held in 27 communities, Inuit debated issues of access divides, impacts of connectivity on culture and language, capacity-building, maintenance and use of technologies, participation, and funding. Using live television, community meetings, fax machines and phone-in sessions, hundreds of people participated in these consultations. The organizers submitted the resulting report to the federal government’s Information Highway Advisory Council, Inuit organizations, and the Government of the NWT. The Nunavut Implementation Commission subsequently utilized it during the formation of the territory in 1995, arguing “the road to Nunavut is along the information highway” (Alia, 2010).

At that time, the Inuit remained cognizant of negative impacts that might accompany the diffusion of new infrastructures (Savard, 1998). However, as with previous media technologies, they also recognized the benefits of appropriating these tools to meet their own needs (Blair Christensen, 2003; Soukup, 2006; Alexander, 2009). To this end, from 1999 to 2001, the Government of Nunavut’s Department of Sustainable Development convened the Nunavut Broadband Task Force under the mandate of “stimulating business and economic opportunity” in the territory (interview 5068). In 2002, the group produced *Sivumuqqallianiq: Moving Forward: Strengthening our Self-Reliance in the Information Age*, which supported the creation of the Nunavut Broadband Development Corporation (NBDC), a not-for-profit institution tasked with driving networked digital infrastructure development in the territory. The NBDC incorporated in fall 2002 and became operational a year later. Managed by a volunteer board of directors elected from communities throughout Nunavut, its mandate is stated as follows:

“The Nunavut Broadband Development Corporation aims to bring affordable, high speed access to the Internet (broadband) to Nunavummiut in all 25 Nunavut communities by supporting local businesses to deliver broadband and related services. Our focus is to bring broadband services to citizens, municipalities, Inuit organizations, businesses, and others not currently served by the Governments of Nunavut and Canada” (Nunavut Broadband Development Corporation, n.d.)
As I discuss in Chapter 4, through the two rounds of the National Satellite Initiative, the federal government contributed significant subsidies to expand broadband in Nunavut. To ensure all 25 Nunavut communities gained equal access to the space segment and infrastructure established through this funding and associated regulatory requirements, NBDC aggregated them in a regional business case, deploying a meshed network to enable lateral connectivity. However, instead of joining the NICSN cooperative or establishing its own not-for-profit institution, NBDC decided to work with a commercial service provider. NBDC put forward an RFP and SSI Micro won the bid, building the Qiniq network between 2003-2005 with a mixture of government funding and customer revenue.\textsuperscript{112}

The for-profit Qiniq network now serves a population of approximately 29,000 across two million square kilometers (approximately 4,000 subscribers). Telesat Canada provides commercial space segment at a cost of $6,000 / month for 1 MHz, (roughly equivalent to 1 Mbps); this space segment is publicly subsidized through NSI. In 2009, Qiniq’s residential offerings were limited to high speed packages at higher than average prices, and “actual inbound rates to residents are less than 256 Kbps due to high demand and limited bandwidth resources” (Fiser, 2010a, pp. 32-3). Communities do not own their local networks; rather SSi Micro owns and operates Qiniq’s infrastructure and pays a small commission to 25 Community Service Providers (CSPs) to distribute modems, manage billing, and assist with local troubleshooting (Mignone & Henley, 2009). In 2008, NBDC released its 5-year business plan, called \textit{Managing Bandwidth -- Nunavut’s Road Ahead}. The following year it signed a 5-year Contribution Agreement with Infrastructure Canada. Called Infrastructure Phase II, the project resulted from several regional consultations, including feedback from 200 survey responses and 50 people at in-person workshops. The proposed $45M in funding will develop a satellite bandwidth management tool, procure additional satellite capacity, and upgrade the

\textsuperscript{112} The $10M network was funded by Industry Canada ($3.83M), with matching funds provided by debt financing secured from an Inuit Venture Capital firm (Atuqtuarvik Corporation) and the Nunavut Business Credit Corporation (interview 5068). Other contributors included SSI Micro ($1.7M), the Government of Nunavut and AANDC ($250,000), and 23 hamlets (who each contributed $10,000 for a total of $230,000). The National Satellite Initiative provided approximately $1M per year over an 8-year period (ending in 2012) for the satellite space segment.
existing terrestrial network for all Nunavut communities. SSi Micro also applied to the 
Broadband Canada infrastructure funding initiative, and received a subsidy to purchase 
足够的空间段和升级的设备来支持1.5 Mbps连接到 
Nunavut until 2016.

At present, it is unclear whether future connectivity services will remain under the 
Qiniq arrangement or be sold directly to users by SSi Micro (interview 4034). In its 2010 
submission to Industry Canada’s consultations on the digital economy strategy, the NBDC 
requested federal investment to ensure the continued operation of the Qiniq network 
(Nunavut Broadband Development Corporation, 2010, p. 2). This reflects a focus on a more 
private-sector oriented enabling environment for the territory, compared to the situation in 
other remote regions such as those services by NICSN. Although the federal government 
(through the northern economic development agency CanNor) announced funding to develop a strategic connectivity plan covering all three northern territories, as of early 2013, no formal replacement program for Qiniq is yet in place.

6.3. Canada’s shifting enabling environment: Public service 
principles in subsidies and regulatory conditions

These various Aboriginal and federal initiatives took place in the context of a shifting balance 
between the public and private sector interests shaping the state enabling environment. 
These changes are associated with debates over the normative goals driving networked 
digital infrastructure development in Canada, as well as government’s role in those 
processes. In 2007, a Conservative federal administration was elected, and the new 
government shifted its involvement in national broadband development policy to focus on

113 According to one interviewee, since Broadband Canada awarded funds directly to the for-profit commercial service provider (as an ‘economic stimulus’ fund), the arrangement did not involve a strong role for NBDC (and therefore undermines Nunavut’s role in managing connectivity in the territory) (interview 4034). Furthermore, according to this interviewee, SSi Micro will no longer provide 20% of the revenues it generates from the sale of its services to local organizations.
addressing access divides and providing economic development opportunities (Raboy & Schtern, 2010; Shade, 2010). Initiatives like Broadband Canada instrumentalized these goals by providing subsidies to private sector network developers, rather than not-for-profit community intermediaries or public sector institutions. Critics argued this approach undermines local network sustainability and service delivery in remote communities (Rideout, 2008; Alexander, 2009; Moll, 2012; Raboy & Schtern, 2010; McMahon, O’Donnell, Smith, Walmark, Beaton & Woodman Simmonds, 2011). In recent years, the federal government has continued to invest in targeted infrastructure projects led by the private sector. Often, these projects are carried out through public-private partnerships (that can include community or non-government organizations). Once built, in most cases this infrastructure is managed and operated by private corporations, although some projects enabled non-profit indigenous socio-technical institutions to operate regional or local networks. As of late 2012, funding to most programs associated with Connecting Canadians ended, as discussed in Chapter 4 (Moll, 2012). Aboriginal organizations (including the AFN) criticized these policy shifts, in part since the federal government did not engage with Aboriginal communities during their planning and implementation. For example, the AFN stated:

“Several First Nations and networks have applied for funding from this new [Broadband Canada] program. Neither the AFN nor individual First Nations were invited to provide input into the selection criteria and procedures for this particular fund. As of the writing of this report [March 31, 2010], it is unknown how many First Nation-specific projects will be funded” (AFN Chiefs Committee on Economic Development, 2010, p. 18).

In June 2010, Industry Canada announced its plans to develop a national digital economy strategy, supported by recommendations from the Senate Standing Committee on Transport and Communications in their Plan for a Digital Canada. In part, this Plan reflected the recommendations of public interest groups, though it focused on economic rather than social goals (Shade, 2010). Several Aboriginal groups criticized the government’s lack of engagement with them in the development of this proposed plan, which presumably outlines the enabling environment for subsequent networked digital infrastructure development. When Industry Canada held formal consultations in 2010 regarding the development of this strategy, it did not refer to the specific contexts of on- and off-reserve indigenous communities (McMahon, 2011). Despite this ‘blind spot’, several Aboriginal groups contributed submissions to the consultations. For example, the AFN (in partnership with
Atlantic Canada’s First Nation Help Desk, the First Nations Education Council and Keewaytinook Okimakanak) submitted a consultation paper outlining four core principles they argued should drive the emerging strategy (Whiteduck, J., Burton, Whiteduck, T., & Beaton, 2010). These principles are:

1. Federal government must work with First Nations leaders and organizations representing First Nations communities, and harmonize with work already being done by the AFN and others as described in the e-Community ICT model.

2. Federal strategies must meet all connectivity needs of First Nations communities. The Government of Canada’s current technical definition of broadband as 1.5 Mbps is insufficient and so must be updated to a minimum of 10 Mbps fibre connection.

3. A broadband infrastructure development model must support First Nations community-owned, managed and sustained connectivity, and companies and organizations receiving federal funding for broadband infrastructure must work in partnership with First Nations.

4. Federal strategies must ensure ongoing support for a national network of First Nations broadband support organizations, building on the successes of the First Nations IT Regional Networks.

As of early 2013, the federal government has yet to release its digital economy strategy. Given this situation, it is unclear whether the plan will take into consideration the points raised in the Aboriginal submissions.

Parallel to these developments, Aboriginal Affairs and Northern Development Canada (AANDC) was tasked with developing a national Aboriginal connectivity strategy. No information on the Aboriginal connectivity strategy has yet been publicly released (although several interviewees told me it is being developed in consultation with the AFN and other organizations). Interviews associated with the First Mile study referenced above yielded several themes that might be useful for federal policy development in this area (McMahon et al, 2010, pp.120-137). I present these themes in Table 12. As outlined in the table, key informants suggested that the Aboriginal connectivity strategy might be a tool to help decolonize the enabling environment for networked digital infrastructure development in Canada. This might be done through funding and institutional support to encourage and sustain community-based endogenous development projects, through both capital and operational expenses. Informants also suggested that government could show leadership in this area by taking into consideration the diverse contexts of First Nations and Inuit
communities (including their rural and remote locations) and engaging with community members and local leadership to ensure that infrastructure and connectivity projects meet their needs. Such a First Mile development approach might involve partnerships with private and public sector organizations, as well as among indigenous communities. At present, given the lack of publicly available information on the federal government’s policies, it is unclear if and how the proposed Aboriginal connectivity strategy will be connected to the digital economy strategy, or what aspects of networked digital infrastructure development these initiatives will address.

Table 12: Ways Forward: Building First Mile Broadband Infrastructure and Connectivity Services with First Nations and Inuit Communities

<table>
<thead>
<tr>
<th>Policy Component</th>
<th>Discussion Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing a First Nations and Inuit Community Broadband Infrastructure and Connectivity Policy</td>
<td>Establish broadband as core infrastructure that enables the delivery of public and community services</td>
</tr>
<tr>
<td></td>
<td>Employ a holistic approach</td>
</tr>
<tr>
<td>Support First Nations and Inuit Community Leadership in Policy Development</td>
<td>Create institutionalized support for First Nations and Inuit broadband development</td>
</tr>
<tr>
<td></td>
<td>Support local engagement</td>
</tr>
<tr>
<td></td>
<td>Recognize remote and rural community realities</td>
</tr>
<tr>
<td>Facilitating Community-Based First Mile Development</td>
<td>Ensure development is driven by community needs</td>
</tr>
<tr>
<td></td>
<td>Support partnerships with commercial and government organizations</td>
</tr>
<tr>
<td></td>
<td>Support resource-sharing between communities</td>
</tr>
<tr>
<td></td>
<td>Establish sustainable funding frameworks</td>
</tr>
</tbody>
</table>

Alongside their contributions to decision-making over supportive policies, Aboriginal organizations are also engaged in regulatory activities associated with the work of the Canadian Radio and Telecommunications Commission (CRTC). Their efforts follow a long tradition of public engagement in Canada’s regulatory hearings: for example, in the early 1900s almost two-hundred local communities petitioned Parliament to block Bell Telephone from installing poles and wires in any municipality without the consent of local government
In its administration of regulatory requirements, the CRTC is guided and bound by the *Telecommunications Act* (1993). Working under the scope and limitations of the Act, the CRTC facilitates access to infrastructure, ensures “just and reasonable” rates, and protects common carriage principles. In its decisions, it is required to strike a balance between market forces and ‘essential services’. In line with these regulatory goals, the CRTC has historically played an important role in shaping networked digital infrastructure in some indigenous communities. For example, in the mid-1990s several First Nations socio-technical institutions in Ontario (including KO-KNET) petitioned the CRTC to pressure incumbent telcos to extend digital infrastructure to their communities located in so-called High Cost Areas.

Based on the *Railway Act* of 1906, and later updated to reflect telegraph and telephone networks through the *Telecommunications Act*, the CRTC regulates the services provided by telecommunications incumbents. To justify their ‘natural monopoly’ over telecommunications infrastructure, incumbents historically deployed several arguments (summarized by Babe, 1990). First, they claimed benefits of economies of scale to support universal service, a point often invoked but rarely supported through empirical evidence. Second, they invoked a need for ‘systemic integrity’ through centralized administration and end-to-end control (including vertical integration of network operators and equipment suppliers/manufacturers). This argument also failed the test of empirical evidence, as is clear in the thousands of independent companies that interconnect with one another. Third, they argued that universal service (including to rural/remote regions and socio-economically marginalized groups) can best be achieved through system-wide cost averaging (which treats an operating territory as one aggregated unit, rather than reflecting real costs for local units) and cross-subsidization (which shares service costs among regions, services, or subscriber groups). Empirical evidence from both Canada and the U.S. reflects the failure of private sector incumbents to extend infrastructure to remote and rural communities (unless supported by public subsidy). This condition led to the creation of dozens of independent private and public sector service providers, such as the dozens of municipal-owned local exchange networks operating in Manitoba, Saskatchewan and Alberta in the early 19th century (Babe, 1990). When incumbent telcos blocked these independent carriers from interconnecting with their networks, provincial governments purchased their assets and created Manitoba Telephone Services (MTS) and SaskTel in the prairie provinces (Babe, 1990). Over time, much of this publicly-owned infrastructure was privatized and sold to incumbents. Scholars like Wu (2010) and Crawford (2013) argue a similar consolidation process is taking place in the context of networked digital infrastructure in the U.S.
Serving Areas (HCSAs) (CRTC, 2005). KO-KNET leveraged the CRTC’s Decision 99-16 to develop its overlay Ku-Ke-Nah (K-NET) network on Bell Canada’s digital infrastructure (Jansen & Bentley, 2004; CRTC, 2005). This example shows how indigenous socio-technical institutions have leveraged regulatory requirements to assert their digital self-determination.

As of early 2013, there is no regulatory requirement for incumbents to provide universal broadband (1.5Mbps) service in Canada. However, over the years the CRTC has made public statements suggesting the need to establish one, given the persistence of access divides. For example, in 2005 the federal government mandated the Telecommunications Policy Review Panel to study ICT regulation, access and adoption, and provide recommendations regarding universal access (CRTC, 2005; McIver, 2010). The Panel’s final report, released in 2006, was critiqued for being dominated by industry and government concerns with competitiveness, productivity, and deregulation (Shade, 2010). That said, it did highlight the high profits and widespread convergence and concentration of ownership in the cable and telecommunications industries, and noted the persistent access divides in rural and remote areas (CRTC, 2005). In response to the Panel’s report, CRTC Decision 2010-637 directed several incumbents (Telus, MTS-Allstream, and Bell Aliant) to spend the funds in their so-called ‘deferral accounts’ to extend infrastructure to 287 rural and remote

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115 In hearings before the CRTC, NOWG and KO-KNET argued that access to broadband (1.5Mbps) be included as an ‘essential service’ in the HCSAs, which were previously exempt from universal service provisions. While pressure from the incumbent telecos overwhelmed these efforts, in Decision 99-16 the CRTC did establish a new definition of ‘basic service’ that included a requirement for the telecos to make available a digital switch with the capability to connect to low-speed data transmission (56kbps) at local rates (in the past, users paid expensive long-distance costs) (INAC, 2002; Fiser, 2010b).

116 Fiser (2010b) describes how this project broke the existing monopsony-monopoly relationship between the regional ILEC (Bell) and its government anchor tenant (Health Canada and INAC) by allowing third-party service providers to access leased infrastructure. Supported by FedNor, the Aboriginal parties argued that given public services (health and education) in First Nations are under federal jurisdiction, in cases where broadband infrastructure is required to deliver these services, the federal government had an obligation to fund and establish infrastructure.
communities in five provinces by 2014, stipulating a cost of $421.9 million for this purpose.117 (Remainder funds were rebated to existing customers living outside the HCSAs). However, this decision only impacted 57 First Nations, with the majority located in B.C.118

In 2010, the CRTC again held hearings to review and update the federal government’s definition of ‘basic service’ for broadband. In Decision 2010-43, the regulator noted it might consider expanding the basic service objective to include broadband access and introduce an obligation to provide it to all Canadians (CRTC, 2010, Appendix 6). However, a year later (Decision 2011-291) the CRTC declined to define broadband as a basic service, though it did establish universal target speeds of 5 Mbps downstream and 1 mbps upstream by 2015 (the so-called 51-15 rule). Hudson (2011a) argues these targets may provide a de facto mechanism that public interest groups can use to advocate for broadband development in rural and remote regions. In coming years, the CRTC will gather information from service providers to monitor progress towards these new targets. Another upcoming regulatory action

117 In 2002, the CRTC required the major incumbents to create deferral accounts for HCSAs that consisted of annual contributions equal to revenue reductions that would otherwise benefit consumers of residential local telephone services in non-HCSAs. In 2006, the CRTC required incumbents to spend these funds to improve services for people with disabilities, and to expand broadband access to rural and remote communities in HCSAs.

118 This activity is associated with the Network BC initiative, which is available at: http://www.cio.gov.bc.ca/cio/networkbc/index.page
with implications for rural and remote communities is the auction for the 700MHz spectrum band, scheduled for 2013.\textsuperscript{119}

Finally, the CRTC recently determined that the incumbent Northwestel failed to fulfill its service obligations in Canada’s Far North. As noted in Chapter 4, in Decision 2010-274, the CRTC criticized Northwestel for failing to provide its Basic Service Objective in the Yukon, despite generating high profits and receiving significant public subsidies to do so (CRTC 2011b). In Telecom Regulatory Policy 2011-771, the CRTC determined that local competition should be introduced into Northwestel’s territory to provide Canadians who reside in the North with a choice of service providers. In this context, the CRTC initiated Consultation CRTC 2012-669 to review the regulatory framework for Northwestel and the company’s proposed \textit{Modernization Plan}.\textsuperscript{120} As of early 2013, several Aboriginal organizations and affiliated groups (including the Nunavut Broadband Development Corporation, First Mile Connectivity

\textsuperscript{119} The Standing Senate Committee on Transport and Communications tabled a report in 2010 that suggested rural and remote infrastructure be funded by proceeds from this auction. The last major spectrum auction generated $4.25B for government – but Industry Canada only provided $225M to extend broadband service to rural areas (through Broadband Canada) (Marlow & El Akkad, 2010). The federal government stated that it will implement specific measures in this auction to support infrastructure development for Canadians in rural areas, including Aboriginal communities (AANDC, 2012). According to Canada’s Economic Action Plan website, companies that access more than one block of the 700MHz band (either directly through the auction or indirectly through spectrum sharing agreements) must deploy new advanced services to 90\% of the population in their coverage area within five years, and to 97\% of that population within seven years (Canada’s Economic Action Plan Website, n.d.). (The definition of ‘new advanced services’ is not specified). Consumer advocacy groups like Open Media argue the public should be involved in decision-making over how to spend this ‘digital dividend’ (personal conversation, Open Media administrator, March 6, 2012).

\textsuperscript{120} In response to this consultation, Northwestel released a redacted version of its Modernization Plan in mid-January 2013. The Plan stated the company plans to commit to a $233M investment through a five-year capital budget, and is actively pursuing partnerships with third parties to secure public funding to subsidize this service expansion and upgrades. Northwestel did not provide a breakdown of revenues from non-telecommunications services (such as cable operations) that utilize its network infrastructure. Subsequent to the release of the Plan, the Public Interest Advocacy Centre and the Consumers’ Association of Canada wrote to the CRTC requesting further that Northwestel disclose further information. The CRTC instructed Northwestel to do so, and extended the deadline for interventions to accommodate this change. However, in its response, the company did not disclose further information, citing the need the need to keep it confidential from competitors.
Consortium, and K’atlodeeche First Nation) filed interventions in this process. In their joint submission, the First Mile Connectivity Consortium and K’atlodeeche First Nation stated:

“It is our opinion that Aboriginal peoples are best positioned to articulate their own broadband development needs. We also submit that community networks can be strategically developed to generate economic development opportunities and provide broadband-enabled public services that resonate with the unique requirements of northern constituents in rural and remote communities.”

These regulatory interventions are situated in the shifting mandate of the CRTC. In recent years, the Telecommunications Act has become more overtly focused on market forces, in line with developments in the U.S. associated with the 1996 Telecommunications Act (Wilson, 2008; Aufderheide, 1999; Buchwald, 1997; Crawford, 2011). In Canada, although the Federal Court of Appeal established a legal precedent that defined Internet access as a public good and a social utility, the CRTC stated it does not have a strong enough mandate to unilaterally enforce universal broadband service (Bredin, 2001). However, the regulator recognizes its mandate should be updated and extended to better fit the context of the emerging digital environment (Marlow, 2010). For example, in a speech on June 13, 2011, outgoing Chair Konrad von Finckenstein suggested a conceptual rethink of the regulatory system is needed (von Finckenstein, 2011; for similar calls for regulation in the U.S. see Crawford, 2011/2013). Recent events suggest the CRTC’s new chair Jean-Pierre Blais may be taking a stronger position on regulating the activities of incumbent teleco and cable companies (Trichur, 2012). For example, in October 2012 the CRTC ruled against the proposed Bell-Astral Media merger on the grounds the consolidation of ownership was not in the public interest. In this context, some Aboriginal groups are advocating the CRTC for regulatory support of their community-driven networked digital infrastructure development projects.

Disclosure: I wrote and filed this submission on behalf of the two groups. The full submission is available here:

A subsequent response to the CRTC’s request for more information is available here:
6.4. Conclusion

In this chapter, I analyzed how indigenous peoples are engaging in the politics of the network society. Since the advent of networked digital infrastructure, indigenous peoples have consistently participated in various forums to argue for more control over and involvement in the enabling environments shaping networked digital infrastructure development. Beginning with examples from international (through the United Nations’ WSIS initiatives) and national (through the development of the National Broadband Plan in the U.S.) contexts, I turned to focus on Canada. I described how Inuit and First Nations political organizations have advocated for increased involvement in the shaping of the state enabling environment for networked digital infrastructure development. Outlining their engagements with both federal policy frameworks and regulatory interventions administered by the CRTC, I argued that the historical record points to a failure on the part of the state to support these initiatives (with important exceptions). Despite almost two decades of work in this area, federal broadband policy in Canada continues to ignore the specific contexts of First Nations and Inuit peoples, and does not yet reflect a comprehensive and sustained Aboriginal connectivity strategy.

At present, the government’s promise to release a Digital Economy Strategy has not yet resulted in any publicly released plan. In the absence of concrete public policy, the corporate sector is rolling out networked digital infrastructure in those regions that remain unserved, including Aboriginal territories. Much of this work is supported by public subsidies provided by government to private sector entities. Although some of these private-public partnerships involve indigenous community intermediary organizations, in many cases these systems are owned and operated by private sector service providers. This exogenous development model threatens to undermine digital self-determination by orienting the diffusion and management of networked digital infrastructure towards profit-oriented private sector entities, rather than service providers with strong ties to constituent Aboriginal communities. It also fails to involve user communities in technical and administrative decision-making, undermines local engagement and economic development opportunities, and may result in the lack of equitable service over the long term.

In this context, I now turn to highlight alternative development processes that more closely engage with the normative goals of digital self-determination. These articulations of
socio-technical governance spring from the activities of indigenous peoples and their partners. Emerging from conditions of scarcity, many of these endogenous development initiatives are driven by indigenous socio-technical institutions linked to local and regional contexts. Given their close ties to indigenous communities, these institutions sometimes reflect an organizational structure that generates multiple opportunities for participation from their constituents, as well as provide equitable access to connectivity services and broadband-enabled public services.

In the next chapter, I show how these socio-technical institutions act as mediators between the technical discourses of governments and regulatory agencies, and the people who are living in place-based indigenous communities (Richardson, 1998). I explore how they provide platforms of engagement between local constituents and regional centres of technical and political expertise. Like all organizations, indigenous socio-technical institutions have their shortcomings, and faced many challenges throughout their development trajectories. Nonetheless, they offer evidence of how a passionate and committed group of individuals can generate organizational frameworks that support the appropriation of large-scale networked digital infrastructures in innovative ways. I now turn to an analysis of these socio-technical institutions, focusing on those associated with the NICSN cooperative.
7. The Governance of Indigenous Infrastructure: Aboriginal Socio-technical Institutions as Networked Organizations

“They can’t just like come in, set something up, and expect [us to let] them to run it... They should have at least a radio show saying we’re here to do this, this is how it will benefit you, or this might be a way that it won’t benefit you. I wish they would be properly giving us all the information. They just come in here and say we’re gonna connect this… [People need to know] how it will affect them and their families” (interview 1008).

Indigenous peoples are actively working to decolonize the state enabling environments supporting networked digital infrastructure development in Canada. In the previous chapter I highlighted the long history of advocacy in this area undertaken by First Nations and Inuit political organizations. But despite these efforts, the historical record points to the continuing persistence of access divides faced by rural and remote indigenous communities, alongside a frustration on the part of First Nations and Inuit organizations regarding their involvement in these decision-making processes. This challenging context – further complicated by complex regulatory frameworks and legalistic and technical discourses they are expressed in (see Richardson, 1998) – nonetheless generated some positive outcomes for Aboriginal organizations. Specifically, the socio-technical institutions that engaged in these activities built up technical and political capacities that assisted with their subsequent development work. This observation echoes a similar point made by Roth (2005) in her discussion of Aboriginal broadcasting:

“First Peoples’ self-organized media projects, the clustering of their broadcasters into policy lobby groups, and their cross-cultural programming initiatives have transformed them into new social actors who do media politics differently from others in Canada” (p.229).

In this chapter, I explore the internal political dynamics and external pressures associated with the socio-technical institutions involved in Aboriginal networked digital
infrastructure development. I show how these organizations are uniquely situated to express the diverse needs of their constituent members. I also explain how they are shaped by the diversity that exists between and inside indigenous communities, as well as the continuing impacts of state-imposed policy and funding frameworks.

Like all communities, indigenous communities include internal distinctions and divisions, sometimes further reified through colonialism (Fanon, 1963; Said, 1979; Voyageur & Calliou, 2000). As Simpson (2011) points out, indigenous conceptions of leadership are grounded in cultural values and social structures that are sometimes distinct from, and even counter to, those that generated the system of elected Chiefs and Band Councils (or other forms of local government, like municipalities in Inuit territories) that formally governs indigenous communities today. Recognizing these complexities, my goal here is not to evaluate or judge the goals, structure, or efficacy of the government institutions I describe in this chapter. Furthermore, as a Euro-Canadian observer, I am neither justified nor qualified to comment on the forms of leadership present in indigenous communities. Instead, I draw on discussions and interviews with residents of place-based indigenous communities and their locally-elected leaders, as well as non-Aboriginal peoples who work for indigenous socio-technical institutions. I present their governance processes and organizational structures as emergent articulations of digital self-determination that I expect will change in form, scope, membership, and focus over time.

Indigenous socio-technical institutions reflect many characteristics of the community technology movement. Servon (2002) describes this as “a grassroots social movement that employs IT to empower historically disadvantaged individuals and communities” (p.1). In the 1980s, people set up text-based Bulletin Board Systems over analogue infrastructure. In following years, their projects became increasingly sophisticated, given the possibilities of digital technologies. They differentiated into various organizational forms, including place-based Community Technology Centres (often associated with community development organizations) and online Community Computing Networks (like Free-Nets and Community Development networks). By the early 2000s, a variety of organizations operated ‘open networking’ projects in communities across North America (McIver, 2010; Myles, 2004; Shade, 2010; Werbach,
n.d.; Castells, 2010a). Some of these groups built their own access infrastructure, utilizing technical configurations like unlicensed spectrum, public Wi-Fi, satellite space segment, and fibre optics.

Despite some notable successes, many of these projects ended by the late 2000s. While reasons varied, they included financial pressures, political tensions, and challenges to organizational viability (Middleton & Crow, 2008). However, while they remain precariously situated, some projects did manage to generate stable structures of community-based governance (Powell, 2011; Pejovic, Johnson, Zheleva, Belding, Parks, & Van Stam, 2012; Longford et al, 2012). Among those that remain in operation are the indigenous socio-technical institutions I discuss in this chapter. I present these institutions as ‘network organizations’ (Castells, 2010b). Compared to the relatively static, centralized, hierarchical nature of traditional organizations, network organizations work like switchboards, in a “flexible, laterally coordinated, team based, and boundary spanning” fashion (Rainie & Wellman, 2012, p.177). Benefits for members include the potential for increased autonomy, flexibility, collaborative sharing of knowledge and expertise, and decentralized control.

In this chapter, I describe how the organizational structure of indigenous socio-technical institutions reflects some of the normative goals of indigenous self-determination. Specifically, this includes a desire for strong engagement in decision-making among geographically dispersed, politically autonomous communities that are situated on the periphery of the network society. My analysis draws on Fiser (2010b), who developed a typology comparing the organizational structure and ownership patterns of indigenous community network models against the baseline of non-Aboriginal

122 Middleton and Crow (2008) note that groups govern network access and design in different ways, according to various normative goals. For example, a municipal network (like Fredericton’s eZone) used Wi-Fi as part of the municipality’s economic development strategy, while the Ile Sans Fil in Montreal focused on community-based applications and content.

123 Management analysts couch these descriptors with a disclaimer that few studies provide conclusive evidence about whether networked organizations actually work better than fixed bureaucracies (Rainie & Wellman, 2012, p.183).
commercial enterprises (incumbent telecos) (see also Whiteduck et al, 2012; Middleton & Crow, 2008; Mignone & Henley, 2009; Ramirez, 2007).\textsuperscript{124} Fiser concluded that although incumbent telecos managed infrastructure in 70% of Aboriginal communities in Canada (as of 2009), they remained divorced from the geographic and cultural contexts of these communities, are less flexible and accountable to local users, and lacked understanding of the history and development goals of indigenous communities. His analysis illustrates some of the tensions associated with profit-oriented networked digital infrastructure development in indigenous communities. As a counterpoint to these organizations, he provides three alternative models of indigenous socio-technical institutions that I summarize in Table 13. In describing these three models, Fiser (2010b) notes that from the earliest days of networking and continuing to the present, First Nations expressed a strong desire for local control and ownership of community infrastructure, and an active role in its governance decisions. In the next section, I explore how some of these normative goals emerged in the organizational structures of several indigenous socio-technical institutions.

\textit{Table 13: Models of Indigenous Socio-Technical Institutions}

<table>
<thead>
<tr>
<th>Model</th>
<th>Ownership and Management</th>
<th>Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Nations entity (ex. Band Council)</td>
<td>Owns local loop as public property Local loop managed by a not-for-profit organization, indigenous enterprise, or external service provider</td>
<td>Leases bandwidth from an incumbent (some own backhauls) Aggregates demand among public service anchor tenants Sells Internet to residential/institutional customers</td>
</tr>
<tr>
<td>Indigenous commercial enterprise</td>
<td>Owns local loop as private property Manages local loop for profit</td>
<td>Leases bandwidth to sell Internet services to residential/institutional customers Less of a focus on public services</td>
</tr>
</tbody>
</table>

\textsuperscript{124} Fiser (2010b) defines a ‘community-based organization’ as directly accountable to the constituency it serves. This constituency has some direct influence over the organization’s development and administration (p.36).
7.1. The formation of Aboriginal socio-technical institutions

Parallel to the development of the state enabling environment described in the previous chapter, several Aboriginal groups established their own socio-technical institutions to drive networked digital infrastructure work in their constituent communities. For example, the AFN First Nations Chiefs-in-Assembly passed several resolutions mandating regional institutions to build and manage infrastructure on behalf of member communities. Recognizing its role as a tool to support their self-determination, in these resolutions the Chiefs framed networked digital infrastructure as basic infrastructure, similar to roads, water, and electricity. Their resolutions mandated the access infrastructure development work I discussed in Chapters 4 and 5, which was supported by Connecting Canadians initiatives like First Nations SchoolNet and the Community Access Program (J. Whiteduck, 2010; Strachan, 2009). Throughout these initiatives, the AFN worked closely with the federal government funders to increase the resources and administrative responsibilities of the involved socio-technical institutions. For example, when First Nations SchoolNet decentralized program administration in 2002, it began funding six (later seven) Regional Management Organizations. The governance structures of these institutions sought to balance centralized efficiencies and economies of scale while retaining close links with local communities. Table 14 lists these organizations, which extended across Canada and are still in operation today.

125 Fiser’s use of the term ‘social enterprise’ is modified from The Social Economy Centre at the University of Toronto. He adapts the framework to consider “how social resources relate to financial and physical capital, not to forget technical actors (such as local loops), and the critical question of ownership and control” (p.54).
<table>
<thead>
<tr>
<th>Region</th>
<th>Organization</th>
<th>Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.C.</td>
<td>First Nations Technology Council (in partnership with the First Nations</td>
<td>FNTC</td>
</tr>
<tr>
<td></td>
<td>Education Steering Committee)</td>
<td></td>
</tr>
<tr>
<td>Alberta</td>
<td>Technical Services Advisory Group</td>
<td>TSAG</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>Keewatin Career Development Corporation</td>
<td>KCDC</td>
</tr>
<tr>
<td></td>
<td>Keewatin Tribal Council working with Broadband Communications North</td>
<td>KTC (BCN)</td>
</tr>
<tr>
<td>Ontario</td>
<td>Keewaytinook Okimakanak K-Net Services</td>
<td>KO-KNet</td>
</tr>
<tr>
<td>Quebec</td>
<td>First Nations Education Council</td>
<td>FNEC</td>
</tr>
<tr>
<td>Atlantic Region</td>
<td>Atlantic Canada’s First Nation Help Desk</td>
<td>FNHD</td>
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</tbody>
</table>

Aside from programs in the Atlantic provinces (which are collectively administered by Atlantic Canada’s First Nation Help Desk), every province has its own Regional IT Organization. These socio-technical institutions administer technology programs, advocate federal and provincial governments for funding and regulatory support, and sometimes develop and operate their own networked digital infrastructure. While they share many normative goals, including a focus on community-driven endogenous development, distinctions between provincial, regional, and legal contexts led to different organizational structures and strategies among the institutions. I will discuss some of these similarities and differences in my discussion of KTC/BCN and KO-KNET.

The normative framework shaping the development of these regional organizations is formally expressed in the AFN’s e-Community ICT model (Whiteduck, J., 2010). First presented at the 2009 Aboriginal Policy Research Conference, the model encompasses five themes associated with First Nations governance of local infrastructure: capacity building; broadband infrastructure and connectivity; human resources; information management; and service delivery. Along with operationalizing these themes in their development and administrative work, the Regional Management Organizations began meeting on a regular basis, coalescing over time into the AFN’s ICT Working Group. This national network continues to be supported through $150,000 in annual funding from AANDC (a senior director at AANDC told me this funding will not be impacted by recent funding cuts to regional Aboriginal organizations, such as those to the Assembly of Manitoba Chiefs) (interview 5067). The members of this AFN ICT Working group continue to apply the e-Community Strategy in their various local and regional development projects.
In December 2011, AFN Chiefs-in-Assembly passed Resolution 2011-09 supporting the e-Community Strategy, and mandated members of the ICT Working Group to build their own e-Community projects. For example, KO-KNET is involved in several projects in northern Ontario.\textsuperscript{126} Researchers are presently exploring this work in partnership with involved institutions. The First Nations Innovation Project, led by the University of New Brunswick, recently received a five-year grant from the Social Sciences and Humanities Research Council to study e-Community projects in Ontario, Quebec, and Atlantic Canada (Whiteduck et al, 2012; Whiteduck, Tenasco, O'Donnell, Whiteduck, & Lockhart, 2012).\textsuperscript{127}

The e-Community framework provides a strongly articulated normative basis from which to frame my discussions of the governance of networked digital infrastructure. My field research found that the indigenous socio-technical institutions associated with NICSN reflect similar goals as those expressed in the e-Community strategy (in part due to KO-KNET and KTC/BCN’s involvement in both initiatives). At the same time, the three NICSN partners emerged from distinct political, social, economic, and cultural contexts. They also reflect differences in terms of their size, revenue, network assets, and relationships with anchor tenants (Table 15 compares some of these factors). But despite these variations, the three organizations are collectively working to shape the governance of their networked digital infrastructure as a public good accountable to constituent user communities.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|}
\hline
Partner & KO-KNET & KTC & KRG \\
\hline
\# of FT (core) employees & 18 & 10 & 11 \\
\multicolumn{3}{|c|}{(accesses professional services from KRG)} \\
\hline
\# of occasional (contract) & 4 & 0 & 1 PT (customer service) \\
\hline
\end{tabular}
\caption{Comparing three NICSN partners}
\end{table}

\textsuperscript{126} For more information, visit: http://e-community.knet.ca/

\textsuperscript{127} Disclosure: I am involved in this group and may be hired as a post-doctoral researcher to work for the First Nations Innovation Project.
employees

<table>
<thead>
<tr>
<th>Administrative structure</th>
<th>Tribal Council</th>
<th>Tribal Council</th>
<th>Regional Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governing body</td>
<td>KO Tribal Council</td>
<td>BCN Executive Council</td>
<td>KRG Regional Council and Executive Committee</td>
</tr>
<tr>
<td>Gross annual revenue ($M)</td>
<td>ONT First Nations Sat - $0.26 NICSN - $0.72 KO-KNet Total - $5M</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>Core Anchor Tenants</td>
<td>KiHS KOTM FNS</td>
<td>MB Telehealth MFNERC FNS</td>
<td>CSPQ (NRBHSS) KRG KSB FCNQ</td>
</tr>
<tr>
<td>Allows local ISPs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, where feasible</td>
</tr>
</tbody>
</table>

In part, this common development strategy links to shared challenges. All three regions lacked an installed base of infrastructure, economic development opportunities, and access to public services like health and education. These conditions led to a similar history of organizational development, as these groups partnered for mutual benefit. As described in Chapter 4, around the same time that KO-KNET was setting up its early satellite network, the Ontario Tribal Council was collaborating with KTC through Connecting Canadians initiatives like First Nations SchoolNet (FNS). The two institutions met during regular videoconference and in-person meetings (Ramirez, Aitkin, Jamieson & Richardson, 2004; Keewaytinook Okimakanak Research Institute, 2005; T. Whiteduck, 2010). Although they interacted less frequently, KRG also shared ties with KO-KNET prior to the NICSN project. The organizations shared a satellite management company (SSi Micro), and when the regional government needed space segment in 2002, the Ontario group provided them with a portion of their public benefit transponder.

Despite these early connections, the three socio-technical institutions only began closely collaborating in 2003, at the SMART Communities conference in Winnipeg (see discussion in Chapter 5). The three partners decided to cooperate to secure Public Benefit space segment made available by Telesat as a regulatory condition of their orbital position.
license for satellite Anik F3. The resulting NSI Round 1 and 2 funding initiatives further strengthened the partnership, and in 2007 the institutions consolidated their partnership into the NICSN Joint Venture (KO-KRG-KTC, n.d.). Throughout this history, the three institutions shared a common instrumental goal: to build and operate a cooperative satellite network that provided equitable, affordable connectivity services to their remote and sparsely populated member communities. In the next section, I illustrate how this goal is expressed in NICSN’s organizational structure by analyzing a confluence of economic, administrative, political, and technical factors.

7.2. Cooperative satellite economics

The economics of satellite networking require operators to lease space segment in bulk over a fixed period of time. This makes it challenging to secure a return on capital investment, particularly in the context of high costs and uncertain user demand (Imatiuk, 2011; Elbert, 2008). Satellite business cases must therefore account for both initial capital and long-term operations and maintenance costs. One way to generate revenue is by leasing processed bandwidth to network tenants. In this context, smaller organizations without a lot of capital can benefit from an arrangement that aggregates demand and revenues from multiple service points across a dispersed network. One reason the NICSN partners decided to form a cooperative was to secure mutual economic benefit through such an arrangement. A cooperative organizational structure enabled the three partners to derive economies of scale and gain access to shared equipment, bandwidth, and administrative and technical resources they could not otherwise afford. The way the partners structured their business case also reflected their normative goal to establish a not-for-profit cooperative that provided advanced digital services to communities that cannot otherwise attract for-profit service providers, given the low profit margins and lack of return on investment.

The NICSN business model reflects the Community Aggregator approach to broadband diffusion I describe in Chapter 4. The three partners, as community intermediary organizations, aggregated demand from public service anchor tenants and residential/business Internet customers. Communities are charged a fixed rate to connect to the network, which is paid for by revenues generated from sales to various tenants. The three
NICSN partners each receive a portion of these monthly revenues to support their operations and maintenance costs, with the remainder accumulating in a public benefit fund. Table 16 shows the breakdowns of these costs and revenues.

**Table 16: Costs and Revenues for NICSN Cooperative (2011)**

<table>
<thead>
<tr>
<th>Partner</th>
<th>Cost charged by NICSN to community</th>
<th>Cost breakdown</th>
<th>(Potential) revenues generated through anchor tenants</th>
</tr>
</thead>
<tbody>
<tr>
<td>KO-KNET</td>
<td>$1,675</td>
<td>KO-KNET: $1,000, Public Benefit: $675</td>
<td>KOTM: $1,200, KiHS: $450, FNS: $300, Internet Sales: (varies)</td>
</tr>
<tr>
<td>BCN</td>
<td>$1,675</td>
<td>KO-KNET: $400, BCN: (N/A), Public Benefit: $675</td>
<td>First Nations SchoolNet (1-4MB dedicated: N/A), Manitoba Telehealth: (1-4MB dedicated: N/A), Province of Manitoba: (N/A), Internet Sales (bandwidth to community ISPs in 7 communities): (N/A), Internet Sales (direct to residents/businesses in 8 communities): (varies)</td>
</tr>
<tr>
<td>KRG</td>
<td>$1,675</td>
<td>KO-KNET: $400, KRG: (N/A)</td>
<td>CSPQ (NRBHSS): $142,000 / month (gross, dedicated), KRG: $35,000 / month</td>
</tr>
</tbody>
</table>

128 N/A indicates cases when the organization was requested to provide data but did not agree to make it publicly available.

129 While the majority (95%) of this amount is used for NHBSS, it also includes support for the provincial Ministry of Justice (1 site) and Minister of Employment and Social Solidarity (2 sites). Most of these monthly revenues are used pay Telesat Canada for an additional 21MHz of bandwidth that is separate from the NICSN cooperative and dedicated for use only by CSPQ (although managed and processes by Tamaani Internet).
| Public Benefit: $675 | KSB: $13,500 / month  
FCNQ: $3,300 / MB / month  
Internet Sales: (varies) |

To ensure equity across the cooperative, costs for the 43 member communities are equalized to an equal monthly rate: $1,675 (the cooperative charges KRG and BCN $1,275 / month per community since they operate their own regional network gateways).\(^{131}\) The partners standardized this rate regardless of location and population size, by internally cross-subsidizing revenues it receives from all communities. They do this to ensure all members gain an adequate level of service, regardless of the ‘real costs’ to connect.\(^{132}\) In some cases,

\(^{130}\) This covers over 60 offices, including Northern Village offices, and 100 mobile devices. Under NSI Round 2, KRG access up to 8 Mbps in Kuujjuaq. In all 14 villages, employment offices, policy stations, airports, national park offices, and around 100 roaming modems could all access 256kbps down / 128 kbps up. This added up to around 63 Mbps, subject to oversubscription (interview 4034). After Broadband Canada, KRG’s head office in Kuujjuaq can access around 20 Mbps, all the fixed links increased to 1.5 Mbps down / 384 Mbps up, and the roaming modem provide 768 kbps down / 256 kbps up, for a total of around 200Mbps (subject to oversubscription) (Interview 4034).

\(^{131}\) This cost initially paid for a 768KB symmetrical link, or half a terrestrial T1, although connectivity has since improved. Inside Ontario and Manitoba, First Nations face cost variations associated with the access infrastructure they connect to on the terrestrial side of their network. For example, BCN’s network in Manitoba utilizes three types of backbone: long-range microwave (which bridges communities to fibre) and fibre optic cables (provided by Manitoba Hydro and MTS Allstream), and C-Band satellite (provided by NICSN). Given large cost discrepancies between these backhaul types, BCN cannot afford to charge all communities the same rate, though it does standardize costs inside each ‘service tier’.

\(^{132}\) The partners also set the ‘equivalent to terrestrial rate’ several hundred dollars higher than real costs of the network to discourage communities from switching from terrestrial to satellite infrastructure.
this process involves dividing up bandwidth according to needs associated with the unique contexts of member communities, rather than a ‘one size fits all’ approach.\textsuperscript{133}

As Table 16 shows, these costs include a payment to KO-KNET to manage the network operations centre and pay connectivity costs, to BCN and KRG to manage the regional gateways, and a monthly contribution of $675 per community for a shared Public Benefit fund. Communities pay the monthly rates through revenues generated by the sale of bandwidth to public service anchor tenants (and the sale of Internet services in Quebec). Specific revenues from these services vary by community, since the sites have different arrangements with public service anchor tenants (for example, although every satellite-served community in Ontario accesses KOTM, they do not all access KiHS). For this reason, the amounts shown in Table 16 present the ‘best case scenario’, rather than the present situation in all NICSN communities. In Ontario and Manitoba, any leftover revenues at the community levels pay for costs associated with local networks (equipment, supplies, maintenance, and staffing) through the sale of Internet services. Finally, given the different accounting method employed by KRG in Quebec (which employs a regional business case), the amounts noted in Table 16 present the charges paid by all points of service in the network, rather than a breakdown by community.

The NICSN Public Benefit fund is used to pay for shared costs stipulated in the Joint Venture agreement (KO-KRG-KTC, n.d.). These common purchases include fees for operations and staffing, interconnection, and technical support (KRG, KO-KNET & KTC, 2007). The fund can also be used to pay for commercial space segment in the event that public subsidies to NICSN end. However, since much of the fund was depleted to pay costs\textsuperscript{133} For example, KRG distributes bandwidth to each community based on the funding amounts the regional government received in the various programs (NSI Round 1 and 2, and Broadband Canada). Although the amount paid to NICSN has remained the same since the start of the cooperative, the bandwidth provided to communities has increased. For example, in NSI Round 1, KRG split up 9 Mbps down / 2 Mbps up between the 14 Nunavik communities. That increased to 45 Mbps down / 22 Mbps up after NSI Round 2. It further increased to 267 Mbps down / 54 Mbps up after Broadband Canada. KRG decides how to partition this bandwidth among the Nunavik communities based its internal planning processes (interview 4034).
associated with NSI Round 2, it could not support the network’s operations for longer than a few months. This highlights that the NICSN cooperative arrangement is only financially sustainable if it continues to receive publicly subsidized space segment. This reflects the precarious nature of NICSN: the entire system, and all of the broadband-enabled public service applications and economic development platforms that are dependent on it, require the presence of a supportive state enabling environment. At the contemporary historical moment of austerity, the NICSN cooperative faces a significant challenge to its continuing existence. As noted in Chapter 4, the federal government’s subsidies for existing space segment are presently scheduled to expire in 2016 and 2019.

Along with providing shared fiscal benefits across the cooperative, the NICSN partners support economic development opportunities for member communities. As I will discuss later, in different ways the NICSN partners all encourage local residents to become involved in the operations, maintenance, and development of networked digital infrastructure. However, levels of community ownership and control of local infrastructure vary. The two First Nations organizations enable more opportunities for local entrepreneurs to set up and manage Internet Service Providers (ISPs) compared to the regional government in Nunavik (although Tamaani Internet does lease bandwidth to one local ISP in Kuujjuaq). While Tamaani Internet’s approach to network operations and maintenance is more centralized than that employed in the two First Nations regions, the institution does work with local agents who contribute to basic administration and repair work (supported by technical staff working out of the network hub). Table 17 summarizes the number of local ISPs in NICSN, and Table 18 compares Internet service offerings in the three regions.
### Table 17: Number of Local ISPs (circa 2012)

<table>
<thead>
<tr>
<th>ISP</th>
<th>Community ISPs</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>KO-KNET</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>KTC-BCN</td>
<td>7</td>
<td>8 served by BCN&lt;sup&gt;135&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 with no residential/business Internet service&lt;sup&gt;136&lt;/sup&gt;</td>
</tr>
<tr>
<td>KRG</td>
<td>1</td>
<td>Community ISP (Nunavik Communications)</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>served by Tamaani Internet</td>
</tr>
</tbody>
</table>

### Table 18: Comparing Monthly Internet Service Offerings

<table>
<thead>
<tr>
<th>Region</th>
<th>Residential Service (upload/download)</th>
<th>Cost ($&lt;sup&gt;134&lt;/sup&gt;)</th>
<th>Business Service</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>Up to 2</td>
<td>30-50</td>
<td>(unavailable)</td>
<td></td>
</tr>
<tr>
<td>Manitoba</td>
<td>BCN Northern Lite (1.5/56; no limits)</td>
<td>60</td>
<td>BCN Northern Biz (2.5/128; no limits)</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>Bloodvein Community ISP</td>
<td>50</td>
<td>Bloodvein Community ISP</td>
<td>150</td>
</tr>
<tr>
<td>Quebec</td>
<td>Basic (512/128; 10GB limit)</td>
<td>60</td>
<td>Basic (1.5/384; 125GB limit)</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Intermediate (768/192; 20GB limit)</td>
<td>70</td>
<td>Elite (3/768; unlimited)</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Power (1.5/384; 30GB limit)</td>
<td>80</td>
<td>Mobile (768/192; 20GB limit)</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Power+ (1.5/384; 45GB limit)</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HomePro (1.5/384; 75GB limit)</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>134</sup> Bunibonibee, Sayisi Dene, Red Sucker Lake, Berens River, Bloodvein, Poplar River and Mathias Colomb.

<sup>135</sup> Barren Lands, God’s Lake, Manto Sipi, Northlands, Shamattawa, Garden Hill, St. Theresa Point, and Mosakahiken Cree.

<sup>136</sup> Wasagmack.
In the Ontario First Nations, Band councils or entrepreneurs can purchase and operate the physical connections located inside the boundaries of their community (Fiser, 2010b). This ‘local loop’ includes the wireless or cable infrastructure that connects homes, businesses, public institutions, and other users to one another, and to the service provider’s Point of Presence (PoP). It terminates at a demarcation point that “separates what the community owns, controls, and its responsible for, from what the telecom service servicer owns, controls, and is responsible for” (Fiser, 2010b, p.39). KO-KNET allows its member First Nations the option to take over ownership and control of these local loops. In Manitoba, BCN provides a similar model, although it retains ownership of some infrastructure, such as the wireless distribution towers that provide the Point of Presence in a community. However, communities ISPs do own their own provisioning equipment, such as the wireless modems that connect residents and businesses to the Internet service provider.¹³⁷ Both regional institutions do this to build capacity, encourage economic development, and circulate revenues generated from Internet sales.

The local ISPs are responsible for selling Internet services to homes and businesses. They set prices, hire technicians, and manage customer accounts and billing. These enterprises benefit from the cooperative network’s economies of scale: as more bandwidth is purchased, the price to lease backhaul from NICSN decreases, with cost savings passed on to communities. Local ownership and management of ISPs also enables communities to set their own usage policies, sometimes arrived at through community deliberations. For example, Sachigo Lake’s network usage policy reflects community concerns around online bullying and access to inappropriate content. Customers that violate the terms of this policy risk a reprimand from the local ISP. One regional administrator commented on the modest, though important, benefits of these enterprises:

¹³⁷ If BCN ever went out of business, this equipment, including the towers, will remit to community assets (interview 3028).
“We’re not saying they’re going to become millionaires from selling Internet. They will derive some benefit. It may be enough to employ a local person or two, but at least you know it’s creating a service. It’s creating capacity and then you have training and skills transfer that are now available to the different communities” (interview 3028).

While some communities have been successful in these endeavours, local ISPs also face significant challenges to their ongoing sustainability. Small populations and poverty impact the financial viability of local ventures. Communities also often lack capacity and resources like equipment and skilled staff. Even communities with trained technicians face challenges in retaining staff. For example, when Fort Severn’s community technician moved to Sachigo Lake, it took some time for the local network to hire a replacement. Many people I spoke to lacked technical confidence and felt anxious working with computers – a point expressed by half (50%) of respondents in KO-KNET’s survey (KO-KNET, 2012, p.9). In the words of one technical trainer from Northern Ontario: “What I always find is that the person is just scared to learn. They’re scared they’re going to break something, or screw up a configuration” (interview 1003). Although this situation is improving over time, some institutions still regularly encounter challenges in working with community ISPs. Though he recognized the need to support their work, one of BCN’s anchor tenants told me:

“It’s not a matter of the ISP not being diligent or so on. It’s a matter of experience and knowledge. And they have to gain that. And if you don’t give them that opportunity, then it’s never going to take off the ground. We try and be as flexible as we can...It’s about building expertise in communities. If we don’t do that, we’ll be in this same spot 20 years from now” (interview 3054).

This statement reflects some of the challenges faced by service providers put in the difficult position of need to secure reliable access to connectivity services without undermining the long-term benefits that can arise from community owned and operated networks. While these organization require a certain quality for the services they provide, they also recognize the need to support local capacity-building over time to support community development.

Compared to KO-KNET and BCN, Tamaani Internet reflects a more centralized approach to the ownership and management of local loop infrastructure. KRG retains ownership of all of Tamaani Internet’s physical assets, and designed its satellite system to be centrally managed from Kuujjuaq, with only limited involvement from local
technicians. Tamaani Internet does allow entrepreneurs to purchase satellite space segment at commercial rates and use it to set up private businesses, and as a result, one local ISP presently exists in Kuujjuaq. An entrepreneur set up Nunavik Communications in 1994 and started selling Internet services in 2005 over the digital cable infrastructure. This network cannot support high-bandwidth applications like videoconferencing or mesh networking, but since late 2012 the company has purchased 7 MB of backhaul satellite bandwidth (6 MB down / 1 MB up) from KRG at a cost of $1,500 per month, which it distributes to approximately 100 residential Internet customers (KRG, 2012).

Tamaani Internet centralizes more of its network management, expertise, knowledge, and capacity in Kuujjuaq. In part, the management team made this decision because of the lack of capacity in the sparsely-populated villages. While Tamaani Internet staff recognize the benefits of building capacity, they found it challenging to find people interested in technical positions, and found that skilled individuals often leave home to work in the urban south (interview 64). For example, in Ivujivik, the school network is managed by a retired volunteer rather than a full-time dedicated staff member. In the words of one resident: “very few of the [Nunavik] communities have significant enough technical knowledge amongst the staff in place to be able to solve problems on a regular basis” (interview 4047). Furthermore, aside from the FCNQ (which decided to end its Internet services venture, Ilagi), no local or regional institutions desired to provide connectivity service. That said, this situation may be changing, as limited local competition now exists in Kuujjuaq through Nunavik Communications, and may spread to other villages in the region.

To generate alternative economic development opportunities for people in Nunavik, KRG also encourages local enterprises to utilize Tamaani Internet as a platform for online business. For example, an Ivujivik-based company called Pirnoma

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138 This is ‘best effort’ dedicated bandwidth. If the company was to purchase this amount of dedicated bandwidth from Tamaani Internet, it would cost $23,000 / month.
Technologies provides web and graphic design services, IT support, and technology training to people across the region (I described this company in Chapter 2).

Tamaani Internet also employs 30 local part-time sales staff and network technicians that sign up new customers, manage accounts, and conduct basic repairs in exchange for free Internet, a small commission (calculated per customer on a monthly basis), and an hourly wage for extra work ($25 / hour).\textsuperscript{139} There is not enough work for these local agents to create a full or even half-time position. On my visit to Ivujivik, I spoke to the community’s two local agents. They sign up customers and take care of the local earth station, shovelling snow from the satellite antenna during winter blizzards. They have no permanent office space or equipment, and keep their files in the municipal office’s storage closet. Both agents became interested in the job for the free Internet and their personal interest in technology. They received some training from KRG in the late 2000s, and spoke with pride about acquiring the knowledge and skills to become “real technicians” (interview 4043). Tamaani Internet only offers limited technical training to these local agents, although the regional government plans to extend more opportunities in the future (interview 4034). However, both local agents I spoke to noted the position does not require a high degree of expertise:

“[Tamaani Internet is] the brains. We’re just the fingers here [laughs]. They tell us what to do. We don’t understand them, but they understand it [the system]...We’re the agents, but only as the sign-up sheet guys. We weren’t really technicians at the time [we started in 2003]. We were just providers. So I became a technician in 2006. To evolve my knowledge” (interview 4043).

Between 2009 and 2012, Tamaani Internet further centralized its operational and administrative staff in Kuujjuaq.\textsuperscript{140} The institution hired additional staff to improve customer

\textsuperscript{139} This model is different from the Nunavut Broadband Development Corporation (NBDC), where the network is managed on a for-profit basis by SSi Micro, which shares a portion of its profits with local agents.

\textsuperscript{140} Permanent staff at the head office in Kuujjuaq include a senior technician, an intermediate technician, a coordinator, and two consultants. Most staff are not Inuit. Tamaani Internet’s new operations and maintenance manager formerly set up communications systems for NATO: his most recent position involved networking sites in Afghanistan.
relations, streamline internal procedures, and increase technical capacity. Two field technicians now cycle in and out of the villages to conduct repairs as needed. These changes reflect the increasing centralization of knowledge and expertise in Nunavik’s regional capital, which may impact long-term capacity development in the region’s other 13 communities.

### 7.3. Governance: Balancing regional efficiencies and community engagement

NICSN’s governance structure reflects attempts to balance the shared normative goals of the three partners with the regional distinctions associated with the ways that state-Aboriginal relations played out over time. Despite efforts to involve local residents in decision-making regarding the cooperative, the partners faced several challenges and limitations in decentralizing its governance structure. At the Winnipeg conference that led to the formation of NICSN, they stressed the need to engage local champions in the network’s development and administration (NICSN, 2005). In part, this was because demand for bandwidth exceeded available capacity, and so the group needed to work out a fair and transparent way to govern the distribution of the limited space segment. To this end they designed a transparent process outlining how they planned to engage indigenous community members in NICSN. The draft NICSN bylaws, published on January 20, 2005, reflect these early goals (Draft Bylaws, 2005).

The three NICSN partners, community members, and representatives from Aboriginal political and socio-technical organizations present at the meeting conceived NICSN as a user group of member communities. They designed it to allow local representatives to directly dialogue with government funders (interview 1021). Local representatives would vote to appoint a six-person Executive Board of Directors, which would convene no less than twice a year and host an Annual General Meeting concerning NICSN’s strategic development (Draft
Bylaws, 2005). Along with decentralizing the cooperative’s governance, this framework was designed to encourage users to become invested in the socio-technical network: “The idea was to make people feel that it’s their network” (interview 4032). The Executive Board would also govern the activities of the three network operators, which administered NICSN on behalf of member communities. This process was to be institutionalized in regional working groups of two representatives in each of the three provinces, plus one non-voting member and a non-voting federal government representative. KO-KNET would manage the network hub in Sioux Lookout, with the other operating partners acting as regional points of contact and managing their respective provincial networks. Figure 5 illustrates this arrangement, as presented in the NSI Round 2 business case (KRG, KO-KNET & KTC, 2007).

**Figure 5: Diagram of NICSN Governance Structure (KRG, KO-KNET & KTC, 2007, p.10)**

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141 Active members (restricted to communities receiving satellite services from the operating partners) with full voting privileges could be elected to serve on a six-person Board of Directors (Three members serving two-year terms; three serving one-year terms). Non-voting general members consisted of parties with a vested interest in NICSN, such as government representatives.
As it turned out, the partners faced significant challenges in implementing this model in practice. This was due to several factors. Politically, the three regional partners have different relationships with their member communities that shaped their subsequent involvement in the NICSN cooperative. Starting in the 1970s, First Nations in Ontario and Manitoba set up several federated Tribal Councils. The composition of these groups shifts over time, reflecting the strong autonomy of their member First Nations. These conditions require Tribal Councils to accommodate the specific needs of their members while also generating the regional solidarity needed to push forward large-scale projects. At present, there are seven Tribal Councils operating in northern Ontario and seven in Manitoba. Table 19 summarizes those Tribal Councils associated with the NICSN cooperative, with satellite-served communities denoted with an asterix (*). The table shows how both regions exhibit a roughly even distribution of satellite-served communities among the various Tribal Councils. However, the two regions differ in ways they organize this distribution and executive decision-making regarding their development and operations.

**Table 19: Tribal Councils in Ontario and Manitoba**

<table>
<thead>
<tr>
<th>Manitoba</th>
<th>Barren Lands*</th>
<th>Bunibonibee*</th>
<th>Fox Lake</th>
<th>God's Lake*</th>
<th>Manto Sipi*</th>
<th>Northlands*</th>
<th>Sayisi Dene*</th>
<th>Shamattawa*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keewatin Tribal Council</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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The relationship between Tribal Councils and member First Nations is also associated with structural frameworks established by the federal government. For example, Section 28(2) of the *Indian Act* stipulates that all infrastructure development on reserve lands – including projects undertaken by Tribal Councils and associated institutions – must be supported by Band Council Resolutions (BCRs) signed by the local Chief and Council. Historically, in most cases these BCRs did not necessarily reflect sustained engagement and consultation with member communities, but rather tacit support. For example, KO-KNET and BCN draft BCRs to present to community leadership, rather than developing them with a community. At times the socio-technical institutions found it challenging to secure BCRs for their projects. One interviewee stated: “sometimes a BCR was not worth the paper it was written on, and other times it was worth its weight in gold” (interview 3052).
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Tribal Councils in Ontario and Manitoba set up KO-KNET and BCN to reflect the normative goals of their constituent member First Nations. These goals included a decentralized governance structure, support for community development, and universal access to services. But despite these commonalities, the two Tribal Councils govern their regional networked digital infrastructure in different ways that reflect their relationships with member communities. KO-KNET is institutionally housed inside the KO Tribal Council. In this capacity, its work is directed by an Executive Board consisting of the Chiefs of the six KO member communities (only one of which, Fort Severn, receives connectivity through satellite).\(^{143}\) Contracts for KO-KNET’s services are signed between this Executive Board and the contracting parties, and the Board distributes revenues and makes decisions about KO-KNET according to its internal decision-making processes. This governance structure resulted in both benefits and challenges for the Ontario-based socio-technical institution.

In recent years, KO-KNET’s membership grew to include First Nations that do not belong to the KO Tribal Council. Although these communities receive equitable access to connectivity, bandwidth, and access pricing, they do not belong to the Board. One benefit of this arrangement is that KO-KNET’s internal team can quickly and easily make decisions about its networked digital infrastructure. One disadvantage relates to perceived accountability: the situation led some members of the cooperative to question how KO ensures that non-Tribal Council member First Nations retain a voice in decision-making. For example, several years ago members of the Nishnawbe Native Education Council (which

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\(^{143}\) The KO member communities are: Deer Lake, Fort Severn, Keewaywin, McDowell Lake, North Spirit Lake, and Poplar Hill.
consists of directors appointed by Chiefs of all First Nations in Northwest Ontario) raised the question of whether KO-KNET’s governance should be reformed to enable more participation from its non-KO constituency.

In Manitoba, KTC and BCN address the governance of networked digital infrastructure differently. KTC represents 11 First Nations in the province’s north (approximately 10,000 people). Unlike KO-KNET, KTC is not directly engaged in infrastructure development or service provision, but rather works with an independent not-for-profit organization it set up in 2005-2006 called Broadband Communications North (BCN). BCN was closely modelled on KO-KNET, which provided the Manitoba organization with development support. At one point, the founders even considered naming the organization ‘KNET Manitoba’ – as one interviewee recalled, “KNET was probably the catalyst in getting us to where we are” (interview 3019). However, BCN is kept institutionally separate from the Tribal Council, and instead is jointly owned by several regional associations. In part, this arrangement developed because BCN’s government funders required the Manitoba Tribal Council to set up an independent incorporated entity. KTC also lacked the mandate and capacity to build and operate infrastructure itself – conditions that had developed in Ontario due to KO-KNET’s long history of networked digital infrastructure development and support from agencies like FedNor. Furthermore, BCN provides services to a broad constituency of First Nations, Métis and non-indigenous communities (including member First Nations from all seven of Manitoba’s Tribal Councils). As a result of this diverse membership, BCN draws its Board members from all of its member communities.

Despite these democratic aims, this broad representation and open governance structure led to serious challenges for BCN. For example, when BCN was founded, some

144 The 11 member First Nations are: Barren Lands (Brochet), Fox Lake, God’s Lake, God’s River, Northlands (Lac Brochet), Oxford House, Sayisi Dene (Tadoule Lake), Shamattawa, Split Lake, War Lake, and York Factory.

145 These are: Keewatin Tribal Council; Northern Association of Community Councils; Southeast Resource Development Council; Island Lake Tribal Council, Swampy Cree Tribal Council, Dakota Ojibway Tribal Council, Manitoba Keewatinowi Okimakanak, and the First Nations of Nelson House and Cross Lake.
Board members wrote its bylaws to gain unilateral authority to appoint the Board and make executive decisions (interview 3052). KTC and BCN’s membership managed to overturn this ‘takeover’, but it took a year for the bylaw protocols to effect these changes, which stalled network development. The institution is now governed by a three-member Executive Council composed of representatives from KTC (the Chair) and two independent First Nations (Norway House and Cross Lake). Even though the Board is now more representative of its membership, most of BCN’s governance is left to internal staff. The Board has not engaged in any focused strategic planning, and while all of BCN’s member communities remain shareholders in the organization, most are not actively engaged in decision-making, aside from at Annual General Meetings. In fact, turnout for past annual meetings has been so low that BCN has on occasion been forced to postpone them to meet quorum (interview 3052). BCN’s membership continues to grow as more communities join the cooperative, and new members can ask to be included on the Board of Directors (and be approved at an AGM).

Compared with Ontario and Manitoba, Nunavik reflects a more centralized governance structure that stems from the ways that self-government arrangements operate in the territory. Rather than federated Tribal Councils, a regional government represents all 14 villages. KRG is governed by a five-member Executive Committee appointed by a Regional Council of elected representatives. The Regional Council meets four times a year, while the Executive Committee meets every few weeks. Although Executive Committee meetings are held in camera, the quarterly proceedings of the Regional Council are public and broadcast throughout the region on community radio. In line with goals established through the *James Bay and Northern Quebec Agreement*, KRG works to adapt public services to meet regional and local contexts, support capacity-building, and ensure administrative control remains grounded in local communities (Lavoie, 2001). To this end, the regional government aims to decentralize capacity and expertise throughout the region, while centralizing some functions in Kuujjuaq to increase efficiency. While KRG’s head office is located in Kuujjuaq, the regional government maintains administrative offices, police stations, and airports in all 14 communities. In fact, over half of KRG’s 450 employees (65% of whom are Inuit) are based in communities other than Kuujjuaq. While some commentators praise KRG’s organizational and governance structure, others caution its potential to develop into a centralized ‘techno-bureaucracy’ that marginalizes Nunavik’s smaller and more remote villages (see Lavoie, 2001).
In this context, when it took on networked digital infrastructure development work in 2002, KRG was mandated by the Executive Committee to balance its internal needs as a public administrator with equitable service provision to Nunavik’s 14 communities. Tamaani Internet has an independent budget, but is financially and organizationally housed inside the regional government. This location enables Tamaani Internet staff to access financial reserves and professional resources like human resources, lawyers, and accountants when needed. As a department of the regional government, it is directly accountable to the elected Regional Council and Executive Committee, and staff must secure authorization for all major decisions, and report to them on a regular basis.\textsuperscript{146} While the Regional Council is generally supportive of Tamaani Internet’s work, they were disappointed in its performance during the challenging years between 2007 and 2009.

The distinctions between the NICSN partners reflect structural conditions associated with the larger context of state-Aboriginal relations in Canada. But alongside these institutional differences, a common challenge that all three partners face is the lack of local engagement in decision-making regarding NICSN. The three partners solicited participation from communities by sending letters to local leadership and creating an interactive website, but in most cases interest and engagement remained low. These challenges led the partners to take on a more active role in NICSN’s governance, which some interviewees felt undermined community voice in the project (interview 1021). After the initial meeting in 2003, the idea that NICSN was a User Group composed of representatives from member communities was never discussed again. Instead, the three operating partners followed separate development paths, periodically converging to discuss NICSN’s strategic development, collaborate on funding proposals, and share knowledge, ideas and expertise.

\textsuperscript{146} This consists of a quarterly official report delivered in public to the Regional Council. Until 2010, this report was combined with the KRG IT section’s report. Ad hoc reporting to the Executive Committee is usually done to obtain permission for decisions that require management approval, but are not large enough to require a formal resolution from the Regional Council.
I observed this lack of community engagement during interviews conducted in my field research. Many people I spoke to in Ontario and Manitoba felt proud that a First Nation institution provided their connectivity services, but did not know that their Band owned and operated local Internet services, or associated services like the voice-over-IP Bamaji Lake Telephone Services in Slate Falls. Many people could not identify who made decisions about technology development in their community. Some felt that more consultation should take place, an opinion echoed in KO-KNET’s survey, in which over a third of respondents (37.9%) strongly felt KO-KNET staff should visit their community more often (KO-KNET, 2012). Most people assumed their local Chief and Council made decisions, in collaboration with regional organizations like KO-KNET and BCN.

In Northern Ontario, I asked specifically about decision-making linked to the Northern Ontario fibre optic project. Most people knew about the build, and had either participated in or heard about consultations with Bell Aliant. For example, in Sachigo Lake one consultation meeting in Fall 2011 was attended by over a hundred people. At the meeting, participants raised concerns such as whether the upgrade increased speed and reliability, whether the teleco would implement usage-based billing and provide transparent pricing, and whether the new services would compete with Band-owned network. Some participants felt skeptical about Bell Aliant’s claims that the company would provide sustainable local jobs. In one person’s words:

In Ontario, Broadband Canada supported the construction of a regional fibre optic network. This project, called the Northwestern Ontario Broadband Expansion Initiative (NOBEI) will connect 26 remote First Nations, including 12 of KO-KNET’s 14 satellite-served communities, with a minimum 1.5 Mbps connection. (Broadband Canada funding does not include the provision of local loop infrastructure). First Nations political organizations, including NAN, supported this project. While KO-KNET generally supports the project, staff did express concerns over the lack of community consultations over its planning and implementation. However, as NOBEI moves forward, some Bands are setting up their own local loops to connect to the regional backbone. As of early 2013, the First Nations of Poplar Hill, Keewaywin and North Spirit Lake installed community-owned fibre loops, networking local administration, health centres, cable head-ends, and other buildings. As these communities connect to the regional network, they will be well positioned to manage their local development trajectories.

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“[Bell Aliant] had a meeting about it, a very long meeting at the resource centre there. But we didn’t learn everything we were supposed to…They had these nice posters of how fast it would be, and how slow satellite is compared to fibre optic…They tried to show too much of the good stuff…[T]hey kept saying it will be faster, faster, more reliable. But there are times when these things are not going to work” (interview 1008).

I did find some examples of community engagement in the management and governance of networked digital infrastructure. For example, as I discussed in Chapter 2, people in Sachigo Lake felt strongly about the Internet when it first arrived in the early 1990s. Local leadership held public meetings to discuss whether they should allow computers and connectivity into the community, and although some members, including Elders, expressed concerns, the majority of the population supported the plan. Chief and Council responded to these concerns by introducing a community Internet usage policy.

People in Nunavik’s villages generally reflected higher levels of awareness of KRG’s role in networked digital infrastructure development. Tamaani Internet is also actively engaged in various public outreach activities. The organization worked to establish a sense of regional pride in Tamaani Internet after the difficult years following NSI Round 2, highlighting how the networked digital infrastructure “was built in Nunavik, for Nunavik people, by people who live here” (interview 4034). During my field work, I asked people in Ivujivik their opinion on Tamaani Internet, and while their responses often highlighted cost and performance (it did not matter to them who owned and operated Internet service as long as it remained cheap and reliable), several people felt proud that KRG owned and operated Tamaani Internet. Everyone was aware of the relationship between Tamaani Internet and KRG, and while some migrated to Xplornet, they commended their regional government’s efforts to bring Internet services to Nunavik. In one person’s words “I want Inuit to do it. I’m proud to have Tamaani Internet, when it’s run by Inuit” (interview 4048). Another person in Ivujivik told me:

“I’m glad that our government is taking care of it. Not anybody else. And it’s [the Internet is] coming to us, and I’m glad they decided to take care of that. Because it’s

148 This observation may be due to the longer span of time I spent in Nunavik compared with Ontario and Manitoba, and so I recommend further research on this issue.
going to help the whole community and villages. And I’m glad they grasped on it. So it could help the whole Inuit. And I like the name too – Tamaani Internet. What does it mean? [It means] ‘here’” (interview 4043).

Faced with these challenges of relatively low engagement from local communities, the three partners solicited participation in other ways. Throughout NICSN’s history, they conducted surveys and focus groups to support local planning input. In Ontario, KO-KNET drew on meetings, structured interviews, local technology inventories, and consultant observations to produce the Keewaytinook Okimakanak First Nations Telecommunications Consultation Report in 1999. (An online archive of this work is available at: http://smart.knet.ca/).

In Manitoba, KTC conducted a similar consultative process in 2002, when it launched a connectivity needs assessment to guide its work as the provincial FNS administrator. The Tribal Council used this survey and workshop data to establish a baseline of needs and identify development priorities. As a result of these findings, KTC prepared ‘connectivity report cards’ to inform a regional strategic plan that reflected disparities between communities (interview 3019). One person involved in this process reflected on its long-term impacts:

This Report articulated a link between self-determination and telecommunications development as a means to achieve community wellness and development. Community participants stressed the importance of local control and ownership in network development, implementation, and administration. They also indicated that technology service delivery organizations must work closely with communities to help build capacity (KO-KNET, 1999a). Jansen and Bentley found that ‘local control’ in this context was perceived as supporting a number of benefits for First Nations, including: the involvement of local management teams in building local systems; successful operation and maintenance of reliable satellite and terrestrial wireless network links and local distribution; local training opportunities; higher levels of customer satisfaction with services; and reasonable monthly costs compared to commercial rates (Jansen & Bentley, 2005).

KTC initially faced challenges in engaging communities: one interviewee recalled that “people would literally hang up on me” (interview 3019). As a result, staff worked to build relationships with communities, stressing the data they collected could influence policy and increase funding for connectivity and access to equipment. They also recruited local community members to administer the survey and brought together approximately 50 broadband champions for a one-day workshop and consultation in Winnipeg. These champions subsequently acted as local contacts for the Tribal Council: “[We] limited our exposure to one or two community champions and then got them to deal with the community-facing barriers or challenges” (interview 3019).
“It’s absolutely important that the communities are consistently involved in terms of what they want and what this means to them. And while it may not be as cost-effective as [it might be in an] urban environment...It is always better to have the communities participating and taking an ownership position...If you don’t do it, you’re going to pay for it in the long run” (interview 3052).

Finally, KRG conducted surveys and focus groups to inform its development work in Nunavik. This was one requirement by funders, who requested evidence that KRG’s network development plan was better suited to the needs of the region than the competing project proposed by the Federation of Cooperatives (FCNQ). The resulting technical assessment provided evidence of how KRG’s proposed network could support regional self-government through its capacity to support high-bandwidth applications like health data transfer and videoconferencing. A needs assessment determined that along with residential and commercial Internet use, regional public service providers could act as anchor tenants. In comparison, FCNQ’s network could only support Internet traffic (KRG, 2002). These three examples illustrate how the NICSN partners, when faced with a lack of participation among community members, attempted to engage people in decision-making associated with the cooperative’s governance. In this sense, their efforts reflect an attempt to support an endogenous approach to the development and governance of networked digital infrastructure.

7.4. Operations and maintenance: Managing scarce resources

“When the Internet first came we did not touch that for awhile. We recently started working with the Internet. We have no knowledge of computers. We Inuit never really had any training about computers so we learn as we play with it or experience it. Or some Qallanat [White] teachers show us you do this and you do that. So with teamwork we’re learning to work with computers” (interview 4048).
At an operational level, NICSN’s technical configuration reflects the evolution of the arrangement that KO-KNET established in its early satellite network development work. Over time, the three partners shaped this system to reflect their common goals, challenges, and limitations. To support network efficiencies, they decided to standardize equipment, bandwidth allocation, and technical protocols across the network. Through their active management of network end points and bandwidth, the partners provided advanced services like videoconferencing and the transfer of secure health data. Space segment processed at KO-KNET’s Network Operations Centre in Sioux Lookout is distributed to the regional gateways for further processing and distribution. The partners dynamically manage this bandwidth, centrally administering attached devices, billing, and customer tracking. Over time, they built on these efficiencies by employing techniques like modulation, multiplexing, switching and routing, and compression (Dankberg, 2009; Elbert, 2008).

Although satellite systems are generally praised for their reliability, they are susceptible to “catastrophic failure” (Imaituk, 2011; Stefanini & Masera, 2008). During my field research I experienced one such failure on October 6, 2011. Starting around 6:30am EST, a

A two-year agreement between KO-KNET and FedNor signed in Spring 2002 outlined the terms of the Ontario organization’s deployment of its initial Public Benefit space segment: FedNor contracted K-Net (for $1) to manage the resource as a not-for-profit cooperative. KO-KNET agreed to charge member communities and network anchor tenants equivalent to terrestrial rates for access to bandwidth, using aggregated revenues (audited by Industry Canada) to pay for ongoing operations and maintenance. Any surplus funds paid for upgrades and/or extensions of ground infrastructure to additional communities. The agreement specified that regardless of location or size, all member communities in the cooperative gained equitable access to a 780 Kbps feed, augmented with dynamically allocated bursts of up to 2 Mbps, scheduled through an online booking system. This financial and operational framework served as a blueprint for the NICSN cooperative.

For example, KO-KNET’s early satellite network (1999-2003) enabled member communities to access both fixed bandwidth and a dynamically allocated videoconferencing network (Keewaytinook Okimakanak Research Institute, 2005). KO-KNET designed an online scheduling system that combined TDMA bandwidth allocation and Direct Video Broadcast (DVB). A version of this system is still in place today. While KTC/BCN now has its own bridge, KRG/Tamaani Internet continues to use KO-KNET’s videoconferencing bridge, since it did not make sense from a network architecture point of view for Kuujjuaq to install its own (installing a bridge there would swamp upstream traffic and likely cause the network to go down).
technical anomaly caused the Anik F2 satellite to point away from the earth, resulting in a loss of connectivity across much of Canada’s remote north – coincidently on the same day as the Ontario provincial elections. Many remote satellite-served communities in that province lost phone services, and elections officers could not call in the results of their ballot stations. Since the NICSN network utilizes transponders located on Anik F3, this outage did not impact their operations, and so in its member communities, business continued as usual. In fact, I interviewed people in Fort Severn on their cell phones for a story I wrote for Metro News (published October 7, 2011).\textsuperscript{153} This incident illustrates the necessity of redundant connections in remote communities (see O’Donnell, Kakekaspan, Beaton, Walmark, Mason, & Mak, 2011 for a case study of the community-owned and operated cellular phone network in Fort Severn).

In this context, the NICSN partners designed their system to be as maintenance-free as possible, while also building up technical capacity in local sites to assist with network reliability. As I discussed earlier, satellite network operators approach this balance between local operation and centralized control differently. The economics of maintaining local staff reflect economic, political, and social considerations. In the NICSN cooperative, the partners centralized network management staff in the regional gateways who remotely operate, diagnose, and repair the network. They also work with local technicians, talking them through the repair process and sending out support teams when necessary. The availability of skilled community technicians assists with network resilience, generates local economic development opportunities, and provides social benefits (Migone & Henley, 2009). It can also support network sustainability. Research has found that in rural development contexts, networks built by external consultants or organizations are sometimes unsustainable, partly due to the lack of skilled local technicians to operate them over the long term (Pejovic et al, 2012; Vaughn, 2011). During my field research, I heard many complaints about local network reliability. Replacement parts often take up to several weeks to arrive. In some cases, community technicians come up with innovative solutions based on the skills and resources

\textsuperscript{153} Read my news story here: http://metronews.ca/news/212635/northern-voices-heard/
on hand. For example, in Nunavik local town scrapyards are known as ‘Canadian Tire’, since they are stocked with so many spare parts. As I walked around snapping photos of Ivujivik’s well-organized scrapyard, several locals drove up in pick-up trucks and loaded them up. Along with supplying parts to fix snowmobiles, vehicles, appliances, and other household items, locals use the scrapyard to repair local network infrastructure. For example, I heard stories of technicians using skidoo blades as wireless antennas while waiting for proper parts to arrive. These kinds of innovations showcase the ingenuity of community members who are used to living in conditions of scarcity.

Despite this demonstrated need for skilled local technicians, available data indicates that many remote and rural indigenous communities lack people with requisite skills and knowledge. For example, one 2010 study conducted by the First Nations RMOs found that in 628 First Nations schools, although more than 68% could access technical support staff only 26% have dedicated, on-site technicians (Fiser, 2012). Another indicator of the lack of technical capacity and engagement in First Nations is the precarious nature of community websites. A recent survey of these sites determined that a majority use old or out of date code, or display a 404/error message (Milburn & McMahon, in development). The lack of technical capacity in communities is also reflected in the use – or non-use – of various devices, such as videoconferencing units that often sit in storage closets or are used as ‘expensive clothes hangers’.

Howard (2011) conducted similar research in his examination of the information infrastructure in Muslim countries. He found that many governments accessed networked digital infrastructure, but few had enough internal capacity to manage this infrastructure themselves, and so instead relied on commercial hosting services located in other countries. Tracing the route that IP packets take, he found that the governments of 20 of 24 emerging democracies in the Muslim world had set up online portals, but half of them were hosted on servers in other countries.
Given the need, all three NICSN partners provided formal technical training programs shaped to fit local contexts.\textsuperscript{155} I spoke to several trainers who developed programs that mitigate the high costs and difficulties of travel between dispersed communities by combining in-person workshops with online course modules. For example, Pirnoma Technologies offers a program leading to Microsoft A+ and Cisco N+ certification. Between 2007 and 2011, the company offered courses on a rotating basis in several Nunavik villages. While student progress was uneven, some graduates now work for regional organizations like FCNQ, Tamaani Internet, and KRG.\textsuperscript{156} Despite the demonstrable need for these IT training programs, funding remains a challenge. For example, in 2008 KO-KNET applied to HRSDC for a Workplace Skills Initiative grant to train local technicians, but the government agency did not fund the project.\textsuperscript{157} To encourage capacity building in the absence of funding and institutional support, the partners encourage local technicians to share their skills in communities of practice. For example, they organize training in the public CAP sites funded

\textsuperscript{155} From an operational perspective, on-site technicians are the first line of defense against system failure. As early as the 1970s and 1980s, Telesat Canada trained community technicians to help install ground infrastructure and conduct basic operations and maintenance. Several Connecting Canadians initiatives (and more recently, AANDC’s FNIF initiatives) include funding for local capacity-building. In the words of one former IHAB administrator: "You want to impart knowledge and technology to local communities. Otherwise jobs always flow from the south. And that’s not a prescription for the transfer of knowledge" (interview 5061).

\textsuperscript{156} Another example is from Ontario, where between 1995 and 2002 funding from HRSDC and CAP enabled KO-KNET to train local technicians in all Sioux Lookout District First Nations (Fiser, 2010b). KO-KNET recently launched an online forum to support community Cable Plant operators (see: http://meeting.knet.ca/mp19/mod/data/view.php?id=22&rid=684). In Manitoba, KTC and BCN partnered with the University of Winnipeg and the Assembly of Manitoba Chiefs for the Manitoba First Nation Technology Training Initiative. Held in 2010-2011, the program involved over 40 First Nations students who took in-person courses at two sites: the University of Winnipeg in the south and at Nelson House First Nation in the North. The courses focused on topics from website development to networking and graphic design. While some interviewees criticized the program’s broad focus, it did enable students in remote communities to gain valuable technical skills. While the program faced organizational difficulties, most of its graduates are now employed – including two who now work at BCN.

\textsuperscript{157} The proposal requested $1.66M from HRSDC (with $580,000 in matched contributions). Called ‘K-WIN’, the project aimed to: develop a network of community-based knowledge workers and off-site mentors; develop ICT-enabled skills and knowledge training; and demonstrate the use of the broadband infrastructure in 10 selected (KO) communities, which would work with KORI (KO-KNET, 2008).
by Connecting Canadians, and target local champions – often youth – to act as connectivity advocates and help teach friends and neighbours. In the words of one resident:

“People are not necessarily technologically literate. So we need to, when we have a few people that are more familiar with technology, we need to use those people and use them as resources to help the others get to the same level” (interview 4037).

Many people told me they are used to fixing things themselves, whether the broken item is a skidoo or a computer. People also teach themselves through trial and error. For example, in Slate Falls the local cable plant technician formerly worked as a janitor, heavy equipment operator, and mechanic before picking up IT skills by tinkering with his computer. He now works for the Band-owned Internet Service Provider and manages the community’s VoIP service. These kinds of examples, while they take place on an ad hoc basis, demonstrate efforts to build up technical capacity in conditions of scarcity. They represent an important facet of digital self-determination: the ability of indigenous peoples to manage the equipment and software that connects their communities to the network society. Rather than relying on external service providers, skilled technicians living in these communities can build, operate, and maintain their own networked digital infrastructure.

7.5. Political advocacy: Cooperating to engage government

Finally, all three NICSN partners derive political benefits from their involvement in the cooperative. In Chapter 5, I discussed this process as it unfolded in funding applications for government initiatives like NSI Round 1 and Round 2. In Chapter 6, I described the efforts of First Nations and Inuit organizations to engage with government departments and regulatory agencies to shape the enabling environment for networked digital infrastructure development. The NICSN partners also engage in other advocacy projects. At one point they considered founding a research consortium (NICSN-RC) to support their work. In 2008, KO-KNET contracted the Centre for Community Informatics Research Development and Training to develop a concept paper proposing collaborative research institutes in all three regions. The proposed institutions would help develop local Aboriginal research and technical capacity, create jobs, and help retain knowledge in the North. The consortium’s first project was to be an impact assessment of NICSN’s satellite system and associated services. While the
partners met with AANDC, Telesat, and Infrastructure Canada to discuss this project, they could not secure a funding commitment, and so the project ended.

All three NICSN partners are also engaged in advocacy initiatives specific to their regions. I will briefly discuss two projects in Manitoba and Quebec, given that in Chapter 6 I covered an example from Ontario through KO-KNET’s activities at the CRTC hearings concerning services in High-Cost Serving Areas. After years of slow and inconsistent progress on bringing access to Manitoba’s remote communities, several First Nations institutions formed the Manitoba First Nations Technology Council (MFNTC). Accountable to the Assembly of Manitoba Chiefs, MFNTC is mandated to “provide advice and direction in utilizing electronic technology in First Nations health, education, economy and other sectors”, to advocate for high speed two-way industrial grade Internet connectivity, and to develop a Manitoba First Nations Technology Plan (Assembly of Manitoba Chiefs, 2009; interview 3055). To this end, the group is facilitating a connectivity assessment, building a provincial videoconference network linking all First Nations Band Offices, and administered the Manitoba First Nation Technology Training Initiative mentioned earlier. The MFNTC also assists First Nations in navigating jurisdictional and administrative boundaries related to networked digital infrastructure development and associated funding, including an extension for its publicly funded space segment.

In Nunavik, KRG advocates provincial and federal government agencies to secure access to various funding opportunities. As a quasi-municipal government, KRG can raise taxes from its population, but chose not to tax its constituents for Internet connectivity (interview 4034). Its legal status also impacts KRG’s ability to access some public funding initiatives. For example, the non-ethnic regional government is not eligible for the First

Established through two resolutions from the Assembly of Manitoba Chiefs (May 2009 and June 2012), the group is an outcome of the Chief’s Task Force on Health, and funded by Health Canada’s First Nations and Inuit Health Branch (FNIHB). Its membership now includes KTC, BCN, MFNERC, AMC, and the Chiefs of Fisher River Cree Nation and Tataskweyak (Split Lake) Cree Nation. Partners also include federal agencies like AANDC, Industry Canada, and the RCMP, as well as private sector service providers.
Nations Infrastructure Fund, which is restricted to Aboriginal governments. The regional government is also prevented from accessing Economic Development Canada funding (after the Tamaani Internet pilot project in 2002) because it is not a private sector enterprise. However, the regional government did convince Industry Canada to re-define satellite broadband as core infrastructure essential to the delivery of public services, given the region’s lack of transportation links (interview 4034). Since Nunavik’s residents pay provincial taxes used to fund road infrastructure in the southern parts of the province, KRG argued they should be entitled to networked digital infrastructure as an alternative ‘transportation’ infrastructure. KRG also contended that since satellite bandwidth is a recurring cost, it should be framed in Industry Canada’s programs as a capital cost (rather than an O&M cost). Since space segment serves the same function as fibre optics, KRG convinced the government funders to treat the two technologies equally.159 Most recently, KRG and Tamaani Internet are working to advocate both provincial and federal government agencies to secure additional public subsidies for space segment, or to fund alternative infrastructure to replace the satellite network. I discuss these initiatives – and those undertaken by the other NICSN partners – in the conclusion to my dissertation.

7.6. Conclusion

In this chapter, I examined the organizational structures of indigenous socio-technical institutions. Focusing on the three partner organizations associated with the NICSN satellite cooperative, I situated their activities in the community technology movement, and also linked them to Aboriginal broadcasting organizations. Framing these socio-technical institutions as networked organizations, I described how they represent a fluid, flexible and collaborative

159 The Nunavut Broadband Development Corporation (NBDC) took the same view, which helped build support for this position. In fact, KRG and Tamaani Internet staff met with members of the NBDC to coordinate their strategy. At the Aboriginal Connectivity forums held in 2004/2005, the former Chair of the Inuit Tapiriit Kanatami, Josie Koosogak, and the former Minister of Indian and Northern Affairs Canada, Jim Prentice, supported this position. As a result, the federal government recognized satellite space segment as an eligible capital expense in NSI Round 1 and Round 2, and Broadband Canada.
approach to governance that seeks to balance centralized efficiencies with autonomy for member communities. I noted that some authors may argue that my methodological focus on socio-technical institutions established by elected Band councils may represent an organizational form rooted in structures of colonialism. Given their links to the Indian Act and accountability to the federal government, some authors may argue that such organizational structures do not represent a governance approach grounded in the values, practices, institutions, and cultures of indigenous peoples (Simpson, 2011; Alfred, 2009a/1999). However, I also recognize that as a non-Aboriginal person, it is not my place to comment on the efficacy or suitability of these contending perspectives on indigenous governance, or the institutional structures that emerge from them. Instead, I positioned my discussion as a descriptive overview of the three indigenous socio-technical institutions that partnered to form NICSN.

The NICSN partners are jointly shaping governance, economic, operational, and advocacy components of their joint satellite cooperative. I argued these processes show how common goals and challenges, as well as differences rooted in distinct regional contexts, reflect the historically-contingent development patterns of the three organizations. I explored the ways that the partners sought to balance local autonomy with the benefits of regional centralization, and also described how they engaged with issues of community engagement, economic sustainability, system reliability, and technical capacity-building.

I situated these activities with reference to the colonialism/self-determination dialectic. As was the case with Aboriginal media development, these efforts draw on the existing governance regimes of indigenous peoples, including local governments, Tribal Councils of federated First Nations, and regional governments. They are also shaped by structural conditions associated with the outcome of land claims and self-government negotiations. Given these links, I contend that indigenous peoples are generating their own organizational structures to support their digital self-determination. In the next chapter, I consider some of the applications made possible through the use of networked digital infrastructure.

Shifting my focus from the activities of highly skilled political and technical personnel, I discuss how individuals and communities use these platforms in their daily lives. Even if infrastructure diffuses throughout a society, it remains useless unless appropriated by the
people it is designed for. In this chapter, I described some of the challenges that the NICSN partners faced regarding local participation in the governance of networked digital infrastructure. However, once shaped into platforms of engagement, indigenous peoples and organizations take up online applications in diverse and innovative ways. In the next chapter, I describe how these usage patterns enable people living in remote Aboriginal communities to access public services, create economic development opportunities, and generate culturally and linguistically specific digital media content. In short, I explored how indigenous peoples are asserting their digital self-determination through networked digital infrastructure.
8. Applications: How Indigenous Peoples Use Networked Digital Infrastructure

“[Speaker 1] There was a wall, and the other side I didn’t know. It was unknown, like the whole world. And I didn’t understand it...[Speaker 2] [Internet] helps us see the world. Before the computers, we only knew the world by the television, mostly, and books, but since they got Internet we know the whole world so to speak. And what’s going on in the world. It makes us part of the world” (interview 4043).

The availability of access infrastructure, an enabling environment to support its development, and the activities of socio-technical and political organizations are all important and necessary elements of digital self-determination. However, without the active engagement of indigenous users, the opportunities that infrastructure makes possible remain restricted to a small group of highly skilled political and technical elites. Previous chapters explored the various mechanisms, structures, and actors involved in building and operating networked digital infrastructure. In this chapter, I consider the online applications that run on it. I focus on how Aboriginal individuals, communities, and governments located in remote and rural communities utilize it in their daily lives.

Around the world, indigenous peoples are using online applications in diverse ways. As far back as the early 1980s, “the smallest Inuit communities were provided [technical] equipment, access, and expertise, and soon were developing websites and exploring various options for using the new technologies” (Alia, 2010, p. 73). More recently, Morris and Meinrath (2009) found that when broadband was available, Native Americans did everything from blog to download podcasts at higher than national averages. Several studies from Canada echo these findings. Budka (2008) surveyed more than 1,000 users of MyK-Net.org and found that they considered the website their most important communication medium: more so than telephone, TV, and community radio. A study of Inuit use of YouTube based on 12 months of ‘cyber-fieldwork’ described user-generated content as “a contemporary and increasingly popular form of storytelling.
in Inuit communities” (Wachowich, & Scobie, 2010, p.85). A 2011 paper found similarly high levels of Aboriginal engagement on social media like Facebook (Taylor, 2011; see also Krebs, 2011). Eight out of 10 respondents in satellite-served communities in KO-KNET’s 2012 survey used social networking sites daily, over half use email (62%), and 1 in 3 use instant messaging (33%). Finally, research associated with Dr. Susan O’Donnell’s VideoCom/First Nations Innovation project found high levels of social media engagement in remote and rural First Nations in Ontario, Quebec, and Atlantic Canada (see for example Carpenter, Gibson, Kakekaspan, & O’Donnell, 2012; Molyneaux, O’Donnell, Kakekaspan, Walmark, Budka, & Gibson, 2012; Gibson et al, 2012).¹⁶⁰ In short, as Roth (2013) notes, notwithstanding the persistence of various digital divides, many indigenous youth reflect the same the drive and desire to use the Internet as other ethnic youth around the world. I would further describe these activities as reflecting the same scope and frequency of the online engagement of youth in general.

In recent years, the proliferation of networked digital infrastructure has intensified and accelerated the scope and pace of these online activities. Digital literacies enable individuals and communities to “find information, assess it, react to it, and even remix it” (Rainie & Wellman, 2012, p.263). However, not all users can equally participate in these activities. Researchers have determined that digital literacies are unevenly distributed among populations and individuals: “Deep divides remain between those who possess the resources, education, and skills to reap the benefits of the information society and

¹⁶⁰ I am presently conducting quantitative research mapping the online presence of First Nations communities (with CMNS Student Leanna Milburn), and our preliminary findings suggest similarly high levels of engagement (Milburn & McMahon, in development).
those who do not” (Servon, 2002, p.4). When combined with the rapid pace of socio-technical change, these activities are sometimes accompanied with feelings of stress and a lack of control among some users (Pejovic et al., 2012). At times, they can undermine people’s decisions of whether to adopt new technologies. For example, Van Dijk (2005) notes that in 2005, 1 in 5 adults in developed countries did not use computers, citing reasons of personal motivation, ambition, cultural propensities, and perceived social, moral, and safety challenges. Another study found that socio-economically marginalized women expressed a desire to dictate how technologies intersected with their everyday lives, rather than only learn basic computer and Internet skills (Gangadharan & Byrum, 2012).

During my fieldwork I had many conversations about people’s hopes and fears over the emergence of the network society and its impacts on their lives and communities. Many people described technologies as essential, framing online applications as a means they can become more empowered. However, others expressed anxieties over perceived negative impacts. Some felt that technologies increased their exposure to inappropriate sexual, violent, or drug-related content. Others felt that social media undermined community cohesion, offering examples of how it is

Van Dijk (2005) developed a three-part typology to capture the breadth of digital literacies, which he represents as informational, operational, and strategic skills. Informational skills are associated with how users engage with online applications, and include searching for and processing information, and using online applications like social media, the Internet, and videoconferencing. While there is presently little quantitative data on how widespread videoconferencing use is in First Nations, available data suggests it is popular (Hancock & O’Donnell, 2009; Perley, 2009; Molyneaux, O’Donnell & Milliken, in press; O’Donnell, Johnson, Kakepetum-Schultz, Burton, Whiteduck, Mason, Beaton, McMahon & Gibson, in press). For example, KO-KNET supports around 1,000 videoconferences and multi-site videoconferences a year. Digital literacy skills are also associated with the technical capacities required to operate online applications and networked digital infrastructure. These operational skills make possible a range of opportunities – from supporting system resilience and local economic development, to enabling indigenous users to shape physical and social technologies. In Chapter 7 I described how indigenous socio-technical institutions are working to develop these technical skills through communities of practice and distributed learning models. Finally, digital literacies include the ability of users to combine informational and technical skills to achieve strategic goals. These strategic skills include the capacity of agents to shape spaces of convergence to meet their needs.
used to spread rumours or for online bullying. In one person’s words: “It just gives me pain when I see somebody down the hall or in the next house having a disagreement over Facebook” (interview 2017).

While most people felt broadcast media more strongly influenced the loss of Aboriginal culture and language than digital media, several also noted the rise of new cultural practices, content, and even words: “I can’t say ‘Playstation 3’ in Inuttitut. The modern life came too fast, so the language has not had time to adapt” (interview 4041). Some people felt online applications undermined interest in Aboriginal languages and cultural activities, particularly among youth. Many worried about the perceived emergence of a generational digital divide – a concern identified in previous research (Wachowich & Scobie, 2010). In this discourse, youth are described as early adopters, and Elders as more critical of new technologies. English is associated with online content, and Aboriginal languages with the stories of Elders. Elders practice traditional activities like hunting, camping and fishing, while youth play video games, listen to hip hop, and prefer Kraft Dinner over country food. Many people situated their observations with reference to rapid changes taking place in other aspects of their lives: “50 or 60 years ago, people were still living in igloos and tents” (interview 4035). One young man in Ivujivik showed me a picture of his mother as a child. She was wearing traditional fur clothing and standing outside an igloo, one of a handful at the village site. He contrasted that image with his home, where his daughter watched a Justin Bieber documentary on a flat-screen TV, and a new laptop sat on his kitchen table, flanked with shelves of DVDs and Playstation 3 games. He told me:

“[Technology] creates a barrier between each generation. So they have different interests. They’re not talking to each other as much as they should. Now I could go visit my aunt and my mom, but our interests are very different. Although we all like nature and to go out, but then again, what else. We can only talk about that

162 For a discussion of Aboriginal languages and online applications, see this blog post about the challenges of Tweeting in Inuktitut: http://globalnativenetworks.com/2012/11/26/silent-syllabics-tracking-inuktitut-tweets-in-qaliujaqpaqt/
to a certain extent. Now with Internet, the new generation, they’re very different from my generation” (interview 4049).

I asked an Elder from Ivujivik for his impressions on this perceived generational divide, and he expressed similar thoughts:

“Our elders are very few in the community. When I say that, out of the 360 or so Inuit, 16 of them are 60 and older. Me included. 60 and older. The older ones who have no second language, I know where they’re coming from. But even them, they were in an age when they said that things are happening fast. So they were not totally nomads anymore. They had grandfathers who were more nomadic, more in tune with nature, less dependent on modern property such as boats and rifles, and more in tune with culture. But then our fathers came along and they were exposed to new weapons, new firearms, better clothing...I was swept up into new things. To the point where I went south for education. I almost lost my language, and a lot of my culture. I had to re-learn all that. So culturally speaking, it does something to a person when he’s too exposed to modern technology. He tends to forget his language, and his historical background, his heritage and culture. But then the young people start complaining that there’s too much of that. And they yearn for culture. They want to find their identity. So we have a certain aspect of the youth that are hungry for culture, for language, for information. How they got there and their identity. There’s a new hunger for that, in the face of the coming of progress” (interview 4045).

Most people I met felt a balance of interest and apprehension associated with their integration in the network society. Many described online applications as a means to participate in Canadian society while retaining their own languages, traditions, and cultural practices. One interviewee felt “people [here] should be as happy and comfortable as any southern Canadian would [be to] use their Internet” (interview 4033). Many noted that although they live in small and remote communities, they have the same needs as people in Vancouver or Toronto. Some saw access to online applications as a way to “catch up” with urban Canada. Others framed their opinions in the discourse of economic development, expressing their belief that government should provide an ‘equal playing field’ for entrepreneurs and consumers from remote communities. Some pointed to examples of how they are using online applications to support local job creation. For example, the Youth ICT Training initiative, which has been in place in Ontario’s Far North for 15 years, assists local youth through short-term employment (Tomkinson, 2009). In Sachigo Lake, the community economic development officer introduced me to one participant in this program whose job was to organize recreational activities for local youth:
“The young man sitting there, he just started last week. That's how we got the funding for him. Through the Internet. We found this program that we thought would fit in our community, the program and all that stuff. So we sent an application about a month ago, two months ago, they responded the next day. And four weeks later, they sent us a letter saying that the proposal that we sent, it fit the program criteria” (interview 1009).

These observations are reflected in a variety of projects that use networked digital infrastructure as a platform for economic development. These include the Virtual Bolivian Market (Salazar, 2007) and an Indigenous Stock Exchange in Australia (Latukefu, 2007). Such initiatives can help stimulate local employment by supporting place-based industries like artistic production and regional tourism. In Nunavik, several carvers and musicians utilize the Internet to promote and sell their creations to buyers around the world. Indigenous businesses and governments also use online applications to define territories of interest, manage traditional knowledge, articulate regional priorities, and forge relationships with other governments and industry (Grossman, 2008). In some cases, they have helped indigenous institutions secure greater control over resource extraction and development projects taking place in their territories. For example, in 2007 the Carrier Sekani Tribal Council in B.C. created the Tsilhqot’in Stewardship Planning Portal, a web-based land use information management and planning system designed to increase First Nation participation in land and resource management (Lulua & Flannery, 2007). The Cheam Band in B.C. used Geographic Information System maps and photo-realistic images to manage technical information associated with land-use planning (Lewis & Sheppard, 2006). During a visit to Doig River First Nation in late 2011, I was shown an application the Band used to map the diffusion of natural gas drilling projects on their territories. Data collected through this project supported their claims for
resource revenue. Finally, like users everywhere, indigenous peoples use online applications and social media for entertainment.

The field of Ethnocomputing provides one area in which to locate research on online applications. It focuses on how indigenous norms of guardianship, stewardship, governance, and responsibility are encoded in technical design choices. For example, Eglash (2007) describes a project involving people from the Shoshone-Bannock reserve in southern Idaho, who worked with technical designers to create a virtual bead loom as a database interface. Other examples include an online archive developed with the Pitjantjatjara and Yankunytjatjara people of Central Australia that allows community members to manage a digitized collection of some 60,000 cultural artifacts (Hughes & Dallwitz, 2007; Leavy, 2007). In North America, the Reciprocal Research Network similarly enables indigenous communities to curate their own ‘virtual museums’ in partnership with research institutions and universities (Kate Hennessy, personal conversation, Feb. 10-12, 2012). Four Directions Teaching presents traditional stories and Elder teachings in digital formats, and aims to reflect indigenous cultural protocols regarding the storage and representation of community-held knowledge (Wemigwans, 2008; Jennifer Wemigwans, personal conversation, Sept. 25, 2011; see also Hennessy & Moore, 2007). Finally, IsumaTV is an Inuit film and digital media production company based in Igloolik, Nunavut that is engaged in the production, distribution, and

163 Many indigenous people also use online applications as consumers, a process some argue risks undermining the development of local economies, since money flows out of communities to purchase goods and services from external businesses. Given the lack of on-site banks, many people use online banking to manage bills, income and cash transfers.

164 Some readers may consider social media ‘entertainment’, but here I frame it as an example of identity formation and community-building. Online gaming has exploded in Northern Aboriginal communities: for example, KO-KNET’s (2012) survey found that almost one-third of respondents play online games daily. In Ivujivik, local youth set up LAN parties to play games like Halo and Call of Duty, while an online high school in Ontario host a competitive online gaming league. Such uses are a valid and interesting avenue of research, but outside the scope of my dissertation.

165 See: http://www.rrnpilot.org/

166 See http://www.fourdirectionsteachings.com/
archiving of digitized cultural content. Despite a history of financial and administrative challenges, as of 2012 IsumaTV had completed over Inuititut-language 40 films (Roth, 2013). Staff continue to work with community members to produce digital media content, and even constructed their own infrastructure to distribute it inside regions that otherwise lack connectivity (Soukup, 2006; Evans, 2008). In 2008, IsumaTV launched the Inuit Language and Culture Institute, a five-year, $25M commitment to install high-speed broadband and public access production studios in participating communities (Alexander, 2009). Funded through the Canadian Media Fund’s Aboriginal Fund, this project developed the Northern Indigenous TV Network, which utilizes satellite infrastructure to support ‘high-speed video in low-speed communities’. IsumaTV now distributes locally-produced digital content (in 2012, approximately 800 Inuititut media files and 2,000 films in 41 other languages) over high-speed wireless networks in seven Nunavut communities. Users can switch between ‘high bandwidth’ and ‘low bandwidth’ versions of media files hosted on a local server (Kunuk & Cohn, 2010; Roth, 2013). These kinds of co-constructed ethnocomputing projects reflect how indigenous peoples are appropriating online applications to meet their needs:

“[I]ndigenization means not just enlisting ICTs to do things with tradition, but enlisting traditions to do things with ICTs. In keeping with the general tenet of human-machine relations, indigenous ICT users may tend to cognize and manipulate these tools differently based upon and in accordance with indigenous idioms” (Landzelius, 2006, p.296).

In this chapter, I frame examples of the indigenization of socio-technical development as "spaces of convergence" (Chow-White & García-Sancho, 2012). I do this to show how indigenous peoples are asserting their digital self-determination through the co-construction of networked digital infrastructures and strategies of self-determination.

### 8.1. Spaces of convergence and indigenous online applications

Spaces of convergence refer to the platforms resulting from the bi-directional convergence of socio-technical development and processes of globalization, the networking of dispersed individuals and groups, the increasingly flexible and
interdisciplinary nature of organizational structures, and the normative values of actors
(Chow-White & García-Sancho, 2012). Empirically grounding their development of this
concept in the example of DNA databases generated through interactions between the
fields of biology and computer science, Chow-White and García-Sancho (2012) argue
that between the 1960s and the 2000s, practices of DNA sequencing rooted in biological
science shifted from the passive instrumentalization of computers to a re-shaping of
socio-technical ensembles that actively support and reflect practices of coding,
decoding, and sequencing associated with computer science. These convergences
became realized in the new field of genomics, which generates and utilizes DNA
databases as both a tool and a site of practice. Describing this process, they write:

“Spaces of convergence are technologically mediated processes of
communication. They are the space of flows of people, disciplinary expertise,
finance, cultural values, institutional ethics, technology, information, data, and
code. At the core of the convergence of biology and computing are genome
databases. They are currently connected in a global network between university
labs, global genome projects, biotechnology companies, state-sponsored
research institutions, and public interest organizations” (p.130).

In this chapter, I adapt the concept of spaces of convergence to show how digital self-
determination results from the mutual shaping of networked digital infrastructures and
assertions of self-determination in fields like politics, education, and health. I argue that
this co-constructed process is seen in the usage patterns of indigenous individuals and
populations, reflected in activities like online community-building, the formation of virtual
identities, political mobilization, and the provision of online health and education
services.

Chow-White and García-Sancho (2012) draw on two definitions of ‘convergence’. Science and
technology studies defines it as “the trading of institutional norms, practices, knowledge, and
technologies between the boundaries of academia and industry” (p.128). Communication
studies frames it as the innovations and convergences linked to different communications
industries (news, television, films, and telephony). This is “a prolonged transition marked by
competition and collaboration between different media systems, rather than through a lens of
inevitable technological progress” (p.129). The term ‘spaces’ is modified from Castells
(2010a), and incorporates both the “materiality of emerging spatially configured global hubs”
and “digital communication networks and databases” (p.129).
Framing digital self-determination as a space of convergence holds political implications for Aboriginal rights and sovereignty in the network society. If processes of networked digital infrastructure development and indigenous self-determination are indeed mutually shaping, it follows that the abilities of indigenous peoples to gain ownership and control over such infrastructures will impact the forms and scope of the political activities these platforms make possible. Available research suggests that many indigenous peoples may be bypassing ‘Web 1.0’ platforms to move directly to easier to use – but exogenously developed and less customizable – commercial ‘Web 2.0’ platforms. Grossman (2008) writes that “[p]articipation in the networked world is primarily through languages and symbolic systems that are already structured by the very technology itself” (p. 8). In the context of spaces of convergence, such proprietary ‘information appliances’ restrict the agency of users and developers when compared to endogenously developed platforms hosted on local servers and managed by users themselves (Wu, 2011). For example, Bredin (2001) warns against the potential of digital content and networks to separate ‘data’ from ‘meta-data’, allowing external parties to extract indigenous knowledge from local or community control, circulating and modifying it through online applications (see also Menzies, 2001 and 2006). In one example of this process, Lakota shamans issued an online Declaration of War Against Exploiters of Lakota Spirituality in 1993 because New Agers used the Internet to appropriate and circulate sacred knowledge for their own commercial ends (Landzelius, 2006). This shows some of the drawbacks of ‘open access’ technologies for indigenous peoples.

Indigenous peoples are aware of these dangers. Along with utilizing commercial ‘walled gardens’ like Facebook and YouTube, some are developing their own platforms. I described several examples earlier, in my discussion of the online archives and databases associated with the field of Ethnocomputing. Other spaces where this process is taking shape include social media sites. For example, MyKnet.org is an ad-free, free of charge application developed by a First Nations socio-technical institution (KO-KNET) several years before Facebook. MyKnet.org has approximately 30,000 registered users and 25,000 active sites (most of which are located in Northwest Ontario, which has a population of 45,000) (Budka, Bell & Fiser, 2009; Bell, Budka, & Fiser, 2012). Another example of a locally generated and managed social media platform is the K’atl’odeeche First Nation Online Community, which the community uses to disseminate information on
These examples show how indigenous peoples are appropriating social media platforms to meet their needs (Howard, 2011). Ideally, they enable indigenous peoples to gain more ownership and control over the tools used to assert their digital self-determination.

In their discussion of spaces of convergence, Chow-White and García-Sancho (2012) also describe how DNA databases shifted over time from local sites of engagement to networked platforms situated in virtual spaces (p.131). They describe how the structure of the Internet made it possible for geographically dispersed research teams to share information, communicate over distance, and participate in online collaborations. The Internet also structured scientific data in hypertextual ways that enabled scientists to perform new types of interpretation and analysis (pp.148-9). Similar to these developments, I argue that networked digital infrastructures offer geographically dispersed indigenous peoples new opportunities to interact with one another over distances. However, this process also involves a shift in conceptions of space and time (Castells, 2010a). As I argued in Chapter 3, indigenous peoples have specific relationships with the land that hold unique spiritual and political significance. Group-differentiated Aboriginal and treaty rights, and the values, practices, and institutions they are grounded in, emerge from the unique relationship between indigenous peoples and the lands they have inhabited for millennia. In this context, the shaping of online applications into spaces of convergence may raise challenges for indigenous peoples, if it threatens to sever or undermine these ties. This point reflects a central argument of my dissertation: in the network society, and particularly for indigenous peoples, place still matters. In the next section, I focus on the different ways that indigenous peoples in Canada are shaping and using spaces of convergence to assert their self-determination in ways that resonate with their place-based communities.

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168 See: http://www.katlodeeche.com/kfn-community/kfn-online-community
8.2. Constructing an indigenous ‘space of flows’: Social media for online community-building and the formation of virtual identities

“We’re a small region. We’re small in numbers and a close-knit family. And I think the more that we realize that the Inuit people are small in numbers, we have to try to unite... We’re one of the last Native cultures in Canada to preserve our language. We’re one of the last. Inuititut is one of the last languages that is still very strong” (interview 4033).

Indigenous peoples are using social media for online community building and the formation of virtual identities. As discussed earlier, many of these activities are restricted by their reliance on third-party commercial platforms. However, they also reflect some of the ways that indigenous peoples are negotiating their engagement with the emergent network society. For this reason, I frame social media platforms as spaces of convergence that demonstrate how indigenous peoples are asserting their digital self-determination in the virtual territories of the Internet, while retaining their ties to place-based spaces and communities.

Researchers working in this area are finding that users everywhere translate and re-articulate their ‘offline’ lives in and through social media. In some ways, these activities are distinct from those associated with the more bounded nature of spatially-defined, ethnic, gendered, religious, or sexual contexts (Castells, 2010c). Compared to the situated nature of offline identities and social ties, networked individuals can use online applications like social media to more easily construct and manipulate their identities and networks of associations (Howard, 2011; Raine & Wellman, 2012). These virtual processes reflect many of the characteristics of ‘offline’ place-based identities, but

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169 It is wrong to assume all online materials produced by indigenous communities are publicly available. Indigenous communities may safeguard more intimate, sacred or ‘authentic’ traditions (Landzelius, 2006). Therefore, my discussion here is tempered with the recognition that users provide varying levels of access to their online communities and manage a fractalized multiplicity of private-public spaces and identities (Lange, 2007).
are also described as more specialized, diverse, open, and fluid.\textsuperscript{170} Available research suggests that people are integrating their ‘virtual’ and ‘offline’ relations, rather than constructing them as separate environments or spheres of activity. As Van Dijk (2005) writes, “the use of the Internet does not lead to social isolation and loneliness because face-to-face communication is reduced but to [also reflect] a reinforcement of existing social contacts and relationships” (p.157; see also Rainie & Wellman, 2012). In this section, I describe how indigenous peoples are constructing virtual communities and online identities that reflect the conditions and social relations of their offline spaces, demonstrating the place-based nature of these spaces of convergence.

The indigenous communities I visited are relatively small in population, ethnically homogenous, and consist of tight-knit familial relations. They include high numbers of people who continue to speak Aboriginal languages and practice traditional cultural activities. They are also located in isolated regions far from metropolitan centres and transportation infrastructures. In northern Ontario, Manitoba and Quebec, Aboriginal peoples historically lived in relatively small, politically independent, semi-nomadic bands, and their contact with one another ranged from cooperation to hostility (McMillan & Yellowhorn, 2004; Miller, 1991; Scott, 2001). After the development of the fur trade of the 17\textsuperscript{th} and 18\textsuperscript{th} centuries, their interactions increased in size, frequency, and scope – reflected in the blended languages spoken in some regions today. For example, First Nations in northern Manitoba and Ontario speak a number of Cree and Ojibwa dialects, and several northern Ojibwa bands now consider themselves Cree, while others speak a blended Oji-Cree (McMillan & Yellowhorn, 2004; Hoffman, 2008). Bonding and bridging ties rooted in past interactions also still exist today. For example, many people living near the Ontario-Manitoba provincial border share family relations. One interviewee from Bloodvein First Nation told me he and his neighbours shared family ties with people in

\textsuperscript{170} Like ‘offline’ communities, online communities include combinations of ‘bonding ties’ and ‘bridging ties’. Bonding ties unite clusters of existing relationships and support internal trust, efficiency, and solidarity. Bridging ties express looser connections between bonded clusters.
Information and communications technologies, from telephones to social media, enabled friends, relatives, and enemies living in these dispersed communities to connect more frequently – even in the absence of transportation links (Roth, 2005). Available research indicates that many remote indigenous communities are now using social media platforms to reinforce the ties that already exist in their ‘offline’ communities. For example, Pejovic et al (2012) found that in rural African villages, more than half (54%) of messages sent through Facebook are between users inside a village, and that pictures shared by local users received four times more local views than those posted by outside users (see Wachowich & Scobie, 2010 for similar findings in a study of Inuit content on YouTube). The remote indigenous communities I visited in Canada exhibit similar practices in their social media interactions (see also Molyneaux, O’Donnell, Kakekaspan, Walmark, Budka, & Gibson, 2012; Carpenter et al, 2012). KO-KNET’s survey found that every day, over half (61%) of respondents in satellite-served communities communicate with other people in Northwest Ontario, and almost three-quarters (70%) of people communicate online with people inside their community (KO-KNET, 2012). Anecdotally, I heard many stories about people using social media to support their local and regional ties. For example, in Inuvik, teachers and parents use Facebook to monitor students outside of school hours for indicators of crisis moments that might lead to youth suicide (interview 4040). In Sachigo Lake, the community uses social media to plan events like feasts, community meetings, and their annual ice fishing derby. One person from Nunavik told me:

“We’re only in Nunavik 10,000. A lot of people are related but live in different communities, and know each other. It’s close but communities are [geographically] separated...[Social media is] a way you can keep in contact with everyone” (interview 4035).

See: http://www.sachigolakefirstnationicefishingderby.com/
Existing research also indicates that people in these remote communities produce, distribute, and consume Aboriginal digital content through social media platforms (KOKNET, 2012). For example, a rapper known as the ‘Black Inuk’ is known across Nunavik for his YouTube performances. Another person told me:

“[People] know [through social media] there’s going to be a festival in POV [Puvirnituq] and they’re doing hip hop at the school in Kuujjuaq and someone came to Kuujjuaq...It makes them feel like they’re there. So you get to see the stuff on YouTube, you get to see the competition at the Inuit Games. You get to see that somebody is competing in the dogsled race across northern Canada from Kuujjuaq or from Salluit or wherever” (interview 4047).

These examples demonstrate that indigenous peoples are engaging with social media in ways that reflect and strengthen their offline communities. These activities enable them to sustain connections with friends and neighbours both over distances and inside their communities. I now turn to consider how indigenous peoples are using social media to negotiate their participation in the broader network society, with a specific focus on political mobilization. This discussion highlights some of the implications of spaces of convergence as platforms for both state surveillance and self-determined political action.

8.3. Negotiating participation in the Network Society: Social media for political mobilization

Along with using social media to construct virtual identities and online communities that are closely tied to offline social relations, indigenous peoples are using it to engage in political mobilization. The shaping of spaces of convergence reflects the potential as well as the challenges linked to these activities. It also overlaps with the previous section’s discussion. As I noted in Chapter 3, indigenous identities are inherently political, since they reflect the dynamic outcomes of negotiations and struggles between imposed classifications and self-determined representations – a tension captured in the twin

172 See: http://www.youtube.com/watch?v=p1io8HwCSM
concepts of the relations of representation and the politics of representation described by Hall (1995/1996). In Canada, state institutions historically subsumed hundreds of distinct Aboriginal nations under generalized terms like ‘Indian’ and ‘Inuit’. For First Nations, the Indian Act of 1876 created a statutory definition of ‘Indian’ that “excluded many people who, prior to its passage, considered themselves to be Indian, and who were recognized as such by society” (Morse, 1999, p.18). Critics argue these imposed identities supported colonial efforts to restrict the autonomy of Aboriginal peoples and their sovereign nations (Boldt, 1993). However, as discussed in Chapter 3, over time these imposed definitions also became linked to the basis and justification of Aboriginal and treaty rights in law, even as they continued to restrict affected individuals and populations in various ways (Lawrence, 2004). This paradox led to a situation where externally imposed collective identities and associated structures simultaneously empower and constrain the agency of indigenous peoples in Canada.

At the same time, indigenous peoples have always asserted their own self-determined political discourses. In this section, I describe how they do this by shaping and using online applications as spaces of convergence. Landzelius (2006) provides a framework to consider this “virtual face of indigeneity”, linking it to diverse political practices, including sovereignty campaigns, social movements, and the construction of activist networks. For example, the Ngati Awi people in New Zealand used social media to re-claim a sovereign indigenous identity historically denied them by the New Zealand government (Landzelius, 2006). While the Ngati Awi no longer actively practice their traditional religion and language (which the government deems necessary to its classification of indigenous identity), they asserted their nationhood through discourses circulated through social media.

Indigenous peoples also use social media to build online networks that cut through administrative divisions imposed by colonial governments. As Roth (2005) writes, communications among northern indigenous peoples in Canada “criss-cross territorial and provincial boundaries on a daily basis...[and reflect] renewed ties and cross-cultural networks” (p.27). In Northern Scandinavia and Russia, the social networking website ‘SameNet’ provides resources to the approximately 80,000 Sámi peoples who share languages and cultural practices, but are divided in the ‘space of
places’ by the borders of four nation-states (Landzelius, 2006). Salazar (2007) describes a similar process in Latin America, where social media supported the creation of a regional ‘pan-indigenous discourse’ that included people located in several countries.

Indigenous peoples also coordinate ‘offline’ political activities through social media. As early as the 1990s, researchers examined how indigenous groups such as the Zapatistas in Mexico used the Internet to mobilize in the ‘space of places’ (Castells, 2010b; O’Donnell & Delgado, 1995). The Confederation of Indigenous Nations of Ecuador also used social media to coordinate mass mobilizations of indigenous peoples against repressive state governments (Salazar, 2007). In Israel, Schejter and Tirosh (2012) describe how Bedouin peoples are appropriating various social media platforms to share information about their struggles against the state’s forced migration policies. In my research, I learned about several political mobilization activities taking place over social media platforms. For example, two Inuit friends in Nunavik founded a website called Qanuuk (which means ‘How’ in Inuktitut) as an online forum that people could use to discuss a referendum on the Nunavik Regional Government (see: http://Qanuuk.com; Figure 6 presents a screen capture of this site). The site was associated with a Facebook page called *Nunavik and the Nunavik Regional Government’s Final Agreement* that attracted almost 1,000 members (881 members as of December 12, 2011).173 (Figure 7 offers a screen shot of this Facebook page). When the referendum vote was held in spring 2012, the majority of Nunavik’s population voted against the initiative, and media outlets including *Nunatsiak News* and the *CBC* claimed that social media played a significant factor in the decision (Rogers, 2011).

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173 See: https://www.facebook.com/groups/189933581040333/
Another prominent example of indigenous political mobilization through social media is the recent #IdleNoMore movement of 2012 and 2013. As a networked social movement (Castells, 2012), #IdleNoMore participants utilized social media platforms like Facebook and Twitter to orchestrate flash mobs and other events across Canada. In January 2013,
two indigenous socio-technical institutions, Atlantic Canada’s First Nation Help Desk and KO-KNET, facilitated an interactive videoconference to discuss the movement (I present a screen capture of this session in Figure 8). Occupy Canada mirrored this online event, which attracted participants from 41 countries and included approximately 5,790 unique webstream connections and 50 videoconferencing sites (First Mile, 2013). Since many of these videoconference and webstream connections reached classrooms and other public sites where many people saw the presentation, organizers estimated a total audience of up to 10,000 live viewers.\footnote{Read more about this event and watch the archived videoconference here: http://meeting.knet.ca/mp19/mod/data/view.php?d=31&rid=982} Importantly, this event was made possible and facilitated by networked digital infrastructure and videoconferencing tools that are owned and operated by First Nations organizations.

**Figure 8: #IdleNoMore Videoconference – Screen Capture from Archived Presentation (January 30, 2013)**

As of Spring 2013, the online activities allocated with #IdleNoMore continue. The movement’s official website posted information about a number of upcoming events, as well as links to active discussion boards, Twitter feeds, and Facebook pages (see Figure
Organizers also announced that they are planning several demonstrations in Summer 2013 under a campaign called “Sovereignty Summer” (Idle No More & Defenders of the Land, 2013). At the same time, news reports pointed out the federal government’s active interest in these online activities, including AANDC’s monitoring of social media for mention of #IdleNoMore (Lindell, 2013). This supports Morozov’s (2011) argument that commercial social media platforms offer a means for state surveillance as well as activist organization.

175 Visit the #IdleNoMore official website here: http://www.idlenomore.ca/
Social media also offers indigenous people living in remote regions opportunities to ‘talk back’ to individuals and groups located in metropolitan centres. For example, in winter 2011, the newspaper La Presse published an article that portrayed a negative image of an Inuit person (see Figure 10 for a screen capture of this article). Someone living in Ivujivik saw this image and posted a rebuttal to the article on Facebook and Qanuuk.com.
In this section, I argued that social media is playing an important role in indigenous electoral and social movement politics. Political mobilization reflects the diversity and breadth of indigenous peoples both inside Canada and in other countries. While the specific forms and goals of these activities take shape in ways that are linked to the unique and localized contexts of the involved political actors, they also exhibit a common focus on issues like group-differentiated treaty and Aboriginal rights, assertions of sovereignty, and the importance of self-determined identities. I contend the articulations of these shared normative goals in social media platforms reflect spaces of convergence. While the limitations of my current study means I am unable to discuss
these developments in further detail, I believe they are an extremely rich site for future research that I hope to pursue in my post-doctoral research.

I now shift from a consideration of the political mobilization of networked social movements to focus on the online activities of Aboriginal governments (and regional governments that represent indigenous constituents). I describe how these organizations are leveraging spaces of convergence in ways that reflect the mutual shaping of public service delivery and networked digital infrastructure. While broadband-enabled public services take on different forms than social media platforms, I argue both types of online application share a similar normative goal: to act as platforms for digital self-determination.

8.4. Broadband-enabled public services as spaces of convergence

Indigenous peoples are using social media platforms to construct virtual identities and negotiate their political participation in the network society. Another space of convergence is through the broadband-enabled online applications developed by Aboriginal governments (and governments representing indigenous constituents). These activities are both constrained and supported by historically-determined state-Aboriginal relations, and as a result reflect the convoluted structures of complex jurisdictional and administrative frameworks. In this section, I describe how negotiations over the self-determination of public services and the strategic development of networked digital infrastructure combine in spaces of convergence. In their discussion of spaces of convergence between computer science and biology, Chow-White and García-Sancho (2012) argue that the process involved complex shifts inside both fields. They write:

“[T]he effects of the convergence between genomics and information technologies cannot be limited to biomedical theory. Other factors such as the organization of genomic centres and values arising from this sort of research are also shaped by the progressive incorporation of computing...[T]he interactions between biology and computing began as bidirectional, where the state of knowledge and progress in the life sciences also decisively affected the development of information technologies” (p.128).
In my discussion of broadband-enabled public services, I describe a similar process between socio-technical development and self-government. In making this argument, I organize my discussion into sections devoted to health and education services. I describe the independent efforts of KO-KNET, KTC/BCN and KRG while also recognizing their commonalities. Isolated communities in all three regions require access to networked digital infrastructures to support education and health care services taken for granted in more populated and/or accessible regions of Canada. Research demonstrates the relatively low numbers of service delivery organizations in rural and remote indigenous communities. One 2008 survey found that almost 20 percent of adult First Nations people in Canada do not have access to a local doctor or nurse (Naditz, 2008). In Nunavik, two hospitals service all 14 villages; the other 12 communities rely on tiny nursing stations staffed with a handful of people. Similar contexts exist in Manitoba and Ontario. For example, only five First Nations in Manitoba have a hospital on or adjacent to their reserve. This lack of access to health services is accompanied with extremely high costs of travel that place a heavy financial burden on both Aboriginal and non-Aboriginal governments. For example, in fiscal year 2000-2001, 1,444 patients accompanied by 799 escorts travelled to Montreal for medical services unavailable in Nunavik – at a total cost of $1.9M (KRG, 2002). More recently, a 2004 study determined that the cost of flying patients from the remote community of Nain (in Labrador) to secondary care facilities was $1,500 higher than that of conducting telepsychiatry consultations over videoconferencing (Jong, 2004). Researchers have found that broadband-enabled health services also decrease wait times for clinical visits, increase compliance with appointments, and support community members like Elders who can find it challenging to leave their communities for medical check-ups.

Access to educational services is also lacking in many of these communities. While primary and elementary schools are often available locally, many communities do not have on-site high schools. Historically, this meant senior students travelled away from their homes to finish school. Many faced social challenges when they did so. For example, in Northern Ontario, some students who left home to study in centres like Thunder Bay and Sioux Lookout failed courses and experienced depression (interview 1060; interview 1001). One interviewee in Sachigo Lake told me: “Maybe 95% of the kids can’t cope out there” (interview 1011). However, those students who do stay at home to study lack access to the teachers,
support staff, courses, and other resources available to their counterparts in less isolated regions of Canada (Grossman, 2008).

I am conscious of the technological boosterism sometimes deployed in discussions of the online delivery of public services. Little empirical evidence conclusively demonstrates a direct causal relationship between the availability of networked digital infrastructure and improved health and education outcomes (partly due to the complexity of generating accurate measurements). The promise of distance education and e-health is further mitigated by the persistence of digital divides and social inequalities faced by people in remote indigenous communities, as discussed throughout this dissertation. But despite these caveats, researchers and policy-makers increasingly recognize that networked digital infrastructures do correlate with social, cultural, and economic development (Bandias & Vemuri, 2005; Matear, 2002; Middleton, 2010; Raboy, 2005). For example, Benkler (2010) writes that “high capacity networks are seen as strategic infrastructure, intended to contribute to high and sustainable economic growth and to core aspects of human development” (p. 11). Arguments for universal access in states like Estonia and Finland go so far as to frame access to networked digital infrastructure as a human right, given its perceived role in delivering essential public services (Longford et al, 2012). In the U.S., the federal government’s ‘digital divide’ rhetoric shifted between the 1990s to early 2000s from describing broadband as an option to a necessity for this reason (Servon, 2002). In Canada, federal agencies like Health Canada and Aboriginal Affairs and Northern Development Canada express similar discourses. For example, Health Canada’s recently released (2012) Health Infostructure Strategic Action Plan notes that:

“In remote, rural or almost any First Nations or Inuit community, ICTs can potentially be a very powerful tool for strengthening community resources, networks and self-reliance, improving the communities bonding and improving the use and contribution of government funding” (Health Canada, 2012).

Aboriginal governments and socio-technical institutions further signal their belief in the potential of networked digital infrastructure to support the delivery of health and education services. For example, the 2004 Aboriginal Voice project suggested that Aboriginal governments use online applications to improve public service delivery, particularly in remote communities (Crossing Boundaries, 2004). These positions are further reflected in the work of the Assembly of First Nations, such as through its e-
Community Strategy (described in Chapter 6). But despite this wide-ranging rhetorical support, the provision of public services through online applications continues to be restricted by complex jurisdic-tional and administrative structures.

Ongoing challenges include conflicting responsibilities and mandates among government agencies and service delivery organizations, short-term and uncertain funding frameworks, a lack of available infrastructure and capacity, and tensions between private and public sector service delivery models (McMahon et al, 2010). In terms of jurisdictional responsibilities, federal and provincial government departments fund public services differently for First Nations and Inuit peoples. Although self-government negotiations provided a forum for these parties to work through issues of administration and service delivery, their implementation continues to reflect a high level of complexity (Irlbacher-Fox, 2009). For example, due to the fiduciary responsibilities established through Aboriginal and treaty rights, health services in many First Nations are funded by Health Canada’s First Nations and Inuit Health Branch (FNIHB). This situation shaped the development of online health applications in First Nations. FNIHB’s Health Infostructure Strategic Action Plan (2012) envisions a First Nations controlled health system that provides services in on-reserve health facilities, and the agency plans to transfer responsibility for health services-related connectivity planning, sustainability, and upgrades to First Nations governments (through so-called Health Transfer Agreements). As a result of this arrangement, this process involves partnerships with First Nations institutions like KO-KNET, BCN, and KTC.176

Funding for First Nations schools is also a federal responsibility, due to the fiduciary relationships established through treaty and Aboriginal rights. As a result, First Nations governments work closely with federal agencies in shaping educational service delivery. However, this process was historically fragmented across various government entities.

176 FNIHB’s national office determines and supports funding while its regional offices coordinate projects. These governments work with various socio-technical institutions that are contracted to provide and manage networked digital infrastructure and associated online applications. (Health Canada, 2012).
agencies. While AANDC was responsible for ‘brick and mortar’ schools, Industry Canada administered connectivity through the First Nations SchoolNet program. After 2002, Industry Canada designated First Nations socio-technical institutions as regional management organizations (RMOs) for FNS, in part to encourage more First Nations involvement in regional service delivery. In this role, the RMOs provided connectivity services and technical support, sharing best practices and challenges across a national network. In 2006, responsibility for connectivity and technology service provision in First Nations schools shifted from Industry Canada to AANDC, and FNS was renamed ‘New Paths in Education’. While the initiative is now more consolidated and remains national in scope, it is administered by AANDC’s regional offices, and the former RMO network is more fragmented (interview 3025). 177

Inuit organizations face similarly complicated jurisdictional relationships regarding public service delivery. In Nunavik, these arrangements are associated with the self-government negotiations and institutions established through the JBNQA. Health delivery is coordinated by the Nunavik Regional Board of Health and Social Services (NRBHSS), while education is administered by the Kativik School Board (KSB). These two institutions are mandated by the JBNQA and funded by the provincial government of Quebec, and so are not part of federal programs like First Nations SchoolNet, nor do they work with agencies like Industry Canada or Health Canada. Between 2000-2002, the head offices of the NRBHSS and KSB relocated from Montreal to Kuujjuak, which pushed staff to establish networked digital infrastructure to support their work. As a result of these long-term partnerships and common goals, both institutions work closely with Tamaani Internet to develop and deliver online health and education applications.

Despite these differences, in all three regions I studied, indigenous socio-technical institutions are engaged in the development of broadband-enabled public

177 In recent years AANDC has been working on several initiatives associated with educational service delivery, including an Education Information System designed to provide an integrated records data system (AANDC, 2012).
services. These applications sought to unite Aboriginal public service delivery with networked digital infrastructure development, and so I frame them as spaces of convergence. In the next section, I present several examples of these spaces of convergence, highlighting both successes and challenges. As described in Chapter 7, NICSN contracts with public service anchor tenants that support the cooperative's ongoing operations and maintenance. These applications are further developed through the involvement of regional and local organizations in areas like socio-technical design, implementation, and operations. To assist this work, some public service anchor tenants funded upgrades to NICSN's infrastructure, equipment, and expertise. Over time, I argue these activities shaped spaces of convergence that reflect the pursuit and assertion of digital self-determination.

8.4.1. Health applications as spaces of convergence

Comprehensive literature reviews by O'Donnell et al (2010), Ho and Jarvis-Selinger (2006), the Assembly of First Nations (Gideon, Nicholas, Rowlandson, & Woolner, 2009), and Health Canada (2002) all provide examples of how online applications can help deliver health services to patients in remote and rural indigenous communities (see also Gideon, 2006). Health practitioners use online applications to provide primary and secondary care in areas like tele-oncology, tele-hospice, tele-psychiatry, pediatric care, dermatology, diabetes care, education, and training. They support the digital transfer of health records and increase professional development opportunities. For example, a 2009 presentation from the Public Health Agency of Canada noted that since 2002, more than 3,500 individuals have completed one or more online education modules associated with health service delivery (Bell, Rossiter & Axtell, 2009). Online applications can also help reduce feelings of isolation experienced by some practitioners living in remote communities, helping with retention and recruitment (Bell et al, 2009). They can also provide support for patients and their families. For example, the Honouring Life Network website offers culturally relevant information and resources on suicide prevention (NAHO, 2009).

In this section, I frame online health applications that utilize the NICSN cooperative satellite network as spaces of convergence. The forms these applications
take reflects differences grounded in infrastructures, jurisdictional powers, administrative responsibilities, and organizational frameworks present in regional contexts. However, I argue they reflect common efforts to shape networked digital infrastructure and the delivery of health services by Aboriginal governments into spaces of convergence. These processes of socio-technical, organizational, and cultural development combine in articulations of digital-self determination. Table 20 presents the key health service anchor tenants on NICSN.

Table 20: Comparing Broadband-enabled Health Applications (circa 2011)

<table>
<thead>
<tr>
<th>Name</th>
<th>Monthly Revenue (per community)</th>
<th># of sites</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOTM</td>
<td>$1,200</td>
<td>13 (satellite)</td>
<td>Consultations and remote diagnosis, Tele-mental health, Public health sessions, Family visits and Elder’s sessions, Tele-radiology, Email and administration, Professional development, Health records transfer, Recruitment and retention</td>
</tr>
<tr>
<td>Manitoba Telehealth</td>
<td>N/A 178</td>
<td>16 (satellite)</td>
<td>Consultations and remote diagnosis, Public health sessions, Family visits and Elder’s sessions, Email and administration, Professional development, Health records transfer, Recruitment and retention</td>
</tr>
<tr>
<td>NRBHSS (via CSPQ)</td>
<td>$142,000/month (for region)</td>
<td>30 (satellite)</td>
<td>Consultations and remote diagnosis, Tele-mental health and tele-psychiatry, Public health sessions, Tele-radiology, Email and administration, Professional development, Electronic patient record management</td>
</tr>
</tbody>
</table>

178 N/A indicates that the organization was requested to provide data but did not agree to make it publicly available.

179 Administration offices, Elder’s houses, youth protection offices, rehabilitation centres, etc.
Throughout its history, KO-KNET worked towards the strategic integration of networked
digital infrastructure and health service delivery. The organization provides a strong example of how these processes merged into spaces of convergence that support the normative goals of digital self-determination. In the 1990s, the organization developed an online health application called Keewaytinook Okimakanak Telemedicine (KOTM) that became the primary anchor tenant in many communities on KO-KNET’s network. KOTM provides an array of services: health personnel use it to support remote diagnosis, telemental health, health records transfer, family visits, Elder’s sessions, and training. It also supports local employment opportunities by hiring on-site Community Telehealth Coordinators. KO-KNET provides the infrastructure, bandwidth, management services, and technical expertise to support KOTM. The two organizations mutually benefit through joint equipment purchasing, and also share human resources and expertise. Most importantly for NICSN, KOTM supports the satellite cooperative’s ongoing operations and maintenance costs, paying $1,200 per month for every community that utilizes the service. This revenue supports connectivity costs at local health centres, KOTM staff, and equipment. It is paid by First Nations out of their health services funding (allocated by Health Canada).

As a space of convergence merging Aboriginal self-determination and networked digital infrastructure development, KOTM emerged alongside KO-KNET’s socio-technical development in the early 1990s. At that time, Health Canada was exploring ways to deliver telemedicine to remote First Nations. Early projects interconnected nursing stations through DirecPC/MSAT infrastructure, and KO-KNET began experimenting with these links to generate its own online health applications. Early videoconferencing networks enabled nursing staff to consult with physicians and administrators.¹⁸⁰ The success of this project pushed KO-KNET to develop the next

¹⁸⁰ In 2000, Health Canada supported an agreement between KO-KNET and the provincial Northern Ontario Remote Telecommunications Health Network to develop telehealth services. The KO-KNET-managed portion of this network became the largest First Nations telehealth network in Canada, although it remained separate from Health Canada’s private health network (AFN Chiefs Committee on Economic Development, 2010).
iteration of KOTM. The new application launched in 2002 in the communities of Deer Lake, Fort Severn, Keewaywin, North Spirit Lake and Poplar Hill. It proved popular, and two years later KOTM received additional funding (approximately $6M between 2003-2006) to roll it out to 24 First Nations (including 12 satellite-served communities). At that time, Health Canada funded a parallel privately-managed health network, while KOTM continued to use KO-KNET’s networked digital infrastructure for videoconferencing and other services. As KO-KNET’s network became more reliable and secure, Health Canada began using it to transfer sensitive health data and records, as well as for videoconferencing and other services. The federal agency continues to provide funding for KOTM in 26 communities (including all of Ontario’s satellite-served communities). However, as of August 2012 the agency capped its funding, so KOTM cannot set up any additional sites unless First Nations invest in their own equipment, bandwidth, and staff. Despite this funding cap, KOTM continues to develop, and in spring 2012 held consultations in almost a dozen communities regarding future plans for the application.

Compared to Ontario, indigenous socio-technical institutions in Manitoba face a different set of administrative relationships that influenced the development of spaces of convergence in that province. Rather than work directly with First Nations service providers, a provincial agency, Manitoba Telehealth, delivers online health services. The agency provides similar functions as KOTM: it delivers telehealth services, operates a videoconference bridge, manages video calls, and supports training – all supported through FNIHB funding (Manitoba Telehealth, n.d.). However, compared to Ontario, this work is less integrated with the operations of an indigenous socio-technical institution, and therefore with Aboriginal self-government.

Manitoba Telehealth contracts with several connectivity service providers – one of which is BCN. As of late 2012, BCN provided connectivity services and technical support to just over half (50-60%) of health centres in the province’s remote First Nations (see Map 12 for an overview of all First Nations serviced by Manitoba Telehealth). While this arrangement precluded the development of as integrated a space of convergence as KOTM, it did support BCN’s networked digital infrastructure. For example, reliability problems during BCN’s early years motivated FNIHB to fund upgrades to the organization’s infrastructure. In 2002-2003, this funding supported builds in 10 satellite-
served First Nations. In 2007, a second infusion of funding improved these sites through the Manitoba Telehealth First Nations Expansion Project. FNIHB continues to support BCN by funding ground infrastructure and space segment for the network’s telehealth sites. That said, the arrangement faces challenges to its long-term sustainability, given ongoing budget cuts to FNIHB’s regional eHealth division. As a result, most projects associated with BCN have been supported on an ad hoc basis through end-of-year slippage dollars.

Due to the institutional separation between online health applications and indigenous socio-technical institutions, I would not describe the Manitoba example as a fully realized space of convergence. However, this arrangement supports digital self-determination in

other ways. BCN describes FNIHB and Manitoba Telehealth as model partners, so integral to their network development that without their support, BCN “probably could have gone bankrupt already” (interview 3052). The partnership also led to positive benefits for people living in Manitoba’s remote First Nations. According to BCN, the province is second only to KO-KNET for the quality of delivery of health services to remote First Nations (interview 3028). Videoconferencing use for telehealth purposes is also growing, to over 3,000 sessions in 2011. Manitoba Telehealth also frequently consults with First Nations leadership regarding the strategic development of their services. For example, the Regional Telehealth Partnership Table works with the Assembly of Manitoba Chiefs’ eHealth Unit. In summer 2012, Manitoba Telehealth was considering setting up permanent telehealth coordinators in communities, which could provide local employment. These trends point to the potential for a more integrated space of convergence in Manitoba’s First Nations.

My third example illustrates how yet another administrative context shaped a space of convergence that reflects a different articulation of digital self-determination. In Nunavik, regional health services are administered by the provincially-funded Nunavik Regional Board of Health and Social Services (NRBHSS), established by the James Bay and Northern Quebec Agreement. The NRBHSS manages hospitals in Kuujjuaq and Puvirnituq, and nursing stations in the other 12 communities. However, given a shortage of medical staff and resources throughout the territory, the regional institutions collaborate with health providers in southern Quebec to access core services. For example, in 1999 NRBHSS began accessing the provincial government’s private health network. Called the Reseau de Telecommunications Sociosanitaire (RTSS), this network was owned and operated by a consortium of several telecommunication companies (Bell Canada, Telebec and QuebecTel), and connected over 600 locations administered by 18 regional health boards (KRG, 2002). Through this arrangement, Nunavik’s two hospitals accessed a 640Kbps bi-directional link with Montreal (the system was not meshed so they could not interconnect with each other, or with nursing stations in the villages). While the network supported videoconferencing, a single session would use up almost three-quarters of available bandwidth, and so the equipment was rarely used. Nursing stations in the villages accessed 56Kbps links that could only support email and Internet.
When the JBNQA institutions relocated to Nunavik in the early 2000s, an opportunity arose to strategically converge networked digital infrastructure development and public service delivery. As KRG developed its plans for regional networked digital infrastructure, it conducted a survey of NRBHSS staff to assess their connectivity needs. While NRBHSS accessed the provincial health network at that time, the two regional institutions discussed the potential for NRBHSS to become an anchor network on KRG’s proposed network. Demand for bandwidth was increasing in the hospitals and nursing stations, and so NRBHSS requested the province to fund upgrades to existing infrastructure. Connectivity improved slightly in 2002, when regional hospitals gained access to a T1-equivalent link and the nursing stations upgraded to 64Kbps links (KRG, 2002). However, this increased capacity was quickly used up.

Subsequent discussions provided a catalyst for NRBHSS and KRG to form a more concrete partnership that generated a co-constructed space of convergence. When the contract between NRBHSS and the telecommunications consortium ended in 2008, the provincial government decided to exclude Nunavik from the provincial tendering process. The province received two proposals for regional services, from Bell and KRG, and chose to support KRG’s proposal. The province remained skeptical whether Tamaani Internet could support NRBHSS’s demanding quality of service and bandwidth requirements. The NRBHSS argued in favour of the regional government, in part because Tamaani Internet was more strongly tied to Nunavik and its self-government aspirations than the southern-based commercial service providers. The health provider also pointed to the future benefits that an integrated network could provide, in the event the two institutions amalgamated into a Nunavik government (interview 4038). Between 2005 and 2009, KRG staff held discussions with NRBHSS but since the NSI Round 2 bandwidth was not yet available, could not offer any concrete service. In 2009, Tamaani Internet offered to connect NRBHSS points of contact in all communities through a 512 Kbps down / 128 Kbps up link, but the regional provide determined that amount insufficient for their needs (interview 4034).

In 2010, after the NSI Round 2 upgrades, the provincial health ministry approved a service contract between Tamaani Internet and the Centre de services partagés du Québec (CSPQ), which works with NRBHSS to coordinate health service delivery. KRG
began working with the provincial health ministry (Ministere de la santé et des services sociaux) to build a dedicated health network to interconnect all Nunavik health institutions (KRG, 2012). Through this arrangement, the hospitals in Kuujjuaq and Puvirnituq required a dedicated 3MB connection, while the 12 nursing stations needed 512KB bi-directional links (KRG, 2008; KRG, KO-KNET & KTC, 2007).

Once Tamaani Internet finished implementing these upgrades, the network stabilized, but still lacked sufficient bandwidth to meet NRBHSS’s needs. KRG and NRBHSS worked with CSPQ and the provincial Ministry of Health to secure funding to purchase 21MHz of additional dedicated bandwidth from Telesat (at commercial rates), which was specifically designated for health services in Nunavik. This work was further supported by infrastructure upgrades associated with Tamaani Internet’s Broadband Canada project, which improved the region’s shared infrastructure.  

After Tamaani Internet proved that its infrastructure and staff could meet the stringent speed, reliability and security requirements of health service providers, the Province of Quebec (through CSPQ) signed a $9M five-year (September 2010 – September 2015) service contract with the network (including $1.7M / year which covers costs for satellite bandwidth purchased from Telesat Canada). This work culminated in March 2011 with the Nunavik Telecommunications Network, a private, independent, secure virtual private network that interconnects 30 health sites in Nunavik, including hospitals and nursing

182 KRG saw Broadband Canada as an opportunity for Tamaani Internet to undertake much-needed service upgrades. The regional government used the funding to purchase two additional transponders (72 MHz) and associated ground infrastructure. This work also paralleled the signing of the 5-year contract between KRG and the Centre de services partagés du Québec (CSPQ). The CSPQ contributed funding for an additional 21MHz of commercial satellite bandwidth from Telesat, paid for by the provincial agency and designated specifically for health services.

183 While this bandwidth is dedicated for health service provision, Tamaani Internet network managers sometimes burst into it when excess is available, although traffic remains separate to protect sensitive health data.
stations. Figure 11 demonstrates how the Network not only increases the availability of bandwidth to the villages, but also re-configures the network architecture to better support intra-regional links between the two regional hospitals and 12 village sites.

The Network also supports 14 portable videoconferencing units provided by McGill University (with support from InfoWay Canada). These portable ‘interns’ connect staff in Nunavik with physicians at McGill University for remote diagnosis, training, tele-psychiatry, and administrative meetings. Health Centre staff can also share electronic health records through the network. For example, when several Nunavik villages suffered a TB outbreak in summer 2012, local staff took on-site X-Rays and digitally transferred them to hospitals in southern Quebec – a procedure that takes approximately one minute. (As recently as 2010, local staff sent images burned on CDs to the south by plane). Tamaani Internet and the NRBHSS are now working with the CSPQ and provincial Ministry of Health on a regional e-health vision to develop future online applications. Importantly, this work builds on exiting institutional and technical ties between the Nunavik institutions. For these reasons, the development of online health applications in Nunavik is a clear example of a space of convergence.

184 NBHSS initially funded connectivity costs for the Network, but once it was deployed, the provincial health ministry began subsidizing operations and maintenance, including bandwidth costs. The Network is peered with the provincial health network based in Montreal, with a backhaul through Toronto (via KO-KNET). It boosted capacity in hospitals in Puvirnituq (3.5 Mbps bi-directional) and Kuujjuaq (4.5 Mbps bi-directional), and health centres in the 12 villages (1.5Mbps bi-directional).

185 The Nunavik Telecommunications Network reflects some unique engineering designs. Because satellite is a broadcast medium these links are shared. Typically, this involves one forward link (from the teleport to multiple remote sites) and many return links (from the remote sites to the teleport). Tamaani Internet engineered a unique arrangement, whereby Kuujjuaq and Puvirnituq can intercept the returns to create a star network (interview 4034).
Figure 11: Comparing network architecture: NICSN versus Nunavik Telecommunications Network
(Reprinted with permission from Kativik Regional Government)
8.4.2. Education applications as spaces of convergence

The NICSN partners also developed online education applications into spaces of convergence that reflect a similar process of the mutual shaping of infrastructure and self-government. Researchers demonstrate how online applications support educational service delivery in remote and rural indigenous communities (Downing, 2002; Scott, 2007). Teachers use online applications to encourage student engagement, and to access learning resources and curriculum. Online applications also connect students to support staff like councillors or psychologists, and assist with administrative and professional development. Similar to health services, education providers are working with indigenous socio-technical institutions to shape networked digital infrastructures to support these applications. The networks, devices, and software used to deliver online education in indigenous communities draw on cultural values, political jurisdictions, organizational structures, and approaches to socio-technical development. They reflect the articulation of the strategic pursuit of digital self-determination in spaces of convergence. In this section, I explore how education anchor tenants on NICSN's cooperative satellite network undertake this process. Table 21 summarizes education applications that use NICSN's infrastructure.

Table 21: Comparing Broadband-enabled Education Applications (circa 2011)

<table>
<thead>
<tr>
<th>Name</th>
<th>Monthly revenue (per community)</th>
<th># of sites</th>
<th>Applications</th>
</tr>
</thead>
</table>
| KiHS  | $450                            | 3 (satellite)  
|       |                                 | 10 (terrestrial) | On-site and online classroom teaching  
|       |                                 |              | Multi-site videoconferencing (virtual assemblies)  
|       |                                 |              | Multimedia curriculum  
|       |                                 |              | Interactive online tools  
|       |                                 |              | Access to off-site courses and material  
|       |                                 |              | Access to off-site teachers and resource personnel  
|       |                                 |              | Professional development  
|       |                                 |              | Recruitment and retention  
|       |                                 |              | Email and administration |
| MFNERC| N/A\(^{186}\)                  | 0           | Online classroom teaching (via Elluminate and |

\(^{186}\) N/A indicates that as of early 2013, BCN does not have any connections with MFNERC. However, the organization would welcome any new joint ventures (interview 3028).
As with health, the education applications shaped by KO-KNET express a strong example of the mutual shaping of infrastructure development and educational service delivery. In Ontario, KO-KNET developed an online application called the Keewaytinook Internet High School (KiHS) to provide youth the opportunity to graduate without having to leave their communities (Potter, 2010; Walmark, 2010). KiHS built on previous remote educational delivery models, like the Wahsa program, which utilized Wawatay’s community radio infrastructure to deliver courses to adult learners. Similar to KOTM, KiHS is offered to communities as a fee-based service delivered over KO-KNET’s networked digital infrastructure. Also like KOTM, it funds KO-KNET’s networked digital infrastructure development, with First Nations paying for the service through funding provided by federal agencies like AANDC, FNS and FedNor. As with KOTM, KiHS

<table>
<thead>
<tr>
<th>KSB</th>
<th>$13,500&lt;sup&gt;187&lt;/sup&gt; (for region)</th>
<th>27 (satellite)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additional $80/hr for VC</td>
<td>Includes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17 schools&lt;sup&gt;188&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 roaming sites</td>
</tr>
</tbody>
</table>

Teacher-training over videoconference
On-site and online classroom teaching (2013)
Multi-site videoconferencing (2013)
Multimedia curriculum (Smart Boards)
Interactive online tools (culture and language apps)
Access to off-site courses and material
Access to off-site teachers and resource personnel
Professional development
Recruitment and retention
Email and administration

<sup>187</sup> This amount is the listed price minus a 10% discount. The $80/hr is for videoconferencing, which is charged because it involves a dedicated link (interview 4034).

<sup>188</sup> This includes offices, administrative centres, adult education sites, training sites, and curriculum development offices.
provides several spin-off benefits for users, including employment for teachers, administrators, and support staff.

In practice, KiHS combines online and offline learning: students take online courses and use videoconferencing to connect with other classrooms in ‘virtual assemblies’. They also work in place-based classrooms supervised by on-site teachers. I visited KiHS classrooms in the First Nations of Sachigo Lake and Saugeen, and also participated in several online KiHS events. I was impressed with the technical sophistication of the online application, and particularly its use of videoconferencing.

In terms of its links to self-government, KiHS initially faced challenges to its legitimacy in Ontario’s school system, given its distributed organizational structure and use of online curriculum and classrooms. Over time, staff demonstrated they could meet the stringent requirements of the Ontario Ministry of Education, and became the province’s first accredited virtual high school. This shows how the application succeeded in re-shaping the institutional structure of the provincial government to better support an Aboriginal educational program. Another indicator of KiHS’s success is the high levels of awareness in member communities. For example, KO-KNET’s 2012 survey found that more than half (52.3%) of respondents from satellite-served communities had a family member who is or has been a KiHS student (KO-KNET, 2012). Like KOTM, KiHS is working to incorporate more local involvement in planning and administration, and its advisory board now consists of representatives from member communities who meet regularly to discuss challenges, identify gaps, and provide feedback. This local and regional engagement is key to KiHS’s continuing development as a space of convergence that supports the self-determination of its user communities.

In Manitoba, along with First Nations SchoolNet (which provides connectivity services to First Nations schools), education services are administered by a regional Aboriginal service delivery organization called the Manitoba First Nations Education Resource Centre (MFNERC). Established in 1999, the Chiefs of Manitoba mandated MFNERC to provide education services (including technology-related services) to 55 on-reserve schools in the province. As of early 2013, BCN does not work with MFNERC, though the organization would welcome new joint ventures (interview 3028). However,
given MFNERC’s role in providing broadband-enabled education services to First Nations in Manitoba, I briefly discuss it here.

MFNERC is funded by the federal government and governed by a Board of Directors drawn from First Nations communities and institutions. In the past, MFNERC’s connectivity work was driven by a close relationship with KTC, which after 2002 became a regional management organization for FNS. Prior to First Nations SchoolNet, three-quarters (approximately 74%) of First Nations schools in Manitoba had limited or no connectivity. At present, thanks in part to the program’s success, all these schools can access high-speed connectivity (though many continue to face bandwidth limitations).

Despite these successes, MFNERC described a ‘rocky relationship’ with KTC in its role as the First Nations SchoolNet administrator for Manitoba. This is due to what they perceived as misguided priorities, such as installing videoconferencing infrastructure in communities without sufficient training, support or grassroots interest. In one administrator’s words:

“There’s a lot of frustration in our communities regarding connectivity. People recognize that SchoolNet can only do so much. They have a limited budget... If the purpose is to improve connectivity in the First Nations, you need to have an infrastructure budget. They never really did. They had money to buy a few computers, servers, software licenses. But in the end [the funding] didn’t meet their end goal in improving connectivity. I think that, in essence, is the shortsightedness of the program” (interview 3054).

Separate from KTC and BCN, MFNERC set up an Information and Communication Technology Unit in 2007 to support coordinated technology planning, network support, media development, and online education tools – many of the same activities undertaken by KTC in its role as an RMO for FNS. Specifically, MFNERC works to integrate technology into curriculum through equipment purchasing, professional development, and curriculum design; provide technical support and training; provide video production and graphic design and layout services; support and develop online education tools; and support videoconferencing services.
late 2012. Classes use online applications (Elluminate and videoconferencing) to provide interactive lessons in real time. MFNERC also developed a centralized application to support data management and administration that also provides some local employment opportunities. MFNERC also provides technical support to ‘brick and mortar’ on-reserve First Nations schools, and plans to use videoconferencing (once infrastructure is in place) to support this work. The organization did fund some infrastructure builds: for example, it partnered with Manitoba Hydro to lease some of the utility’s dark fibre. For those communities connected to existing network digital infrastructure, it contracts with various service providers to access bandwidth. MFNERC chooses which service provider to work with based on factors like network availability, equipment, and cost – rather than whether or not the provider is an indigenous socio-technical institution (interview 3054). While it is institutionally separate from, does not work strategically with BCN, offers many of the same services, and competes for a limited pool of funding, MFNERC considered the possibility of utilizing the network provider’s services. In one staff member’s words:

“[BCN is] like any other service provider. We try and work with them to meet the needs of our communities. But...we can advocate or recommend another company if [BCN] cannot provide what we feel is adequate service to a community...As much as we would like to support another FN community or organization, we have to say you know, for the good of the school, it’s more affordable to do it this way. In the end, that’s what a lot of this comes down to. Can it be done affordably?” (interview 3054).

Given this context, I characterize the example from Manitoba as a space of convergence that faces several technical, administrative, and political challenges. Political and institutional differences can impede the co-construction of online applications that rely on partnerships between network operators and public service providers. This demonstrates how normative goals of digital self-determination can be restricted by the differing perspectives of involved actors.
My final example of a space of convergence is from Nunavik. There, educational services are administered by the Kativik School Board (KSB), a regional institution created through the JBNQA. As with health services, this arrangement reflects a tightly structured and highly strategic development path aimed to support the region’s digital self-determination.\(^{190}\) In fact, along with purchasing services and working closely with Tamaani Internet, KSB’s contract with the institution includes specific mention of support for the network’s strategic development, including for funding applications (interview 4034). When KSB relocated its head office from Montreal to Kuujjuaq in the early 2000s, it began focusing on how to support regional networked digital infrastructure development and online applications from its new location. As a result, KSB became a key driver in Tamaani Internet’s early development, signing on as an early network anchor tenant and proving to NSI Round 1 and Round 2 funders that the public benefit space segment would be used for non-commercial purposes. This partnership enabled KRG to access funds from the Government of Quebec’s *Villages Branches* (Connected Villages and Cities) program. Initially KRG was denied funding under *Villages Branches*, since Nunavik villages are considered remote (not rural) communities. However, KRG succeeded in shifting that definition, and after 2005 the program provided KSB with subsidies ($300,000 a year) to offset its connectivity costs.

Despite these successes, KSB and KRG’s partnership faced challenges throughout the years. Prior to June 2012, KSB accessed a total of 6 Mbps divided among all 17 schools, with a video link only available in the Kuujjuaq administration office (interview 4034). This level of capacity did not meet the KSB’s needs, and when Tamaani Internet’s network speed and reliability decreased after NSI Round 2, the organization contracted with alternative Internet service providers to supplement their limited bandwidth. Their head office in Kuujjuaq began using iDirect, while community

\(^{190}\) Prior to the mid-2000s, the 17 schools in Nunavik faced very limited connectivity. In 1996, Bell Canada provided the schools with a 1-800 service to ISPs in Southern Canada, but this system suffered from slow connectivity and was shut down by 2001. In 1997, the region experimented with a pilot project linking several schools via Bell DirecPC (funded by SchoolNet) but that program also proved unsustainable.
schools used both Tamaani (in classrooms) and XplorNet (in administrative offices). This siloed infrastructure was still in place when I visited Ivujivik in early June 2012. Teachers there complained about the extremely slow speeds on classroom computers connected to a single Tamaani Internet line (256Kbps) routed through the school. (Tamaani Internet also imposed traffic-shaping since users flooded the network through heavy usage of social media or other bandwidth-hungry applications). After Tamaani Internet completed its service upgrades following Broadband Canada, KSB signed an agreement for more bandwidth and advanced services. As of late June 2012, KSB could access a much faster rate in both schools and administrative offices. KSB also centralized various functions in Kuujjuaq, standardizing policies and budgets for equipment and software. Maintenance is also centralized: two Kuujjuaq-based network technicians travel to the villages twice a year. Now that Tamaani Internet’s installed base of infrastructure is in place, KSB is promoting various educational applications that use the network, starting with videoconferencing. The institution recently partnered with KRG, McGill University, and the University of Quebec in Abitibi-Témiscamingue (UQAT) to utilize videoconferencing for remotely-delivered teacher-training, a project funded through a three-year SSHRC grant. Historically, teachers received training during in-person workshops (45 hours of on-site instruction) that were expensive to deliver and difficult for students to take, given demanding travel and the scope of content delivered during that short time. The new videoconferencing program enables students to maintain regular contact with their professor, who supervises classes remotely from her office in Rouyn-Noranda. Project leaders stressed this program does not replace face-to-face teaching, but rather supplements it: “We don’t want the technology to replace the human relations” (interview 4034; interview 4037).

191 Up to a 93 Mbps maximum burst rate, which consisted of 3 Mbps up / 0.77 Mbps down for each school and 6 Mbps up / 1 Mbps down at their administration office in Kuujjuaq (interview 4034; interview 4037).

192 UQAT partnered with Puvirnituq and Ivujivik since 1984. Since those two communities did not sign the JBNQA they partnered with UQAT rather than McGill. In Ivujivik, the school partners with UQAT for Inuit teacher training.
In the project’s second year, the partners will experiment with using videoconferencing to deliver course content and interconnect village schools. KSB is also using online applications like Smart Boards and culturally- and linguistically-specific online learning interfaces (like Inuttitut syllabics and online games). These developments offer evidence of the continued efforts of KSB, Tamaani Internet, and their partners to shape the region’s educational service delivery into a productive space of convergence that supports both self-government and networked digital infrastructure in Nunavik.

8.5. Conclusion

Indigenous individuals, communities, and governments all utilize networked digital infrastructure as a platform for digital self-determination. Focusing on the shaping and use of online applications, I provided several examples of how these platforms and activities developed over time. Specially, I examined the formation of virtual identities and online communities, political mobilization, and the shaping of broadband-enabled public services. The conceptual framework I used to tie these diverse activities together was the mutual shaping of self-determination and socio-technical development into spaces of convergence.

Indigenous efforts to shape spaces of convergence are constrained by commercial logics and design choices, the persistence of structural conditions grounded in colonialism, and the presence of diversity and disagreement inside indigenous communities. A vibrant indigenous social media presence suggests that many indigenous peoples may be bypassing ‘Web 1.0’ platforms to move directly to easier to use – but less customizable – ‘Web 2.0’ platforms that are owned and operated by third-party commercial entities. I suggested this lack of control and ownership over such information appliances threatens to constrain the future potential of indigenous peoples to use these platforms to assert self-determination. As Morozov (2011) points out, third-party social media platforms are also used for state surveillance as well as activism (see Dean, 2009; Fuchs, 2011). For these reasons, I focused on examples of social media platforms that indigenous peoples have shaped into community-based platforms of engagement.
The ongoing dialectic between self-determination and colonialism also shapes the online activities of indigenous peoples. The formation of virtual identities, online communities, and political action all engage with the legacy of externally-imposed identities and conditions on indigenous individuals and populations. In Canada, the history of state-Aboriginal relations reflects the complex tensions between legal and administrative structures that constrain the activities of indigenous peoples while simultaneously supporting their unique status and group-differentiated rights. I argued that social media use reflects this paradox. Indigenous peoples are engaging with these platforms in ways that reflect and strengthen their place-based identities and social relations, sustaining connections with friends and neighbours both over distances and inside their communities. At the same time, these peoples face powerful pressures to assimilate into a globalizing network society. But along with an influx of exogenously generated digital media, content produced by indigenous peoples reflects the hybridization and syncretisation of ‘Aboriginal’ and ‘non-Aboriginal’ cultures, as seen in examples from hip-hop videos to museum archives of digitized cultural artifacts. In this context, I suggested that the persistent focus on identities and communities linked to place-based territories offers a means indigenous peoples can use to resist the deterritorialization of virtual identities and online communities. I suggested that community-based archives offer one example of how digitized Aboriginal content and artifacts can be housed in ways that further enable indigenous communities to retain control over community-held data.

Finally, Aboriginal governments are shaping broadband-enabled health and education services in ways that leverage networked digital infrastructures to support the delivery of public services. These co-constructed spaces of convergence represent the mutual shaping of Aboriginal self-government and socio-technical development into broadband-enabled health and education applications. I argued these spaces are influenced by state-Aboriginal relations, while also pointing towards a future of self-government. Drawing on several online applications developed by Aboriginal service providers, I described how these projects are rooted in the fiduciary responsibilities of state and provincial governments, as well as the self-government activities of Aboriginal governments, service providers, and socio-technical institutions. I argued that the development processes associated with these applications embodies broader struggles
over self-determination, since they demonstrate the different ways that involved parties are encoding issues of local control, centralized service delivery, and the provision of health and educational services in spaces of convergence. They also reflect how disagreements among diverse indigenous organizations, communities and individuals can circumscribe these efforts.

The complex terrain mapped in this chapter covers some of the multiple, dynamic, and hybrid forms of digital self-determination that are playing out on the multiple platforms of the network society. I see their emergence as the latest step in the recursive shaping of digital self-determination that is rooted in the distant past and extends to our unknown future. In the next chapter, which concludes my dissertation, I bring together the various strands of my argument and summarize my thoughts on the promise, and the challenge, of digital self-determination.
9. Conclusion: The Challenges and Promises of Digital Self-Determination

“More and more we’re talking about how much change is needed in Nunavik. Because we’re not really in control of where we’re going, where we’re heading, in which direction we’re going. We’re using any means we can to try to change where we’re heading to. Including technology” (interview 4049).

At the start of 2013, the historically fraught relations between Aboriginal peoples and the Canadian state continue to shape developments on indigenous territories. Remote indigenous communities still face significant divides regarding the access, governance, shaping, and use of transportation, electrical, communications, and networked digital infrastructures. At the same time, these people continue to pursue a better life through asserting their self-determination in various endogenous development projects. Their activities reflect both the diversity of indigenous peoples, and their common values, goals and challenges. The energy of these projects offers evidence that our shared future holds space and potential for decolonization.

In this dissertation, I considered these phenomena through the disciplinary lens of communication theory. In her study of Aboriginal media development in Canada, Roth (2005) frames that history as a form of ‘communitarian’ development: “a flexible, syncretic model working to integrate old with new” that also balances internal and external development pressures (p.34; see also Downing & Husband, 2005). While commending aspects of this process-oriented approach, she also critiques communitarian projects for their “limited theoretical value when it comes to explaining power relationships among those communities and individuals involved in the process of planning and implementing development strategies” (p.36). Throughout this dissertation, I have worked to engage with this critique. I described the potential of locally-emergent, endogenously-driven socio-technical development projects, while also articulating the many structural barriers and unequal social relations that their builders
face. I suggest the concept of digital self-determination provides a framework to guide analysis of these projects.

Digital self-determination describes how indigenous peoples are shaping and using newly developing technologies to meet their needs as self-determined collectives. While these endogenous development projects take shape in diverse forms, they share a common normative grounding in indigenous laws, practices, and institutions. In theorizing this concept, I drew on various strands of communication theory. In this conclusion, I discuss how the concept of digital self-determination bridges scholarship on the network society, digital divides, post-colonial theory, and critical indigenous methodologies.

Scholarship on the network society explores how socio-technical developments encompass the re-articulation of unequal social relations in new ways (Castells, 2009; Dean, 2009; Van Dijk, 2005; Bendlath & Mueller, 2011; Fuchs, 2011; Morozov, 2011; Mosco, 2005; Sandvig, 2006). Those individuals and populations left outside the emergent networked society risk structural exclusion from transnational flows of various forms of capital (Castells, 2010c). Powerful economic and political actors valorize certain nodes as ‘valuable’, while those left out face exclusion and structural irrelevance (Tongia & Wilson, 2011). Some scholars researching these marginalized ‘fourth world’ spaces seek to demonstrate how affected individuals and populations are not passive victims in these developments. Instead, working from conditions of scarcity, creative actors are setting up their own spaces of innovation from which to negotiate their involvement in the network society (Longford et al, 2013; Dyer-Witherford, 1999; Feenberg, 2002/2010).

These practices mirror prior histories of community-based rural and remote media and telecommunications development (Snowden, 1998; Babe, 1990). But while this work provokes interest in the conditions faced by indigenous communities, as a specific area of consideration, the uniquely ‘indigenous’ nature of some of these projects remains under-theorized in much existing literature (with important exceptions, see O’Donnell, Milliken, Chong, & Walmark, 2010; Whiteduck, Beaton, Burton, & O’Donnell, 2012; Sandvig, 2012; Fiser & Clement, 2012; Bredin, 2001; Fiser 2010b; Hudson, 2011b; Latukefu, 2006; Mignone & Henley, 2009; Srinivasan, 2007). Available research
in this area indicates that the efforts of indigenous peoples to connect to the network society reflect their past efforts to generate electrical, water, and transportation infrastructures in regions left neglected by urban, centralized development processes (Dymond, 1998; Fiser & Seibel, 2009; Hudson, 1998; Menzies, 2006; Ramirez, 2007; Shade, 2010). However, much of this work lacks substantive treatment of the potential of networked digital infrastructures to support broader projects of decolonization and self-determination.

Post-colonial theory offers one way to address this gap. Highlighting the creative agency of indigenous peoples, post-colonial scholars have argued for the need to transform unequal social relations in ways that reflect the path-dependent nature of indigenous development projects (Said, 1979; Fanon, 1963; Spivak, 1999; Foucault, 1995). In different ways, this work shows how marginalized individuals and populations are generating their own solutions to development challenges as a form of situated pluralism, rather than the ‘melting pot’ of cosmopolitanism (Pfaffenberger, 1992; Anderson & Adams, 2008; Horst & Wallis, 2011). While distinct in form and focus, these studies share a common normative goal: to re-frame development policies and practices to more deeply engage with and support the needs of indigenous individuals and populations. This goal encompasses several processes: ownership and control of infrastructures, engagement in the formation of state enabling environments, decision-making over socio-technical development, the emergence of community-based institutions, and the use of these tools to support the self-determined needs of user communities. Framed in post-colonial theory, these projects are collectively shaped in the interactions between creative agency and entrenched structural inequalities.

This dissertation presents digital self-determination as a new frontier in this ongoing dialectic. In Canada, it is part of a long historical continuum of indigenous contact with explorers and missionaries, Northwest Mounted Police and whales, the fur trade, reserve system, residential schools, self-government, court cases, and media development, among other matters (Valaskakis, 1979; Miller, 1991; McMillan & Yellowhorn, 2004). This breadth of activities shares a common link to underlying issues of control and power that are explored by scholars of indigenous resurgence and nation re-building (Alfred, 1999/2009a/2009b; Palmater, 2011; Coulthard, 2007; Simpson,
In different ways, these authors argue that to decolonize the social relations, institutional arrangements, and structural conditions associated with the persistence of colonialism in Canada, we must recognize the self-determined values, institutions, practices, and customs of indigenous peoples. In international law, scholars of self-determination draw on this position as a means to reform existing institutions and structural frameworks to substantially incorporate indigenous values and practices (Glenn, 2011; Parry, 2011).

Scholars working in the field of communication studies draw on this branch of post-colonial theory to trace an evolution from colonial discourses to self-determined media (Alia, 2010; Demay, 1993; Evans, 2008; Ginsberg, 1995; Harding, 2007; Roth & Valaskakis, 1989; Meadows, 1995). They show how over time, indigenous peoples acquired the knowledge, skills, institutions, and infrastructures to produce their own community-based media content, and reform state enabling environments to support it. In this way, the field of communication theory enriched existing debates by demonstrating how communication and information infrastructures carry more than water or electricity; they are the conduits through which informational resources flow (Baker, 2002; Buckley, Duer, Mendel, Ó Siochru, Price, & Raboy, 2008). Print and broadcast media distribute cultural and political content that enables actors to engage in political participation, expose the abuses of power, and interact over distances (Baker, 2002). Post-colonial communication scholars described how these infrastructures serve as the terrain for struggles over the relations of representation and the politics of representation (Hall, 1995/1996). As Hackett and Carroll (2006) point out, these activities encompass democratization both of and through the media (see also Mazepa, 2007). They framed media systems as both the results of, and the platforms for, indigenous self-determination (Roth, 2005).

Expanding this discussion to the context of the network society, networked digital infrastructures encompass more than the terrain of culture and politics. Early studies in this area focused on a similar discourse of representation (Blair Christensen, 2003; Budka, Bell & Fiser, 2009; Hancock & O’Donnell, 2009; Iseke-Barnes & Danard, 2007; Soucup, 2006; Wemigwans, 2008). More recent work explores how these socio-technical projects provide certain affordances that open potential for indigenous peoples
to assert their self-determination in diverse fields like health, education, governance, and economic development (Fiddler, 2008; Gideon, 2006; O’Donnell et al, 2010). Digital self-determination contributes to this discussion by using the normative reasoning employed in such approaches to self-determination to explain how indigenous peoples are negotiating their involvement in the network society. In this way, while linking the concept to a historical continuum, I also argue that digital self-determination offers something new.

Projects of digital self-determination are situated in a growing body of evidence that shows how the political actors shaping the emergent network society are structured in dominance (Castells, 2009; Freedman, 2008; Hassan, 2004; McChesney, 2007). Academic discussions of these tensions are sometimes accompanied with perceptions of the decreasing role of the state in contemporary societies, given the turn towards deregulation, the consolidation of corporate and private power, and the direct actions of networked individuals and social movements (Napoli, 2011; Castells, 2012). In this neo-liberal context, as Schuurman (2000) writes, “the central role of the state...is being hollowed out from above as well as from below” (p.12; see also Curran, 2002; Crawford, 2011/2013; Wu, 2010; Schiller, 2007). However, many authors argue the state remains an important resource for citizens, and rather than abandoned, should be reformed and strengthened as a container and enabler for democratic action (Castells, 2010a; Held, 1996; Schejter, 2009). Others point out that the state offers a stronger basis for public accountability than private sector or civil society organizations, which lack formalized channels of participation and obligations to citizens (Ayers, 2006; Weiss, 2000). One field where states remain important political and strategic actors is in the shaping of domestic socio-technical infrastructures (Crawford, 2013; Wu, 2010; Helberger, 2011; Hitchens, 2011). In this context, digital self-determination helps explain the role of the state in driving the emergence of the network society, vis-a-vis its relations with the indigenous peoples living on traditional territories now located inside its borders. This suggests that policy-makers consider the important role that networked digital infrastructures play in broader efforts to decolonize the structures and institutions of settler states.
In Canada, state-Aboriginal relations are linked to structural frameworks rooted in our country’s colonial past that continue to be leveraged by powerful political and economic actors. This tension is reflected in the federal government’s *de jure* support for Aboriginal and treaty rights, alongside its *de facto* failure to honour these agreements in practice (Weaver, 1990; Green, 1995; Culhane, 1998; Cairns, 2005; Borrows, 2010). In this context, a decolonializing approach to socio-technical development aims to generate an enabling environment that supports the place-based institutions, practices, values and customs of indigenous communities and individuals. Digital self-determination provides a framework in which to situate these reforms. Rather than a means to ‘police dissent’, it is a conceptual tool that both indigenous peoples and state governments can use to justify concrete changes to economic and political structures (Fraser, 2003; Kymlicka, 2007).

One source of inspiration for such reforms is articulated in the *United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)*, which states that projects of decolonization are not only about supporting distinct and localized articulations of self-determination, but also aim to reform structures of democratic participation (Daes, 2011; Burger, 2011; Quane, 2011).¹⁹³ In this way, developers of networked digital infrastructures can work with indigenous peoples to shape local and regional governance structures, enable economic development opportunities, and provide access to public services, among other means of self-determination.

Therefore, digital self-determination necessarily involves paying attention to both community-driven development projects and the state enabling environments required to support them (Price & Krug, 2002; Raboy, 2005; Sen, 1999; Tapia et al, 2009). Funding initiatives and regulatory conditions grounded in the formal recognition of inherent Aboriginal and treaty rights can be used to decolonize the institutional structures driving

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¹⁹³ One area of consideration that might help further develop the normative reasoning supporting digital self-determination and its engagement with the state is the field of Communications Rights. While I do not have scope to discuss that area in my dissertation, I suggest it is a fruitful site for further analysis and consideration.
networked digital infrastructure development.\textsuperscript{194} In this dissertation, I provide a concrete empirical example of how this process can unfold. The Government of Canada established an enabling environment linked to the early stages of networked digital infrastructure development (roughly 1993 – 2008). This support set the stage for the formation of the Northern Indigenous Community Satellite Network (NICSN), which leveraged subsidies and regulatory conditions to build a cooperative satellite network from the ground up. A partial, if growing, history of First Nations and Inuit efforts to generate their own endogenous socio-technical development initiatives parallels this development (O’Donnell et al, 2010; Whiteduck et al, 2012; Alexander, 2001; Bredin, 2001; Fiser, 2010b; Fiser & Clement, 2012; McMahon et al, 2011; Carpenter, 2010). Despite their diversity, these studies collectively explore how indigenous projects of digital self-determination emerge from the needs of place-based communities, and seek to encode a degree of ownership and control in socio-technical development.

However, the success of these projects remains qualified and tenuous. Despite a long history of advocating the federal government in this area, Aboriginal political and socio-technical institutions have largely failed to secure long-term and stable support of their endogenous development projects. Recent changes to policy frameworks threaten to exacerbate these problems through their focus on infrastructure projects led by private sector entities, rather than those undertaken by indigenous socio-technical institutions. Statements from political organizations like the Assembly of First Nations continue to frame community-driven ICT development as key to furthering the broader self-government objectives of indigenous peoples (see for example J. Whiteduck, 2009).

\textsuperscript{194} An example of such institutional reforms is in the U.S., where the Federal Communications Commission established an Office of Native Affairs (ONAP) to work with federally-recognized Tribal governments and Native organizations on a nation-to-nation basis through regulatory action, consumer information, and community outreach. The Office released its first (2012) Annual Report in March 2013, which outlined several developments, including reforms to that country’s Universal Service Fund to support projects undertaken on Tribal lands (and by Tribal entities). ONAP also instated an engagement obligation for carriers and providers that service Tribal lands to consult with Tribal governments (Office of Native Affairs and Policy, 2012).
Aboriginal groups have consistently and clearly argued for increased federal support of their digital self-determination. However, their assertions continue to be constricted by institutional contexts derived from past and ongoing conditions linked to colonialism (Sandvig, 2012; McMahon, 2011; Gibson et al, 2007).

Digital divide scholarship offers empirical research and methodological considerations that can help involved actors advocate for reform to these unequal development patterns. Digital divide research has gone through several ‘waves’. Early studies based in diffusionist models (Rogers, 2003; Norris, 2001) shifted over time to more nuanced considerations of social relations and contexts (Clement & Shade, 2000; Hudson, 2011b; Nakamura & Chow-White, 2011; Shade, 2010; Servon, 2002; Rideout, 2008). These changes incorporated critiques of technological determinism and exogenously-imposed development models grounded in theories of modernization.

Recently, some scholars have been suggesting a ‘third wave’ of digital divide research that treats affected individuals and populations as active participants involved in shaping their own connectivity solutions (Gangadharan & Byrum, 2012; Unwin, 2009; Pejovic et al, 2012; Davidson et al, 2012). Starting from a consideration of underlying social relations, studies in fields like Community Informatics focus on how various actors – socio-technical institutions, state governments, and everyday users – are driving locally-emergent articulations of digital self determination (Gurstein, 2012; Longford et al, 2012; McMahon et al, 2010; Ciborra, 2004; Powell, 2011).

The endogenous development process that these projects reflect is explained in the methodological approach of the First Mile. First Mile projects attempt to reframe development patterns from externally-imposed ‘last-mile’ initiatives to community-based processes (Strover, 2000; Paisley & Richardson, 1998). Proponents of the First Mile argue that far more than technical configurations, socio-technical development projects link to the broader social, political, economic, and political goals of involved individuals and user communities (Richardson, 1998). If generated from the unique requirements of constituent users, these projects can re-shape connections to the network society in ways that enable a degree of local control and ownership. In this way, the First Mile reflects the methodological position of this ‘third wave’ of digital divide research.
In this dissertation, I sought to modify First Mile-oriented ‘third wave’ of digital divide research to the unique context of indigenous-led digital self-determination. This practice involved working in partnership with individuals and user communities to discern indicators, methodologies, and solutions to the digital divides they face. To this end, my study incorporated multiple sites of analysis, including the activities of people living in remote First Nations and Inuit communities, as well as the political and technical manoeuvres of regional and national institutions. Beyond a small group of technical and political elites, I argued that digital self-determination also involves people living in remote First Nations and Inuit communities who are engaging in projects of identity-building, political participation, and the delivery of broadband-enabled public services. Their activities show the mutual shaping of networked digital infrastructure and self-determination into ‘spaces of convergence’ (Chow-White & García-Sancho, 2012).

My approach also incorporated suggestions drawn from critical indigenous methodologies – including ‘Red Pedagogy’ (Grande, 2008) – which recommends that researchers actively engage with their ‘subjects’ at all stages of research design and interpretation (see also Tuhiwai Smith, 1999; Denzin & Lincoln, 2008; Jones & Jenkins, 2008). These scholars recognize that understandings of radical democracy must be supplemented with a conception of a land-based indigenous sovereignty that is distinct from Western notions of rights, citizenship, property, and exploitation. This indigenous focus on place highlights another methodological contention of this dissertation: in the globalizing network society, place still matters (Graham, 2011; Raine & Wellman, 2012). Heeding this axiom throughout my project, I demonstrated how processes of socio-technical development evolve in relationship with broader indigenous struggles over lands, resources, treaty rights, and intellectual property. Rather than a teleological approach to analysis and interpretation, digital self-determination seeks to work with involved place-based communities to describe community-oriented development patterns and digital divides that unfold according to unique and specific contexts.
9.1. NICSN and the state of Digital Self-Determination in Canada

These various theoretical considerations informed my analysis of NICSN. The organizational structures deployed by indigenous socio-technical institutions are distinct from private sector, profit-oriented telecommunications or cable companies (Fiser, 2010b). Given their close links with place-based indigenous constituents and their not-for-profit orientation, these organizations more closely reflect the territorially and culturally grounded needs of constituent communities. My study provided empirical evidence to back up this assertion. I found that the three NICSN partners work independently and collectively to balance the needs of their constituent users with the benefits of centralization and standardization. Their cooperative, not-for-profit organizational structures reflect distinctions between regions while negotiating complex geographic, jurisdictional, and administrative boundaries.

But despite their successes, the institutions associated with NICSN face internal and external pressures that threaten their longevity. They continue to operate independently in terms of securing anchor tenants, developing local capacity, and operating their regional networks. At times, they compete for limited funding and resources, due to the requirements of funding frameworks. In five years, due to planned transitions to terrestrial infrastructure, the partners also anticipate that NICSN’s membership will shrink by at least 18 communities (losing 12 from Ontario; 5 from Manitoba; and 1 from Quebec). As these communities migrate to alternative infrastructure, remaining members will gain more connectivity through newly freed up space segment, but these changes also threaten to undermine the economic viability of the cooperative (which operates through leveraging and cross-subsidizing economies of scale across a large network).

The partners also face external challenges linked to Canada’s state enabling environment for digital self-determination. Their work remains subject to the shifting normative goals of state governments. The NICSN Joint Venture now generates enough revenue to cover ongoing operations and maintenance costs in all three regions, and in fact accumulates an annual surplus in the NICSN Public Benefit fund. The three partners...
can access a total of 144MHZ through five transponders (including the two transponders KRG secured via Broadband Canada). But despite this technical and organizational capacity, significant access divides persist in all three regions. Upcoming structural changes to the state enabling environment further threaten to overwhelm the efforts of the three partners. In 2016 and 2019, public subsidies for space segment are scheduled to end, with no replacement funding announced by government as of early 2013. Recent funding for space segment and infrastructure, such as Broadband Canada, are short-term and tied to discrete projects. They also indicate declining levels of government support. Compared to NSI Round 1 (100% federally funded for 15 years) and NSI Round 2 (75% federally funded for 10 years), Broadband Canada funding was pre-paid for only five years (extended to a maximum of 5 additional years), and the federal government only supplied 50 percent of project costs. In one interviewee’s words: “The trend appears clear: lower funding for less stable lengths of time” (interview 4034).

Complicating this situation further, the regulatory frameworks shaping this enabling environment are in flux. Recent federal initiatives include a yet-to-be publicly articulated digital economy strategy and an Aboriginal connectivity strategy. However, the development of these policy frameworks, at least initially, lacked substantive engagement with indigenous peoples. Public consultations held in 2009 connected to the digital economy strategy concerned only a general recognition of ‘rural and remote’ broadband development. They failed to take into account the specific needs of First Nations and Inuit communities and organizations. Several interview participants told me that AANDC is working with the AFN and First Nations socio-technical organizations to develop an Aboriginal connectivity strategy, but this work has not yet been made publicly available. It remains to be seen whether these two proposed federal strategies offer concrete opportunities to institutionalize a decolonizing approach to networked digital infrastructure development.

In this context, the NICSN partners face a crossroads. At a meeting in November 2012, they discussed the need to prepare a strategic plan to address these external and internal pressures. Ideas included expanding the network to new regions, increasing the size of the cooperative, and selling their assets to external organizations. They also identified opportunities to build on the network with a second satellite hub site, which
would increase redundancy and make NICSN a more attractive service provider. They are working to find ways to transition onto longer-term fibre optic or long-range microwave infrastructure. Several private and public sector firms are proposing massive infrastructure development projects to network Canada’s Far North. These include a regional fibre optic network owned and operated by the James Bay Cree, the Mackenzie Valley Fibre project in the NWT, a \textit{Modernization Plan} released by Northwestel, a proposed undersea cable connecting Asia and Europe via the Northwest Passage, and a plan released by Telesat Canada based on its continued provision of satellite services to remote Northern communities. (Table 22 summarizes these projects). In this context, the NICSN project remains a rich and fruitful site for future research and analysis. I will be exploring some of these developments, and their implications for digital self-determination, in my post-graduate work.

\begin{table}[h]
\centering
\caption{Proposed infrastructure projects in Canada’s far North (circa 2012)}
\begin{tabular}{|l|l|l|l|}
\hline
Project & Estimated Cost ($M) & Communities Connected & Notes \\
\hline
Arctic Fibre Project & 600 (main trunk) 162 (spur lines) & 52\% of Arctic population (main trunk) Remainder through spur lines and satellite & Through Northwest Passage Engineering challenges Open access network \\
\hline
Telesat Proposal & 200 (40 contribution from Telesat) & 36 satellite communities Backup connections for terrestrial communities & Uses 15GM capacity on 15 unused transponders Requires ongoing space segment – estimate is for 10 years \\
\hline
Mackenzie Valley Fibre Project & 60-62 51 for main trunk) 7 for extension) (3-5 for environmental permits) & 7 NWT communities (5 through fibre; 2 through microwave) & Anchor tenant: Inuvik Satellite Station Facility \\
\hline
Northwestel Modernization Plan & 233 & 96 communities in Yukon, Nunavut, and Northwest Territories (including 72 “remote” communities) & 5-year capital budget Actively pursuing partnerships with third parties Focused on high-speed Internet and mobile wireless (4G) CRTC hearing underway \\
\hline
Eeyou Communications Network & 29 & 14 communities (9 Cree communities) & Not-for-profit regional fibre optic network Leases fibre from Hydro-Quebec Provide health, education, and IP telecommunications \\
\hline
\end{tabular}
\end{table}
In many ways, digital self-determination describes liminal phenomena that arise from the efforts of marginalized communities located on the periphery of the network society, tenuously supported through dynamically-shifting enabling environments shaped by powerful economic and political elites operating from positions of structural dominance. Yet these challenging conditions do not preclude the potential of creative agency. Lanzara (1983) wrote about how ephemeral organizations sometimes emerge from extreme environments where formal organizations are overwhelmed by uncertainty and burdened by static organizational forms. He writes:

“In a world which has suddenly become turbulent, unreliable, unpredictable, and where the value of the ‘precedent’, once indisputable, is becoming of little help for present and future action, it would not be surprising if human societies and their members relied less and less on formal, long-standing institutions and procedures, and more and more on informal, ephemeral arrangements” (p.92).

In this dissertation, I described several examples of such ephemeral arrangements. While the specific networked formations associated with these activities remain precarious, certain core elements persist over time. I argued that for indigenous peoples, these unifying factors are embodied in the normative goals expressed in the concept of digital self-determination. This framework ties together the unique articulations of activities that unfold in multiple socio-cultural, political, and geographic environments. Around the world, communities and individuals face complexities and contradictions arising from a rapidly changing, globalizing network society. In many ways, these developments are exacerbating inequalities and tensions across terrains of economics and politics, language, mobility, and culture.

Given the uncertainties of our present and the insecurities of our future, the lessons learned from the ephemeral projects described in this dissertation, and the state enabling environments that support them, may be of use to individuals and organizations engaged in similar efforts. I hope my dissertation is useful to groups everywhere who are engaged in First Mile initiatives, as well as to the indigenous peoples, socio-technical institutions, policy-makers, governments, and private sector parties engaged in these activities. Most importantly, I hope it is useful to the people living in the unique and vibrant communities that use and sustain these infrastructures every day. We have much to learn from the creativity and tenacity of the First Peoples of Canada.
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Appendix 1: Letter to Chief and Council

APPROVAL OF CHIEF AND COUNCIL

Name of Study: ‘Digital Divides’ and Aboriginal ICT Development in Canada
Project Number: 2011s0274
Principal Investigator: Rob McMahon, Ph.D. Candidate, School of Communication.
Supervisor: Dr. Peter Chow-White, School of Communication.

PURPOSE AND GOALS OF THE STUDY
Rural and remote Aboriginal communities in Canada face a substantial ‘digital divide’ with regards to access to and use of digital technologies and broadband networks. Yet at the same time, these communities are actively engaged in efforts to shape physical and virtual digital networks and technologies to meet their needs. The purpose of this research is to develop a deeper understanding of technology development, Aboriginal self-government and community development. The results of this study will be incorporated into the Principal Investigator’s Ph.D. dissertation. This is not an evaluative study.

RECRUITMENT OF PARTICIPANTS
This study employs an ethnographic technique that combines participant-observation with audio-recorded, semi-structured interviews about technology development and use in your community. All interviews will take place at the convenience of interview participants. This study employs a participatory, collaborative approach, and interview participants will have the opportunity to review and discuss interview data before it is incorporated into the Principal Investigator’s dissertation.

The study will be coordinated with selected Aboriginal communities. Individual interview participants will be identified through recommendations from Aboriginal ICT organizations, personal contacts, and “snowball” sampling. Several regional Aboriginal ICT organizations are participating in the study as informal project advisors. In the Northern Ontario region, the project advisors are:

• Keewaytinook Okimakanak Tribal Council K-NET (KO-KNET)

Data collection will primarily take place during on-site visits to selected Aboriginal communities. Representatives from Aboriginal regional ICT organizations and communities may also be interviewed via videoconference or telephone.
Site visits to communities will be coordinated by the principal investigator, in collaboration with community leadership. The principal investigator will not visit a community for study purposes without first confirming the visit and securing permission from community leadership. Interview participants may withdraw their participation in the study at any time.

CONFIDENTIALITY

The information gained from this study will be kept in strict confidence and will only be available to the Principal Investigator. The names of the participants will not be revealed in any report or publicly disseminated document/electronic media unless their approval is explicitly given.

BENEFITS OF THE STUDY TO COMMUNITY PARTICIPANTS

Interview participants are selected on the basis of their knowledge and experience with community-based technology development and use. Many participants will find their involvement to be a rewarding opportunity to share their knowledge and perspective.

BENEFITS OF THE STUDY TO CHIEF AND COUNCIL

It is hoped that this research will be of relevance and use to your community, and steps will be taken to solicit feedback to help achieve this goal. Local interviews will reflect the input of community members in ICT development practices. Communities will also be given a copy of the final research document to use as they wish.

RISKS TO PARTICIPANTS

Participants will not encounter any risks beyond those encountered in their daily activities.

SIGNATURES

This document indicates that Rob McMahon has been approved to undertake the study entitled “‘Digital Divides’ and Aboriginal ICT Development in Canada” by the Chief and Council of the community of ________________________________ according to the parameters outlined above.

Signature ______________ Date ______________
Chief and/or Community Representative

Signature ______________ Date ______________
Principal Investigator
Appendix 2: Ethics Protocol and Consent Form

INFORMED CONSENT FORM

Name of Study: ‘Digital Divides’ and Aboriginal ICT Development in Canada
Project Number: 2011s0274
Principal Investigator: Rob McMahon, Ph.D. Candidate, School of Communication.
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Rural and remote Aboriginal communities in Canada face a substantial ‘digital divide’ with regards to access to and use of digital technologies and broadband networks. Yet at the same time, these communities are actively engaged in efforts to shape physical and virtual digital networks and technologies to meet their needs. The purpose of this research is to develop a deeper understanding of technology development, Aboriginal self-government and community development. The results of this study will be incorporated into the Principal Investigator’s Ph.D. dissertation. This is not an evaluative study.

REQUIREMENTS FOR PARTICIPATION
This study employs an ethnographic technique that combines participant-observation with audio-recorded, semi-structured interviews about your experience with technology development and use in your community. All interviews will take place at your convenience. This study employs a participatory, collaborative approach, and you will have the opportunity to review and discuss interview data before it is incorporated into the Principal Investigator’s dissertation.

CONFIDENTIALITY
The information you provide will be kept in strict confidence and will only be available to the Principal Investigator. Your name will not be revealed in any report or publicly disseminated document/electronic media unless your consent is explicitly given. Your participation is completely voluntary and you may withdraw from the study at any time without penalty.

All paper notes and audio files related to your interview will be kept in a physically secure locked space accessible only to the Primary Investigator. The data will be retained until April 2013 at which point it will be destroyed.

BENEFITS OF THE STUDY TO YOU
You are a participant in this project based on your knowledge and experience of technology development and use in your community. Many people participating in these kinds of projects
have enjoyed their experience. Moreover, your participation will contribute to efforts in learning about technology development and First Nation communities.

RISKS TO YOU
You will not encounter any risks beyond those that are encountered in your daily activities.

COMPLAINTS
Complaints can be directed to Dr. Hal Weinberg, Director, Office of Research: hal_weinberg@sfu.ca or 778-682-6593.

FEEDBACK AND RESULTS
You can direct any feedback on the study as well as obtain a copy of the research results directly from: Rob McMahon: rma29@sfu.ca

LEGAL RIGHTS AND SIGNATURES

I ______________________ consent to participate in the study entitled ‘Digital Divides’ and Aboriginal ICT Development in Canada” conducted by Rob McMahon. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature ______________________ Date ______________________
You

Signature ______________________ Date ______________________
Principal Investigator
CONSENT TO PUBLICITY

Name of Study: ‘Digital Divides’ and Aboriginal ICT Development in Canada
Project Number: 2011s0274
Principal Investigator: Rob McMahon, Ph.D. Candidate, School of Communication.
Supervisor: Dr. Peter Chow-White, School of Communication.

I, _________________________, having participated in the study “‘Digital Divides’ and Aboriginal ICT Development in Canada”, grant permission for my name, community’s name, institutional affiliation, and recorded statements to be disclosed for the purposes of public dissemination of the research results.

Signature: _________________________    Date: _________________________
Phone:______________________________
Address:_____________________________
City:_______________________________
Email:_____________________________

Signature: _________________________    Date: _________________________
Principal Investigator
## Appendix 3: List of Interviews

<table>
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