FASTER, FURTHER:

A Best Practices Review of the Eastern Ontario Regional Network Project

September 26, 2017

Innovative Public-Private Partnership Generates Success for Regional Broadband Initiative

imagine. transform. sustain.
Natural Capital Resources Inc.

Author:

Prepared by Kathryn Wood

President and CEO, Natural Capital Resources Inc.

This Best Practices Review follows a template developed by Alwazae, Perjons, and Johannesson, Department of Computer and System Sciences, and evaluated in *Applying a Template for Best Practice Documentation*, in Elsevier B.V., 2015 and presented as an open access article through the Creative Commons and www.sciencedirect.com. Some modifications have been made to Best Practice properties to tailor them to EORN's specific situation.

Table of Contents

1 Executive Summary

1.1 Overview

In April of 2007, municipal officials in the Eastern Ontario, Canada conceived a bold initiative to improve high-speed internet infrastructure and services in a 50,000-square kilometre, mostly rural region that was experiencing significant economic deterioration and job loss. The geographic scale of the project was unprecedented in Canada, as was its complexity, and the business and organizational models that would be developed to drive the project toward its intended results. More than a decade later, the Eastern Ontario Regional Network is in place and in full operation, created from a carefully-designed web of existing and new technology assets, and operating within a partnership framework of public and private organizations and resources. As its advocates intended, the region's residents, businesses and other organizations are adopting broadband at a brisk pace, supporting local business retention and growth, connecting residents to vital public services, and opening up access to the world.

The special purpose organization created to execute this regional broadband initiative, the Eastern Ontario Regional Network Inc. (hereafter referred to EORN Inc.), delivered a $175 million project on time and on budget while meeting or exceeding expectations as articulated in funding agreements with provincial and federal governments as well as those articulated by the lead municipal investors. The construction or 'build' phase of the broadband network incorporated 5,500 kilometres of fibre, 160 Points of Presence (PoPs), more than 250 new Digital Subscriber Lines (DSL) areas, more than 200 towers for fixed wireless service, and significant service from two satellites. Making this network accessible to potential users meant engaging dozens of internet service providers (ISPs), all of which had some market coverage in the region, negotiating 26 contracts to connect ISPs to the network, and opening up the network to potential subscribers in fifteen (15) zones encompassing rural areas, small towns and cities, and four (4) First Nation communities.

The network's operation is characterized by a requirement for open access to the backbone for all ISPs, comparable pricing for rural/remote subscribers (as compared to their urban counterparts) and built-in contractual commitments for the private sector network operators to keep technology current when ownership of network assets financed by public funds transfers to the operators in 2017.

Beyond the deliverables included in EORN Inc.'s Contribution Agreement with funders, the Eastern Ontario broadband project also earned high marks from stakeholders on a range of measures related to project design and formulation, governance, execution and relationship management, financial management and administration.

This report was commissioned by EORN Inc. to document the project's evolution and execution as well as to capture 'lessons learned' and best practices that were either introduced into the project or can be derived from the Eastern Ontario experience. As a result, this report provides invaluable guidance to other regions – within or outside Canada – that are considering similar initiatives in historically economically-challenged, under-serviced areas. It is also intended to guide EORN Inc.'s self-evaluation and provide a roadmap for success in any future endeavors.

1.2 Eastern Ontario: Nearly A Million People Widely Dispersed

The Eastern Ontario region is largely rural with many small towns and villages. Total population of the region (excluding the nation's capital Ottawa) was 1.14 million people in 2011, with citizens distributed over roughly 50,000 square kilometres – a geographic area larger than 109 countries in the world – with an average population density of just 23 people per square kilometre [1]*.

Without Broadband, Region is Hard to Serve, Hard to Grow. As has been well-documented over the last decade [2], rural Eastern Ontario (compared to the other parts of Ontario, has below-average median incomes; unemployment typically runs several percentage points above other regions, with limited post-2008 recession bounce-back. Households are more dependent on government transfers rather than employment earnings. Youth migrate out of the region for work and for higher education (often not returning); as a result, the regional population is aging faster than large urban centres. Health, education and social services organizations – as well as governments – moving to service delivery via the internet – were experiencing increasing difficulty reaching the region's householders (e.g. 100 schools in the region had no access to broadband) [3].

Although broadband is considered a "given" for businesses, those in Eastern Ontario – especially the estimated 30,000 small businesses – were often unable to get online to undertake online market research, maintain an online marketing presence for their products and services, capitalize on online education, training, and social media opportunities, or use broadband for wide range of administrative and business management services. The absence of broadband began to show up in business retention surveys conducted by the region's economic development authorities: local businesses were finding it increasingly difficult to compete in a wired world and were now explicitly considering broadband availability as a factor in plans for staying or growing in their existing host communities.

*References Cited in the Review can be found in Appendix C, page 77

1.3 The Problem to be Addressed: A Classic Case of Market Failure

Although rural Eastern Ontario lies in the middle of three of Canada's largest cities – Toronto, Ottawa and Montreal, the average population density in Eastern Ontario (23 persons per square kilometre) was well below the threshold that would support a business case for broadband service provided by the private sector alone. At the time the EOWC conceived its regional broadband project, high-speed internet access was available mostly in the region's densely populated pockets (such as Kingston, Belleville, and Brockville); the only available internet options in less densely populated areas *at that time* were either torturously slow (e.g. dial-up) or extremely expensive (e.g. satellite). Wired and fixed wireless (terrestrial towers) were limited and the service from them was usually less than 5 Mbps.

1.4 Results Compared to Expected Outcomes

The following table summarizes the actual results of the Eastern Ontario regional broadband initiative as compared to the outcomes expected of the project at its inception. In virtually all cases, the EORN project met or exceeded the established targets.

Expected Outcome	Actual Results
Coverage target: 85 per cent of households and businesses @ up to 10Mbps	89 per cent
Transport Network Target: 800 kms of fibre	5,855 kms (due to Bell decision to link 5,000 km into network)
No business park connection target	63 business parks connected
60 PoPs identified based on initial design	More than 160 PoPs
Speed targets: Up to 10 Mbps download; 1 Mbps upload	10/1 Mbps available at target speeds
Access/last mile Target: ISPs in EORN access zones participating in network	Target met
Increased competition by ISPs	Increased number of ISP competitors in some EORN zones
Comparable rural-urban pricing for end users	Target met
Capital raise target: $160M (beyond EOWC commitment of $10M)	Exceeded by $5M
Project executed within budget for network build	Under budget while exceeding deliverables for budgeted work
Positive ROI on municipal investment	Exceeded: 16:1
Long-term economic development	Positive anecdotal reports; research needed in next 3-5 years to validate adoption

1.5 Lessons Learned from the Eastern Ontario Experience

Despite stakeholders' initial inclinations, at its heart, a regional broadband initiative like the Eastern Ontario Regional Network is not a technology-driven venture. Rather, it is a strategy for preventing further economic and social decline – indeed to stimulate economic activity and social vibrancy – in an era characterized by digital transformation. The strategy utilizes financing from public and private sources to aggregate demand for an essential form of physical infrastructure and associated utility-like service that connects organizations and populations to the rest of the world. In this sense, a regional broadband network is an economic and social platform for addressing the needs and aspirations of a region's citizens and organizations, in the absence of a conventional market-based approach. While technology-laden, the network is created not for the sake of technology but for the sake of an economy, businesses and citizens.

According to stakeholders familiar with the Eastern Ontario project, the EORN initiative offers many 'lessons learned', all of which are noteworthy for similar future projects. In particular, stakeholders noted the importance of:

- **Recognizing that a broadband network is a different kind of infrastructure and must be structured and executed accordingly.** Such a network spans different geographic distribution patterns that do not normally align with political boundaries, is often heavily regulated with 'public good' characteristics in mind, while simultaneously being largely private sector in both ownership and operation. The EOWC quickly understood that the ultimate success of its initiative would be dictated in significant measure, by their ability to change funders' notions of appropriate business models and agreements through which to deliver regional broadband infrastructure.

- **Seizing the moment.** In addition to developing an unconventional public-private partnership approach (typically described as a '3P'), the EOWC chose to act at a time when the importance of Information and Communications Technology (ICT) was growing rapidly, and governments were eager to invest to support their commitments to social and economic development, as well as be part of the emerging transformation to a knowledge-based economy.

  At the time the Eastern Ontario initiative was being conceived, it was clear that the early stages of a revolutionary societal transformation based on digitization, were under way. This transformation is now highly visible through the Internet of Things (technology embedded in machines and devices), significant data traffic shifts from desktops to mobile devices, and exponential increase in bandwidth requirements. The EOWC chose the right time to act.

- **Identification of enduring champions early and nurturing them throughout the initiative.** Broadband infrastructure is a long-term, capital-intensive proposition; municipalities and other investors need to add it into their capital asset plans, particularly in regions where it is unlikely there will be a (private) business case any time soon. In the case of Eastern Ontario, development and execution of the Eastern Ontario network was a decade-long initiative. Proponents of the regional network placed early and regular emphasis on identifying and nurturing enduring champions – those that were committed to staying the course on what promised to be a challenging, decade-long project. In contrast to other types of infrastructure (e.g. roads, water/wastewater treatment facilities etc.), regional broadband is likely to require a long-term view. Yet, with rapid ongoing advances in information and communications technology, stakeholders understand that they will need to keep an eye on the sufficiency of the regional network, and be prepared to champion and make additional investments to keep pace. Long-term engagement by champions becomes extremely important.

  Eastern Ontario's ability to identify, activate and nurture regional champions with a long-term commitment, was key to navigating ever-changing public policy landscapes, turnover and transitions in both funder and regulatory organizations, and energizing those at the forefront of efforts to obtain approvals for, and launch the regional broadband initiative.

- **Capitalizing on the political support, reputation and credibility of the champions.** The Eastern Ontario regional broadband initiative was conceived by the Eastern Ontario Wardens' Caucus, an organization representing more than 100 local governments across the region. At the time, the EORN project was conceived, the EOWC had already earned credibility with upper levels of government on *regional issues* and development of strategies/policy positions to address those issue; as a result, the EOWC's mandate and scope of influence was congruent with those of a *regional* broadband initiative. Therefore, the EOWC was an effective and appropriate spokesperson/advocate for a regional broadband project. Through the EOWC, EORN Inc. became a strong supporter in capturing and holding the support of elected officials and senior public servants throughout the project.

  In addition to advocacy support, the EOWC – and its member municipalities – also provided vital assistance for such business functions as cash flow management, procurement, and financial services. EORN Inc. has built on the EOWC's reputation (as well as establishing its own) to advocate with the Canadian Radio-Television and Telecommunications Commission (CRTC) for spectrum allocations for municipal services, as well as for mobile broadband.

- **Deciding to create and staff a separate organization (EORN Inc.) for this initiative was the right choice for Eastern Ontario.** A separate organization allowed those working on the project to focus solely on bringing the high-profile, multi-year, large budget network to life, rather than being expected to execute the project 'off the side of their desks'.

- **Deciding early on the appropriate role(s) and a congruent business model for a regional broadband project.** In Eastern Ontario, the decision was to take a catalytic role rather than a long-term, owner-operator model. This strategic choice set the stage for use of a business model that positioned EORN Inc. as an implementation, financial, legal, risk and accountability management organization, using specialized external resources (partners) on a time-limited, targeted basis rather than being directly responsible for all aspects of the project. In this role, EORN Inc.'s governance relationships included having a Board representative of funders as well as possessing domain expertise, and regular reporting to the EOWC, under whose auspices EORN Inc. had been created.

- **Aligning the staffing model with the governance and business models.** The Eastern Ontario project used what could be described as an 'empowered 3P' staffing model (professional, passionate, purpose-driven). These terms were used repeatedly by stakeholders to describe EORN staff and champions, and were seen as a key factor in EORN's success, matching role and outcomes that the EOWC and other funders anticipated.

- **Building the dedicated organization's (EORN Inc.) operating style** based on a firm commitment to achieving the project's original objectives combined with a constructive problem-solving attitude, creativity, flexibility and nimbleness to respond to in-project challenges, all on a solid administrative foundation that ensures accountability to partners and investors. The operating style was one that aligned with the 'empowered 3P' staffing model.

- **Creating and implementing a project plan with built-in flexibility**, conferred by the regional nature of the project (allowing different approaches in different parts of the region) a phased approach that allowed in-project learning – for EORN Inc. and internet service providers – and recalibration for future work in response to unexpected challenges and opportunities. This approach to project design and implementation was consistent with the governance and business model, and the operating style adopted for EORN Inc.

- The **diversity of landscapes, population situations, and appropriate technologies** to deliver broadband services varied significantly across the Eastern Ontario region. This created a demand for customized solutions in particular areas.

- **Designing the network for maximum accessibility**, both in terms of geographic coverage and end user pricing, even if that means a mix of technology solutions (which was the case in Eastern Ontario).
- **Structuring implementation based on multiple competitive bidding processes** that provided an opportunity for firms of all sizes to participate in the network's construction, operation and utilization.
- **Making significant investments in relationship management (stakeholders and subscribers) and communications**, despite the challenges of working indirectly (e.g. through/with ISPs on behalf of subscribers) and seeking customized solutions. While it would be expected that any infrastructure investment project would include an ongoing program of partner and stakeholder engagement, as well as communication from the project's inception through to completion, the Eastern Ontario project found expectations management to be especially challenging.
- It would have been useful to put **more project emphasis on the elusive nature of 'enough' broadband**. The project unfolded in an era of **exponentially increasing demand for bandwidth** (that has not abated and appears to be accelerating). Despite having set what was at the time, a relatively high speed target (10Mbps down; 1Mbps up), and building in significant capacity to scale up the backbone as demand increased, the available bandwidth is being taken up faster than anticipated. As a result, there has been network congestion between the backbone and the end user, in some parts of the region.

  For EORN, the lesson is that the quest for more bandwidth will likely be a long-term challenge; as a result, a broadband project is unlikely to ever be 'finished'. Broadband proponents, particularly for initiatives in rural areas, are well-advised to convey to subscribers the elusive nature of "enough" bandwidth. Whether for personal use (such as Netflix which was just emerging as the Eastern Ontario project got underway), for public services (such as education or healthcare), or business purposes (video conferencing, training, product installation guidance, or a host of other applications), video streaming is placing ever increasing demand on available bandwidth generating network congestion, usage-based overage charges, and/or throttling of download speeds. While understandable (and, in fact, a sign of strong utilization of the network), these issues require finely-tuned attention to expectations management. Without it, as EORN has found, some subscribers can end up feeling as though the network's promise has not been fulfilled.
- **Knowing that success is only attained if the completed network is used** by those for whom it was created. As a result, EORN Inc.'s plan for a second phase to the project, in which the emphasis shifts from the 'build' phase of the network to encouraging adoption, is important to the network's long-term success.

1.6 Best Practices Derived from the Eastern Ontario Experience

A review of the Eastern Ontario project and the operation of EORN Inc. suggests the following best practices:

1. **Help champions, funders and other stakeholders recognize from the outset that broadband is a different kind of infrastructure** than is normally an investment target for public authorities. A network operates across political boundaries, and has historically been owned and operated by the private sector. These factors introduce new policy and contractual considerations, some of which can be perplexing and challenging. Project leaders need to be prepared to listen and develop creative solutions so that a broadband project can move forward.

2. **Understand your region thoroughly.** This knowledge is key to network design, structuring budgets and financing, creating effective procurement processes and contract negotiations, and the ability to work with existing service providers and stakeholders to deliver intended outcomes.

3. **Identify champions who will lead the charge and stay the course.** Regional broadband projects are a long-term venture. Champions must understand that their support and contributions will be needed for years not months.

4. **Get political support early and often,** in part because of the long-term nature of the project, and because the scale of public investment for a regional project will be larger than for those focused on individual communities. In addition, inter-governmental participation can raise multiple sets of expectations that must be negotiated. Regular communication and re-engagement can build consensus and willingness to compromise in order to see the project move forward.

5. **Consider the wisdom of technology agnosticism** – because potential partners may want to propose different technology solutions for different applications within the larger regional project, and because technologies that were not mainstream at the project's inception may be so by the time you finalize the network design and begin to build. Early commitment to relatively few, specific technologies (such as specifying them in an RFP) can lead some potential suppliers and partners to decline participation if they believe they will be at a disadvantage without the identified technologies.

6. **Choose intended project outcomes carefully.** Agreements with funders will almost certainly contain specific outcomes you will be expected to deliver. Make sure you choose outcomes that are relevant for your region, that you can deliver, and that you can afford.

7. **Hand the implementation assignment to an organization or team that is focused on one mission**. An expectation that a regional broadband network project can be executed by an organization or team with multiple priorities is ill-founded. Such a project is too large, complex and fraught with risk to be undertaken as part of a suite of projects or responsibilities.

8. **Structure the project to build in flexibility,** in part, because regional projects are often introduced in areas with significant on-the-ground variability and because the multi-year nature of a regional broadband project may generate surprises. Use the scale of a regional project to 'average out' variations and to be able to respond to surprises (that may be opportunities, not problems).

9. **Consider your business model carefully.** It affects investor/funder, partner and stakeholder perceptions of the project, their willingness to work with you, and invest their own resources in the initiative. It also affects the risk profile of the venture since there are different types of risks – and opportunities – associated with different business models. While most stakeholders associated with the Eastern Ontario project believe EORN Inc. was the right business model and might well work in other jurisdictions, there was a cautionary note that any business model needs to be assessed against a region's particular circumstances and needs. Similarly, a business model that works well for one ICT project may be inappropriate for another one.

10. **Invest in risk management and top-notch talent.** The scale and complexity of a regional broadband network, and the comfort level of funders, argue for significant attention to risk management. Since a significant share of the risk is either 'baked in' or avoided in the project's initial stages project, securing top-notch talent for such assignments as legal work, procurement and contract negotiations, technology and engineering, governance oversight and project management, communications, and customer relations will pay dividends in avoiding costly or damaging mistakes and in cost-effective project delivery. Remember that these costs are a small proportion of total project costs (in EORN Inc.'s case, 5.7 percent of the total project budget). Scrimping on these expenditures will not free up significant resources to cover implementation costs.

    Finally, funders, partners and other stakeholders will have greater confidence in a team that demonstrates exceptional professionalism and expertise, and may be more willing to consider changes in strategy or reallocation of resources to deliver better results.

11. **Project design and rollout can accomplish objectives beyond getting a network built and subscribers online.** The scale of a regional broadband network can have a significant short-term direct economic impact within the region, as well as sparking longer-term impacts during the network's operating phase. It can also help to achieve other objectives such as stimulating greater competition in the ICT marketplace; enabling both ongoing economic and community development aspirations; and potentially enhancing the brand or reputation of the region and participating stakeholder organizations. Consider all the objectives proponents might have for this project, within the project itself and the broader community.

12. **Managing expectations is key to perceptions of success,** especially in an era of rapidly advancing technologies and applications. For instance, it is now clear that demand for broadband services will continue to grow dramatically, leaving network operators and ISPs in a state of perpetual catch-up. Make sure you can deliver on the expectations you are setting with stakeholders, end users, citizens and funders.

Given the relative paucity of evaluations and best practice derivations for regional broadband initiatives, the preceding 'lessons learned' and best practice considerations are presented as an early contribution to this field of analysis. By virtually all measures, the EORN initiative has been deemed successful – a conclusion borne out by this review (for which evidence has been presented). For that reason, the conclusions of this report warrant more than passing interest for anyone considering a regional broadband project or having best practice interest in the ICT sector.

2 Introduction

2.1 Challenges Across a Region

At the time the Eastern Ontario Regional Network project was conceived – nearly a decade ago – the 'digital divide' terminology had entered the public lexicon, often in reference to the significant variation in high-speed internet availability and pricing between urban and rural areas. These variations were viewed as having developed because of 'market failure' (a situation where private technology companies cannot justify network investments in an area because there are either too few potential subscribers or they are too widely dispersed to be cost-effective). With the pervasive movement to a digital world – from public service delivery to video streaming – the signs of the emerging digital world abounded. The rapid proliferation of communications devices – from desktops to mobile devices and embedded sensors in all sorts of physical assets – made it clear that those areas without high-speed internet would be left behind.

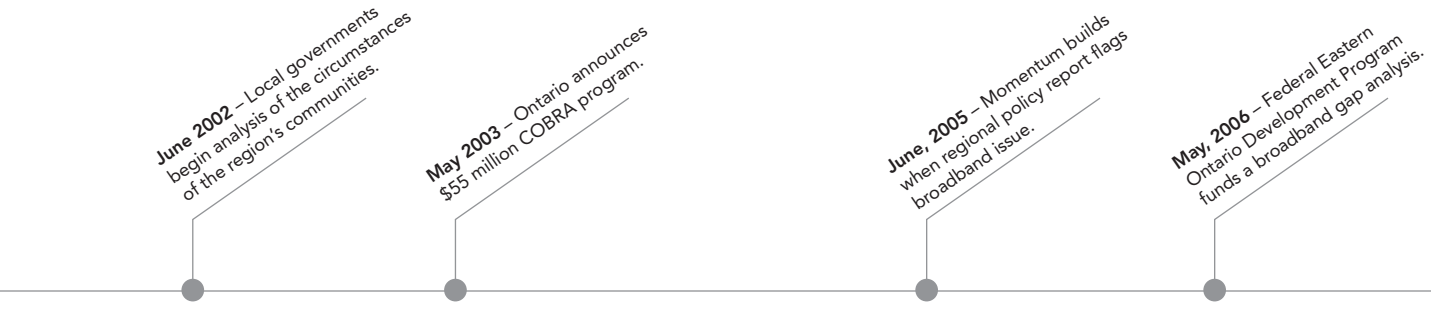
The implications of this economic and social transformation were particularly disturbing for the 50,000-square kilometre region of Eastern Ontario, Canada. From 1995 to 2005, more than 12,000 jobs had disappeared in the region's rural areas. Traditional industries such as forestry and agriculture were reeling. In many areas of rural Eastern Ontario, there was either no internet coverage at all, or the only options were dial-up or satellite. Business retention surveys revealed that to keep businesses (or attract new ones), high-speed internet would be a pivotal consideration. In other words, if the region was to participate in the transition to a knowledge-based economy, preserve its communities, and maintain economic prosperity, action was required. A (then) informal coalition of the region's municipal governments, known as the Eastern Ontario Wardens' Caucus (EOWC), identified high-speed internet/broadband as an infrastructure imperative. While the EOWC's mandate had focused on advocacy related to municipal government, the deteriorating economic conditions in the region prompted them to become more active in supporting economic transition. So began the mission to address the digital divide.

2.2 Timeline for the Project

This detailed project timeline is included to underscore both the complexity and multi-year nature of regional broadband projects such as the Eastern Ontario initiative. It is intended to flag the many tasks that must be undertaken before a project can be launched, and highlight the leadership and administrative capacity that must be in place to execute a project of this type successfully. The following timeline is drawn from materials provided by EORN Inc. [4],[5],[6],[7],[8],[9]

- **June, 2002: Local Governments in rural Eastern Ontario come together.** On an informal basis, they begin to analyze the circumstances of the region's communities. Having first begun meeting in the late 1990s to collaborate on issues affecting the financial health of the region's rural municipalities, the Eastern Ontario Wardens Caucus (EOWC) took an important evolutionary step to formalize its efforts to rise above local/community-specific issues to work together for the betterment of the entire region. The 2002 Financial Directions update notes that "there is a broadly held view that Eastern Ontario Counties are not faring well financially and that the situation is likely to worsen without effective Provincial/County coordination and collaboration within the region."

- **May, 2003: Province of Ontario announces the $55 million COBRA program.** Connect Ontario: Broadband Regional Access was intended to complement the federal BRAND program (Broadband for Rural and Northern Development) that was announced in 2002 and ran until 2007. In 2007, the Province of Ontario announced investments in its Rural Connections program totalling $30 million. All of these programs were targeted at specific/individual communities rather than enhancing regional infrastructure (such as backhaul capacity) that crosses local government boundaries and links local economies to the outside world; some programs such as BRAND emphasized local partnerships with business, institutions and other community groups but specifically excluded telecommunications service suppliers. As a result, projects funded under these programs had difficulty making significant improvements in rural broadband availability. A June 2015 thematic analysis of Canadian broadband policy and programs (including many at the provincial level) described them as "increasingly unambitious."



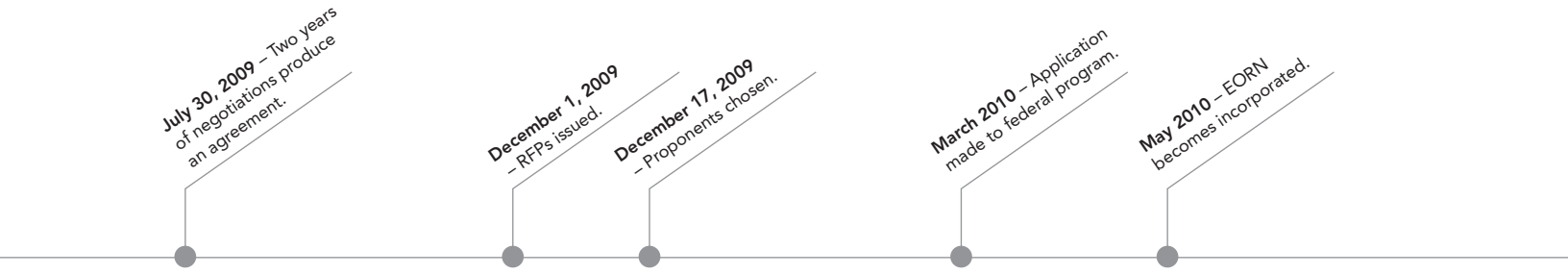
- **June, 2005: Momentum builds when regional policy report flags broadband issue.** The Eastern Ontario Opportunity Action Plan identified broadband access as "basic infrastructure" and identified connectivity as an early action priority. This was followed up in 2007 with the release of the EOWC's Eastern Ontario Prosperity Plan, identifying broadband as an "infrastructure imperative," urging the Provincial to fund it immediately and separately from other infrastructure (transportation, water & sewer). This report advocated a regional – rather than the conventional single-community – approach, and proposed that a regional stakeholder group oversee implementation and accountability for use of public funds.

- **May, 2006: Federal Eastern Ontario Development Program funds a Broadband Gap Analysis.** The analysis assessed the geographic distribution of availability of high-speed internet service among the region's homes and businesses. For the purposes of this study, 'high-speed' was then defined as at least 1.5 Mbps for download and 0.50 Mbps for upload. The analysis revealed that more than 200,000 people and businesses had poor or no access to the internet across the region (nearly 27 per cent of its rural population). Note that the target speeds were increased significantly for the regional broadband network project.

- **April, 2007: The EOWC seizes the moment.** In mid-decade, local governments in Eastern Ontario witnessed dramatic changes to the region's economy: more than 12,000 jobs in traditional industries (manufacturing, forestry, agriculture) had been lost and not replaced. In their search for strategies to replace jobs and rejuvenate a rapidly declining regional economy, the EOWC identified broadband service as essential to business retention, attraction and economic growth. Without it, they faced a future of further economic and social decline, deteriorating infrastructure, and inability to support essential local services. Regional broadband was viewed as 'doable' by local government and the EOWC embraced the challenge of bringing it to life.

- **September, 2008: The plan comes together.** The EOWC began to build pan-regional support and associated preliminary planning on how a regional broadband network could come to life. A year later, EOWC members unanimously committed to a total expenditure of $10 million to demonstrate the importance of broadband to the region and their willingness to support an initiative with their own (municipal) resources.

- **2008-2009: Request for Expressions of Interest provides order-of magnitude cost estimates.** Based on the gap analysis, ground-truthing (on-the-ground verification) and additional research, the EOWC issued a request for expressions of interest for private sector firms interested in undertaking the network 'build'. The rationale for the REI process was to gain more clarity on what the network could look like, in technical and bandwidth terms, and on the associated costs, to support an eventual funding application. On the advice of federal officials, the EOWC incorporated into the EOWC Inc. in readiness for the potential receipt of public funding.
- **March, 2009: Digital Summit focuses on user uptake.** The EOWC and its partners organized a Digital Summit in Kingston, Ontario to bring stakeholders together to begin thinking about how to utilize the improved broadband capacity anticipated for the region. Opportunities and applications in e-learning, e-government, e-business and e-health were explored.
- **May, 2009: First Funding Application Made.** Initial Application was made for a new, high-speed, high-capacity broadband network to serve Eastern Ontario filed under the Build Canada Fund Major Initiatives program, by the Eastern Ontario Wardens' Caucus. The Eastern Ontario Wardens Caucus submitted additional information supplementing the original proposal in March 2010.
- **May, 2009: EOWC makes first funding application:** The Eastern Ontario Wardens' Caucus made the initial application for a new, high-speed high-capacity broadband network to serve Eastern Ontario, filed under the Build Canada Fund Major Initiatives program. The Eastern Ontario Wardens' Caucus submitted additional information supplementing the original proposal in March 2010.
- **July 30, 2009: Two years of discussions produce an agreement.** The federal and provincial (Ontario) governments agreed to co-fund $110 million in financial support for an Eastern Ontario regional broadband network. The project was estimated to cost $175 million. It was expected to take three years to fully complete the network portion, but residents would begin to receive access and higher capacities as the network was built out.



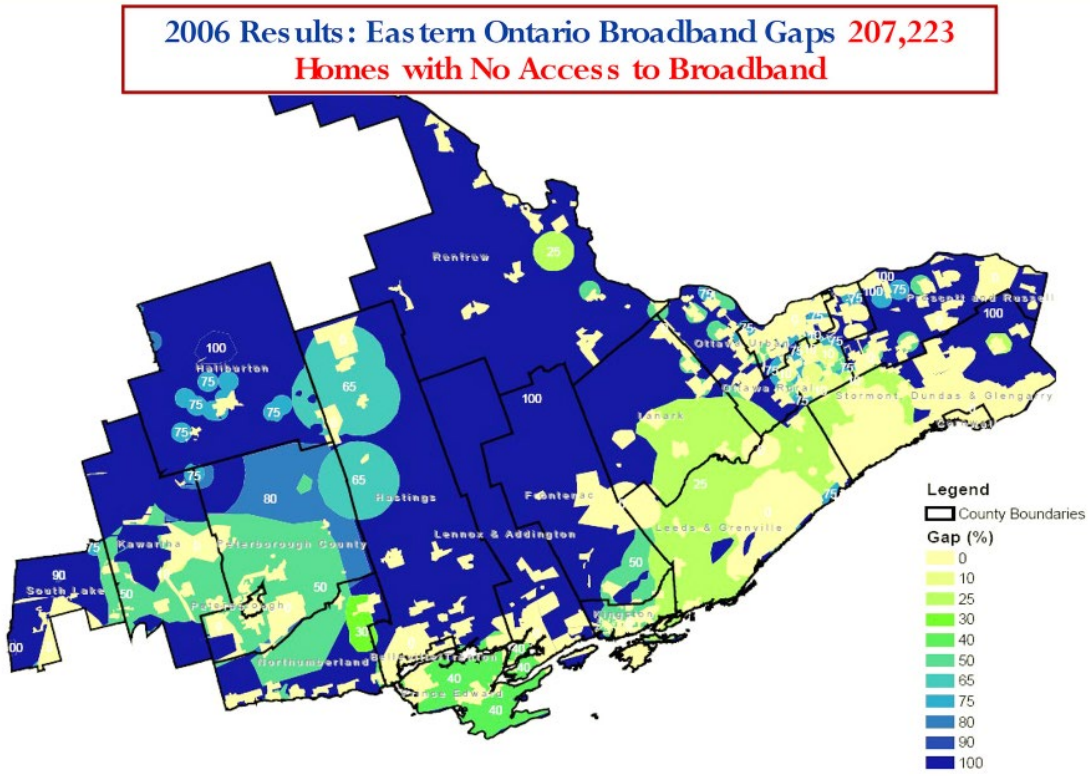


Figure 1 - Summary of Analysis from EODP-funded broadband gap analysis executed by the Eastern Ontario Broadband Coalition.

- **December 1, 2009: Two EORN RFPs issued by the EOWC broadband team closed.** One RFP was for the construction of the high-capacity fibre ring backhaul transport component of the proposed project. The second was for the acquisition of dedicated satellite capacity for the region.
- **December 17, 2009: Proponents chosen.** EOWC Board of Directors accepted a recommendation from the EORN project team that Bell Alliant be selected as the leading proponent for the backhaul/transport ring. The Board also accepted a recommendation that Barrett Xplornet Inc. be selected as the preferred proponent to provide dedicated satellite capacity.

June 2010 – Contribution agreements negotiated, project management team established.

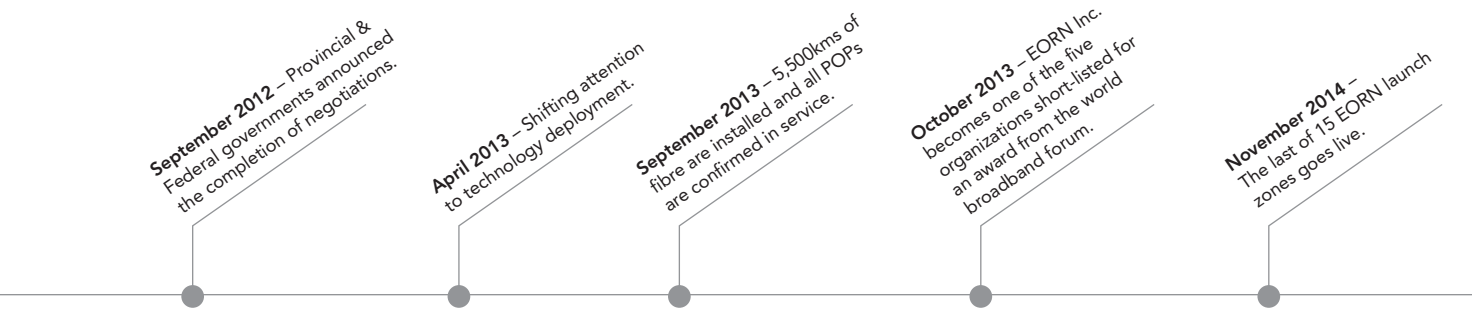
August 2010 – Contribution begins on 'Backbone' of Eastern Ontario network.

January 2011 – The EOWC begins to award local access contracts.

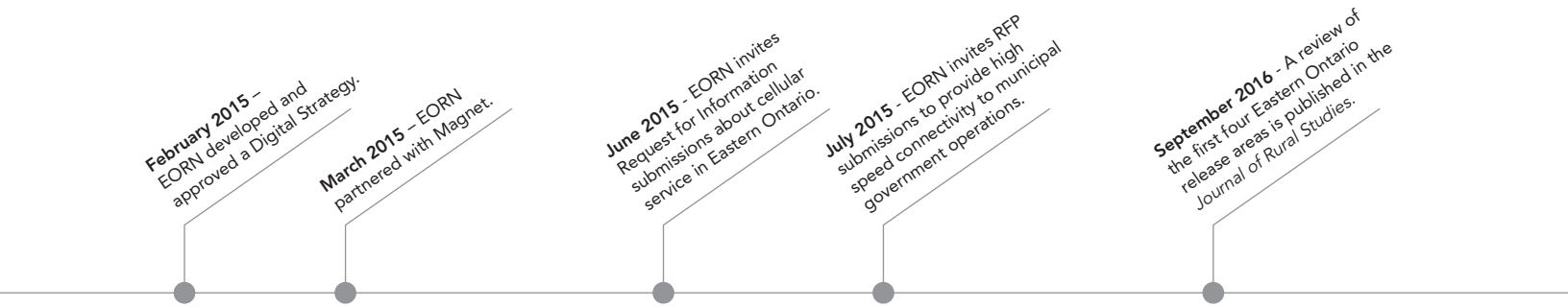
October 2011 – A new high-throughput 4G satellite was launched.

December 2011 – Backbone construction completed and improved internet access available.

- **March, 2010: Application made to federal program.** The Final Report on the Eastern Ontario Broadband Network (EORN) Proposal was submitted to the Building Canada Fund.
- **May, 2010: EORN becomes incorporated.** The Eastern Ontario Regional Network Inc. was incorporated without share capital, to manage the EOWC project to improve internet access to at least 95 per cent of the homes and businesses (85 per cent of which are targeted to receive speeds of up to 10 Mbps/1 Mbps) in Eastern Ontario, with the support of the Federal, Provincial and Municipal governments and the private sector. For the first year of its operations, EORN Inc. operated on advances from the EOWC, with interest payable at five per cent per annum based on contribution agreements between the EOWC and each of its municipalities.
- **June, 2010: EORN negotiates Contribution Agreements and establishes project management team.** EORN Inc. created a team that blended contracted employees with consulting resources retained for specialized assignments (technical/engineering, legal services and some communication services).
- **August, 2010: Construction begins on 'backbone' for Eastern Ontario Network.**
- **2010-2011: The EOWC begins to award Local Access Contracts.** These contracts allow thousands of homes and businesses in the region to connect to high-speed internet. Altogether, EORN issued 15 access RFPs and awarded 26 contracts (not including those for the Business Parks).
- **October, 2011: A new high-throughput 4G satellite launches.** Xplornet Communications Inc. is a partner on a new satellite, setting the stage for a new suite of internet services for customers across Eastern Ontario. A second satellite was launched in December 2016.
- **December, 2011: Backbone construction is completed and improved internet access becomes available.** The Embrun zone of the EORN project was the first of 15 zones to launch and saw an immediate jump in broadband use among businesses and households.



- **April, 2013: EORN looks at technology deployment on network.** EORN began exploring remote patient monitoring across the Eastern Ontario region, given that the use of such technology might reduce or delay admission to long-term care. Half of the cost of long-term care is borne by local government, and the technology might dovetail effectively with paramedic and community paramedic services, both of which are operated by local governments.
- **September 15, 2013: 5,500-kms of fibre and all 160 backbone Points of Presence** (POPs) come into service. Four months ahead of schedule and $11 million under budget, the project delivered nearly three times as many POPs as originally anticipated, driving broadband penetration more deeply into the region. Overall project implementation was ahead of schedule and under budget which gave residents broadband access faster than originally anticipated.
- **October, 2013: EORN Inc. becomes one of five organizations short-listed for a global award.** The Broadband World Forum short-listed EORN in recognition of efforts to improve broadband penetration.
- **November, 2014: The Thousand Islands zone, the last of 15 EORN launch zones, goes live.** The final local access network improved internet access available in that zone.
- **February, 2015: EORN develops a Digital Strategy.** Recognizing that 'uptake is everything', once the network build phase was complete, EORN reoriented its attention to focus on extracting economic value from the network. This second phase had been part of EORN's plan since the project's inception and is reflected in the Contribution Agreements that EORN signed with upper levels of government. Ultimately, the key metrics for the success of the regional broadband network are a) employment – retention and job growth, and b) business start-ups and investment. The advocates of a regional broadband initiative also knew that theirs was a region of small and medium-sized employers, with many home-based businesses across the region.



- **March, 2015: Digital Strategy implementation begins.** EORN Phase 1 Broadband 'build' is complete and funding from upper levels of government ends. Although not included in the original funding, EORN Phase 2 – EORN began to implement a regional Digital Strategy. EORN partners with Magnet, an innovative online jobs portal developed to help jobseekers connect to meaningful employment opportunities across the province, including Eastern Ontario.
- **June, 2015:** Although not part of the original broadband project, EORN invites Requests for Information submissions from qualified firms to provide information about cellular services in Eastern Ontario.
- **July, 2015:** EORN invites Request for Proposal submissions from qualified firms to provide high-speed connectivity to municipal government operations.
- **September, 2016:** A review of the first four Eastern Ontario release areas (Broadband for a Sustainable Digital Future of Rural Communities: A Reflexive Interactive Assessment) is published in the Journal of Rural Studies. The report used a case study report to test a conceptual approach to transitions toward more sustainable rural communities.

Phased Approach to Rolling Out High-Speed Internet across Eastern Ontario:

December, 2011	– Embrun zone
February, 2012	– Prescott-Russell zone
September, 2012	– Alderville First Nation
April, 2013	– Quinte-Loyalist zone; Northumberland zone
June, 2013	– South Nation zone
July, 2013	– Highlands zone
April, 2014	– Ottawa Valley South zone
August, 2014	– Ottawa Valley North zone; Kawartha Lakes, Peterborough zones; Stormont, Dundas and Glengarry zone; Haliburton and Hastings North zone
November, 2014	– Thousand Islands zone

2.3 Overall Project Description

The following descriptive information outlines the scope, scale, governance, operational structure, partnership, and financial characteristics associated with the Eastern Ontario regional broadband initiative and the EORN model that is now in place. These characteristics may be helpful to proponents considering a similar initiative and wanting to capitalize on the Eastern Ontario experience.

- **$175 Million Project Implemented Fibre Backbone, Wireless and Satellite Blend:** The EORN project involved a Gigabit Ethernet backhaul transport and access network, and last mile access via wired Asymmetric Digital Subscriber Line (ADSL), fixed wireless and next-generation satellite solutions for more than 500,000 homes and businesses across 50,000 kms2 of challenging terrain. The backbone's total 5,855 kilometres of fibre is scalable (1 Gb to 100 Gb), to meet future bandwidth demands.

- **Formalized Governance Enabled Local Stakeholders to Lead:** To negotiate with other levels of government, receive funding for a regional broadband project, and provide accountability to funders, the EOWC coalition formalized into a corporation without share capital, then created a separate corporation, also without share capital, called Eastern Ontario Regional Network Inc., to develop and manage the broadband project.

- **Decade-Long Project Timeline:** Conceptual development, governance changes and expressions of interest were completed in 2009, followed by securing of funding/financing in 2010 and multiple RFPs in 2011. The backbone build, initial access builds, and satellite launches took place in 2012, with the first three zones going live before year-end. The remaining zones went live in 2013-14.

- **Largest Project of Its Kind in Canada:** The size of EORN's budget and geographic coverage make it the largest broadband project of its kind in Canada and perhaps North America. In addition to local governments in the region's rural areas, EORN Inc. addressed the needs of six participating independent cities and towns as well as four First Nations communities.

- **Champion with a Solid Regional Reputation:** The EOWC Inc. is a corporation without share capital whose mandate is to present a unified voice on behalf of eastern Ontario municipalities engaging both the federal and provincial governments in developing new programs and policies that support the goal of realizing the region's full potential for sustainable economies and communities.

  Membership includes the counties of Northumberland, Peterborough, Haliburton, Hastings, Lennox & Addington, Lanark, Frontenac, Renfrew, as well as the United Counties of Stormont, Dundas and Glengarry, the United Counties of Leeds & Grenville, the United Counties of Prescott & Russell and the single-tier municipalities of the City of Kawartha Lakes and the County of Prince Edward. The municipalities include nearly one million people.

- **Self-Managed Project Implementation** (not outsourced): EORN established its own project implementation team rather than out-sourcing this function. This approach kept project management costs to just under six (5.7) per cent of total operating expenses, preserving funds to extend the network's reach (connectivity to rural business parks) and stimulate end user uptake.
- **Competition Spurred by Multiple Request for Proposal (RFP) Processes:** The approach was used for construction of the fibre, terrestrial wireless and satellite services, and for ISP services in the region. This also allowed smaller organizations to compete in the local marketplace. Rather than follow municipal boundaries, the network's design clustered service delivery into 15 zones with 26 last mile access contracts to encourage 'last mile' competition within zones.
- **Bridging the Urban-Rural Pricing Gap:** By design, EORN Inc. was able to lower wholesale costs to ISPs, permitting them to offer comparable broadband prices (for same level of service) to end users.
- **Open Access Requirement:** The private network operator is contractually prohibited from denying access to or charging higher wholesale toll charges to ISPs for network use. This requirement extends to 2024.
- **Network Ownership Now, Ultimate Transfer to Private Sector:** EORN Inc. currently owns 51 per cent of network assets; it will transfer these assets to the private sector in 2017, with an agreement that the private sector will refresh the network with modern technology at its own expense. Ownership was a condition of funding (given that it was an infrastructure project). Transfer to the private sector was an acknowledgement that the life of ICT infrastructure is considerably less than other assets such as bridges or buildings; as a result, transfer allowed EORN Inc. to limit its long-term liability for the network.
- **Enormous Leverage for Local Funding:** By securing significant funding/ contributions of assets from upper levels of government and the private sector, EORN Inc. achieved an average of 16:1 leverage from the EOWC's $10 million investment, exceeded its $50 million private sector cash target, and attracted an additional $50 million in private sector assets into the project, raising total project value to $260 million.

2.4 Five Main Components of the Project

The EORN project had five major components, four of which have now been implemented (the fifth was in process at the time this review was completed):

- Installation of a **backbone** throughout the rural region (a backbone is a principal data route between large, strategically interconnected networks and core routers on the internet). Backbones require high-speed bandwidth connections and higher-performance servers/routers to handle the data traffic associated with modern internet utilization. A sufficiently robust backbone, with the opportunity to increase the amount of data that can be handled effectively determines the maximum number of users and/or speeds with which they can use the network.

- Establishing or linking to at least 160 **Points of Presence** (POPs) across the region. A point of presence (POP) is an artificial interface (demarcation point) between communicating entities. Typically, POPs house servers, routers, network switches, multiplexers, and other network interface equipment.

- Securing agreements with internet service providers (ISPs) that would address local **distribution within communities**, often referred to as the 'last mile' between the POP and the end user's premises. Across Eastern Ontario, there were more than 40 ISPs in operation at the time of the EORN project, including both public (municipal utilities) and private firms.

- **Satellite capacity**, the low population density across the region combined with variable terrain meant that it was highly unlikely that all residents and businesses interested in accessing high-speed internet could do so. As a result, the EORN team understood from the beginning that for some, satellite internet might be the only option.

- Implementation of **adoption strategies**, to encourage businesses (particularly small businesses) and households to begin to use broadband or use it to engage more intensively in their communities, with their prospects and customers, to learn, and to improve their economic prospects. This phase must necessarily follow the implementation and availability of high-speed internet service; as a result, this component of the project is now under way but cannot be evaluated until sufficient time passes for adoption strategies to be implemented and for end users to make adoption decisions.

3 Methodology

3.1 A Note on Best Practices Documentation

A Best Practice can be defined as "*a technique or methodology that, through experience and research, has proven to reliably lead to a desired result. A commitment to using the best practices in any field is a commitment to using all the knowledge and technology at one's disposal to ensure success.*" [11] The derivation – or application – of best practices can only take place in organizations with a commitment to knowledge management ("the process of creating, sharing, using and managing the knowledge and information of an organization") [12]. The preparation of this report indicates the commitment of EORN Inc. and the EOWC to knowledge management not just within their own organizations but also with other organizations for whom it might be useful.

The approach to Best Practice analysis used in this review is based on adaptation of a template developed by Alwazae, Perjons and Johannesson [13] and shared in a presentation to the Third Information Systems International Conference, 2015. This template identifies the information considered useful in best practice work, grouped in the following categories (adapted slightly for use in reviewing a regional broadband initiative). The Summary of Results, Lessons Learned, and Best Practices sections of the review are presented through this lens. Additional detail on the original template is presented in Appendix B.

Best Practice Template Categories

- **Summary** (title, summary/short description of contents)
- **Best Practice Description** (statement of problem, solution and context)
- **Requirements for Application of Best Practice(s)** (intended effect of best practice application; what/who is needed to apply it; skills and competence required by end user; costs of best practice application; potential obstacles and/or problems; procedures to address obstacles/problems)
- **Best Practice Actors** (community of practice, need/role of best practice champion, owner of best practice, training needs for best practice implementation; degree of acceptance by domain experts)

- **Best Practice Characteristics** (usability, comprehensiveness in addressing problem/solution; significance of problem addressed; evidence that best practice solves the problem; concrete proposals to solve problem; relatedness of best practices; consistency with knowledge/vocabulary in sector/domain; appropriate level of detail; adaptability to other situations; identification of tasks to apply best practice; integration with other best practices or knowledge management
- **Best Practice Implementation** (demonstration of success, time required to introduce and implement, and to apply best practice in an organization, experiences and feedback from users; indicators for measuring quality and performance.

3.2 Conceptual Approach: Broadband as a Form of Infrastructure

As with other types of large infrastructure investments, there is "considerable uncertainty in policymaking and research communities over the appropriate frameworks and models for assessing the outcomes and impacts of large-scale broadband/Internet infrastructure investment programs" [14], let alone deriving best practices from these programs and projects. This evaluation challenge (e.g. was the investment and the project through which the investment flowed successful?) also makes it difficult to discern best practices from large-scale broadband projects. After all, characterization of structures, approaches, decisions and actions as 'best practices' requires that they be deemed to have generated success (the best solution to a problem).

Evaluating a regional broadband initiative is especially challenging because:

- **Such investments – and their impacts – have extended time frames** (the EORN initiative was nearly a decade in the making). Beyond the immediate economic impact of the network's creation, many other effects are indirect, diffuse and take time to emerge (e.g. impact on household or individual behaviours, on social economic characteristics of the community, on the growth and development of businesses, or on the competitive marketplace for internet services).
- **The distributed nature of these assets** means that stakeholder expectations and perceived benefits can be quite different depending on geographic location or a stakeholder's role in the network. Large-scale broadband/internet infrastructure networks are distributed over multiple jurisdictions, with implementation, ongoing operations, ownership and governance vested with multiple organizations.
- **In an 'open' market, it is challenging to isolate the impact on stakeholders and end users of investments** of this complexity and duration. Other changes or initiatives taking place in the same timeframe as a broadband initiative may have had significant impact on stakeholders and end users and thereby influenced the degree of success – positively or negatively – of a particular investment or project.

As noted by Hambly et al. (ibid), evaluation of the EORN project requires a multi-level approach, combining more "linear" program-focused approaches (the degree to which an investment achieved anticipated results based on certain inputs) and in-project adaptations as an initiative moves forward, based on real-time learning. The first approach is akin to input-output analysis while the second draws on learning and innovation strategies. The relative paucity of impact studies on large-scale infrastructure network investments suggested that both approaches would be necessary in EORN's case, for both evaluation and best practice identification.

One analysis of factors influencing the success of "broadband supply gaps" was a 2010 survey of eight (8) projects in rural and urban communities in Germany [15] that identified best practice examples from economic, administrative and technological perspectives. This report, undertaken by the federal Ministry of Economics and Technology in Germany, also provides detailed checklists for community broadband projects and emphasizes many of the broadband challenges facing rural municipalities that EORN was designed to address. The checklists reflect many of the approaches and strategies that the EORN project utilized – from mapping the gaps in service and using requests for information to gather information on the cost of solutions, to developing regional objectives, and formulating short and long-term strategies. Another report, consolidating case studies from across the European Union, echoed many of the same factors that were understood to be important in the Eastern Ontario initiative [16].

As a result of these considerations, this Best Practice Review focused on internal/project-specific criteria of success, examined by addressing three questions:

1. To what extent did the EORN project fulfil its input-output expectations as articulated in the funders' Contribution Agreement with EORN? (Did the investment achieve the outcomes sought?)
2. What factors do stakeholders who were part of the EORN project believe were the greatest contributors to the project's success or lack thereof? (What were their experiences and feedback?)
3. Is there evidence of in-project learning that triggered changes that then influenced outcomes? (How important was in-project learning in the project's success and to what extent is this phenomenon a best practice from an implementation perspective?)

The answers to these questions were then used to identify best practices for consideration by other groups pursuing similar projects (large-scale broadband network investments).

3.3 Methodology: A Mixed Methods Approach

The preceding questions were investigated using five different methodologies:

- **Secondary Data Review:** Literature and documentation reviewed (with emphasis on contribution agreements).
- **Project Leadership Interviews:** Consultation interviews and discussions with project and governance leadership (EORN Board of Directors and senior staff).
- **Stakeholder Interviews:** Consultation interviews with a cross-section of stakeholders representing funders, private sector partners, recipient communities and public sector policymakers) – see Appendix D.
- **Gap Analysis:** 'Distance' between expected and actual results; falling short, achieving or overachieving on anticipated results.
- **Qualitative Assessment:** Stakeholders' evaluation of the success of the EORN project and factors influencing that success (or lack thereof). Recurring themes were identified and assessed in relation to lessons learned and best practices. When multiple, disparate stakeholders identified the same factors as being responsible for project outcomes, these were given greater credence in explaining project results and deriving best practices. Some of these factors were related to overall project design including but not limited to governance, business model, project management, and operating style. Others were related to the capacity for in-project learning and adjustment.

3.4 Review of Documentation to Understand Expectations, Progress Milestones

EORN Inc. provided significant amounts of background documentation, leading back to and including its first application for funding to Build Canada, as well as the formal Contribution Agreement for upper level of government funding support, financial reports, Board reports, presentations, and results of their own internal discussions regarding 'lessons learned'. See Appendix C for a summary of the documentation reviewed.

3.5 Consultation with Project Leadership to Understand Expected Outcomes, Learning

At the outset of the preparation of this report, the consultant met with the EORN Board on two separate occasions for extended discussions, to probe their perceptions of the relative success of the project against committed outcomes, and the factors that contributed to or reduced the project's success. There was broad and detailed participation in these discussions and keen interest in seeing the final report, including the sentiments and assessments of other stakeholders. Staff and contractors participated in these discussions and were provided with other opportunities for input and feedback, including through submission of individual reflections on the project.

3.6 Key Informant Interviews Provide Stakeholder Feedback

In conjunction with EORN co-chairs and senior staff, the consultant developed a list of 111 stakeholders who could contribute to a post-project evaluation. From this list, 26 stakeholders were interviewed by telephone and face-to-face, using a standardized discussion guide included in an appendix to this report. This group represented municipal, provincial and federal governments, private and public sector partners in the ICT sector (large and small), elected officials, and members of the research community. The specific comments made by each interviewee were held in confidence and aggregated for inclusion in the report. Some individual comments, that illustrated a particular theme, were used on an unattributed basis but may be considered representative of comments made by other stakeholders. Another 15 individuals participated in other discussions (e.g. EORN Board and staff meetings). Outreach to other stakeholder groups such as First Nations communities was also pursued.

3.7 Review of Consolidated Information, Analysis, Report with EORN Representatives

Following distillation of all the aforementioned information into a report, the consultant provided EORN with a highlights presentation and a full draft report for comment and feedback. The emphasis in this review was on correcting any errors and noting any omissions. A highlights presentation was made to the EORN Board before preparation of the final report.

4 Summary of Results

4.1 Results Compared to Expected Outcomes (Contribution Agreement)

4.1.1 Household and Business Coverage Target Surpassed

The Eastern Ontario Regional Network project had as its target, to achieve 85 per cent coverage of all households and businesses in the defined region, with an up to 10Mbps/1Mbps service, with another 10 per cent able to access a 1.5Mbps service (total: 95 per cent with at least a 1.5Mbps service). The target referred to ensuring access to up to 10 Megabits per second download speed and 1 Megabit per second upload speed. **EORN met and exceeded this target, bringing high-speed internet to a geographic area that encompassed 89 per cent of the region.**

How Did EORN Assess Success in Meeting the Target? The EORN project used detailed and verified (by on-the-ground tests) mapping of the region to establish the distribution of households (and potential users) across the region, as well as current internet service levels and the proportion of the region that would have access to the 1.5 and 10Mbps service levels. The project used the hexagon mapping structure used by the Province of Ontario and Industry Canada. Municipalities were also able to correlate hexagon data with their GIS systems. Through extensive discussion with ISPs (to understand the areas they could not reach with existing equipment), the entire region was mapped in roughly 25 square kilometer hexagons, then further sub-divided into sub-hexes. This approach provided a more granular picture of areas where a) there was no service at all, b) service was defined as affordable, sustained 1.5Mbps, c) service ranged from 1.5Mbps to 7Mbps (with affordability considerations), and d) affordable 10 Mbps service was available.

How Did EORN Go Beyond Meeting the Target? Because EORN was able to achieve its household and business coverage targets within prescribed budgets and timelines, the project team was able to go back to the market late in the 'build' phase to add to the region's coverage. Additional access capacity was added into eight zones for both fixed wireless and wireline providers. This opportunity to go back after the initial builds were completed allowed EORN to fill in coverage and capacity gaps that were subsequently identified.

In addition, EORN was able to contract with four organizations to bring fibre connections to 63 business parks across the region. The business park builds had not been part of EORN's initial aspirations for improved business connectivity (they were not part of the Contribution Agreement with provincial and federal governments) because it was not clear there would be sufficient resources to execute this piece of

work. When it became clear that some portions of the project were under budget, EORN was able to return to the business park work and move forward with it.

Further, although not part of the original project, EORN is also pursuing a second strategy to extend coverage/reach of the network, which is to improve high-speed internet to municipal offices in support of e-government services. Some of the 113 municipal governments in the region did not have access to high-speed internet until the regional network was implemented.

4.1.2 Build Phase Completed, Beyond Original Expectations

Transport Network Fibre (Backhaul) in Place: The original target for the regional network was to install at least 800 kilometres of fibre across the region, connecting to other (private) network fibre at key points. However, with Bell Alliant's decision to contribute more than 5,000 kilometres of their fibre to the project (fibre in their current network), **EORN was able to put in place another 855 kilometres of new cabling in the region, and achieve a more deeply embedded high capacity regional network than originally envisaged.** Note that even without Bell's contribution, EORN would have met the expected outcome on this measure.

The Gigabit Ethernet technology deployed in the EORN project not only delivers the desired bandwidth services but also serves as a platform that can be used to cost-effectively deliver new internet-based applications such as video, Web 2.0 (higher user interactivity and collaboration), and electronic commerce (online financial transactions).

Figure 2 - Backhaul Fibre Network in Eastern Ontario (Conceptual illustration)

Business Park Connections across the Region Represent an Unanticipated Deliverable: Because the implementation of the transport network fibre benefited from Bell Alliant's contributed assets (5,500 kilometres of fibre), the EORN project was able to redirect some of its budget to extend fibre to organizations or sites where there were prospects for new or expanded business activity. Business parks were a class of physical asset that the EORN team had considered connecting as part of the project but the team did not expect to have sufficient financial resources to execute this component. The EORN team issued a separate RFP for this work and received multiple submissions; in the end, four public and private organizations were selected to implement this portion of the plan. Their work resulted in 63 business parks across the region being connected to high-speed internet.

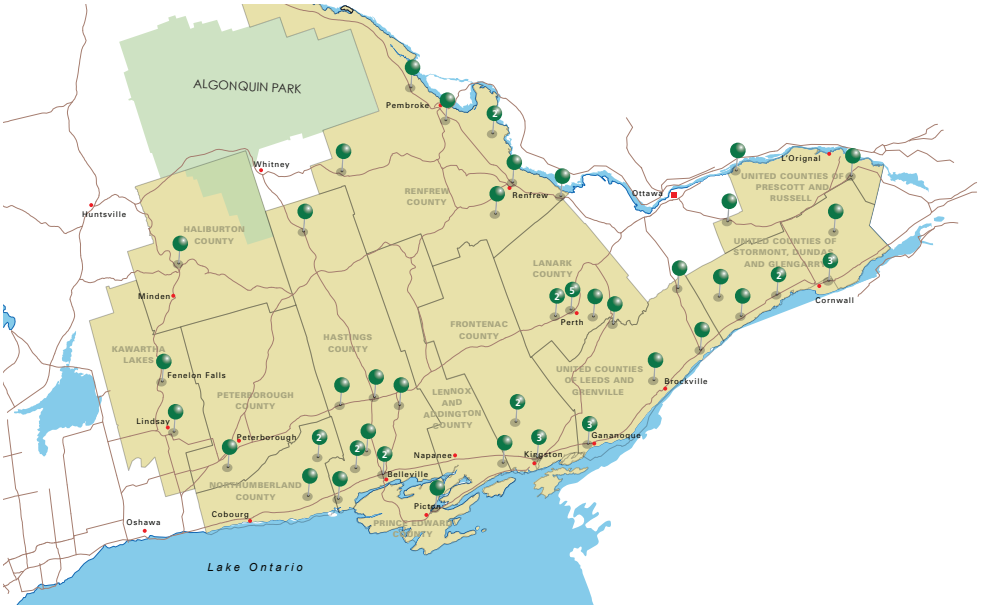


Figure 3 - Map showing locations of Business Parks connected through the EORN Project (numbers indicate if there is more than one business area connected)

In stakeholder interviews, the inclusion of business parks was not commented on extensively but the majority of those referring to it were positive about its inclusion. There was some comment however, that in this situation, a filter should have been more rigorously applied to ensure that EORN's resources went to business parks with the best near-term potential for generating a return on that public investment.

Access-Last Mile Target Reached: The central objective of the EORN project was to increase access to high-speed internet/ broadband across the region, focusing particularly on households and businesses. Putting a network in place across the region would not make any difference to regional participation in the digital economy unless an internet service provider made the connection between the network and the end user, and offered that connection (typically referred to as the last mile) to end users at a reasonable price. Through additional RFPs, achieved through multiple rounds of sub-regional RFPs, EORN was able to keep pushing out last mile access in the most cost-effective manner.

4.1.3 Technology Goals Met

Backhaul Target Exceeded: The initial design expected to have 60 PoPs throughout the region, and Bell/Bell Aliant's completed design resulted in over 160 PoPs. The technology objective of the EORN project was a regional network that could scale to at least 10 Gigabits (this is a measure of the 'size of the pipe' not the capacity of any individual user). This target was set with careful use of public funds in mind (e.g. not overbuilding capacity that wouldn't be used for years. EORN's initial estimate was that within 15 years (by 2024), required network capacity would be 7.5 Gigabits. EORN's appreciation of the rapid growth in demand for broadband services has been borne out: by 2016 (just two years after the network was activated region-wide), backhaul capacity utilization was well above projected levels. Nonetheless, EORN met and exceeded its backhaul target since the design capability allows for scaling to over 100G capable.

In issuing RFPs for the network 'build' phase, EORN fulfilled the requirement of its Contribution Agreement to be technology neutral, encouraging proponents to recommend technologies that would best achieve the prescribed project objectives in the geographic areas or zones identified. In addition to encouraging submissions from multiple proponents with different technologies (particularly in a region with many small ISPs), this approach also reduced prospects for obsolete or inadequate technology within a few years. (Note that with the rapid development of information and communications technologies, there cannot be a guarantee that any technology choice will be 'leading edge' for long. However, known technologies with scalability can provide some predictability of extended usability for at least a few years into the future.)

> *"Electronics do not have long life cycles (i.e. less than 10 years). However, a short life cycle does not mean that the equipment is not capable of supporting the required services. In fact, equipment can outlive its life cycle significantly if the service being delivered adequately meets the demand."*
>
> *EORN submission to Building Canada Fund, March 2010*

The proposal of the backhaul proponent (Bell Alliant), was based on known technology (multi-strand fibre and Alcatel 7750 access trunk switching equipment) as well as Multi-Protocol Label Switching (MPLS) based service to carry and direct traffic from one network node to the next. These technologies provided the opportunity to start with 10 Gigabits and scale to 100 Gigabits in future. This spare capacity is good insurance for the apparently insatiable demand for bandwidth. For instance, the CRTC's Communications Monitoring Report for 2016 found that broadband internet usage jumped 40 per cent from 2014 to 2015, while mobile data usage saw an even larger 44-per-cent spike. There is little reason to think this upward trend will end. Eastern Ontario's experience parallels the national experience of exponential increases in capacity demand. Network designs that predated the deployment of services such as Netflix, ended up – in some areas – being rapidly oversubscribed, and continue to be so despite ongoing Network upgrades driven by EORN's service level agreements.

4.1.4 Speed Targets Achieved with Scaling Opportunities Built in

Establishing and meeting speed targets (typically measured in Megabits per second down and up – download and upload) required judgment of:

a) what constitutes high-speed internet in a contemporary era?
b) what might funders be willing to support?
c) what are the anticipated near-term and long-term needs for users across the region?
d) what are the realistic technology options to deliver high-speed internet?
e) what might the costs be to implement networks based on speed aspirations and available technology?

In taking forward its proposal to funders, the EOWC provided multiple project options, each with different service targets and different total costs (e.g. $175 million, $200 million and $250 million). The one most palatable to funders was the target of 10Mbps with an associated $175 million cost.

At the time, the standard definition of "high-speed" internet was 1.5 Mbps not just within the Canadian provincial and federal governments but in Europe as well. Recognizing that the minimum speed expected by consumers would rise steadily in the years ahead, the EOWC proposal also incorporated a significant commitment to preparing "now" for anticipated surges in broadband use – at any speed.

The Eastern Ontario initiative strove to achieve "'up to 10 Mbps" speeds, recognizing that a) this target was pushing the limits of what available technology (such as fixed wireless radios) could provide at that time, and b) subscribers might not require – at least initially – the full 10 Mbps and might choose a slightly slower speed at less cost. Internet service providers were able to offer varied packages to meet subscribers' needs. Several years into full operation of the network, they are beginning to offer faster access – up to 25 Mbps and higher in some areas.

In December 2016, the CRTC also raised the bar by declaring broadband internet a "basic telecommunications service" and set new targets for internet service providers to offer customers in all parts of the country download speeds of at least 50 Mbps and upload speeds of at least 10 Mbps, as well as offering the option of unlimited data.

4.1.5 Points of Presence Target Surpassed

The original plan for the high-speed internet network to be introduced through the EORN project envisaged 60 'points of presence' (POPs) or nodes across the region. A POP is an interface point where multiple communications entities interconnect and exchange information or transfer traffic between users. In its submission, Bell Alliant proposed to (and did) bring 160 POPs (266 per cent of the POPs requested), allowing the project to push fibre much deeper into the region. A denser distribution of POPs also made ISP service expansion more cost-effective.

4.2 Financial Targets Met and Exceeded

4.2.1 Capital Raise Targets Surpassed

The initial approved budget for the EORN initiative was $160 million, with the provincial and federal governments each contributing $55 million, building on the initial $10 million pledged by the 13 members of the Eastern Ontario Wardens' Caucus. The private sector was expected to contribute another $55 million, matching the upper levels of government. The total approved budget for the project would therefore have been $175 million. However, EORN exceeded the capital raise target significantly, attracting $58 million in private capital and another $93 million in in-kind assets now accessible through the project. As a result, EORN achieved the targeted funding from all three levels of government, attracted more private capital than had been anticipated, and was able to incorporate additional in-kind private sector assets into the network.

4.2.2 Project Under Budget for Build Phase

On the expenditure front, the EORN initiative was expected to fully expend the approved budget to achieve the access and pricing targets described earlier. In fact, efficiencies in the early phases of the project (due to Bell Alliant bringing in additional fibre capacity), as well as access providers (predominately Xplornet Inc) delivering under budget, opened up an opportunity to further invest in additional access coverage and capacity in selected areas throughout the region. In addition, the project was able to give consideration to a component of the project that was not part of the original plan and for which financial resources had not been available: connecting 63 business parks across the region to the network. In this way, EORN Inc. could further extend the reach into the business sectors of communities across the region. EORN Inc. was able to address another desired aspect of connectivity: connecting municipal offices. This project is under way and is expected to be completed in 2017. At its conclusion, the budget for entire regional network project was fully expended.

Throughout the project, financial management has been thoroughly scrutinized, with EORN going through an annual audit that is reported to both the EORN and EOWC boards of Directors and four independent audits, emerging with full compliance in all cases. In one on one interviews, the quality of financial management was cited as very well-handled by multiple stakeholders with direct interaction with EORN on financial matters.

4.3 Return on Investment Metrics Promising

For the Eastern Ontario regional broadband network project, return on investment was defined in three ways:

- For all stakeholders, return on investment was assessed based on *each stakeholder's definition of 'value for money'* and their assessment of the project's performance against that definition. This assessment is discussed in greater detail in a following section but as a rule, stakeholders saw the project as being a cost-effective allocation of funds that preserved the opportunity for the region's residents, businesses and other organizations to keep pace in a rapidly changing world.

- For municipal partners, short-term Return-on-Investment was defined as *leverage value of municipal investment* (for every dollar of municipal investment how much funding was leveraged from upper levels of government and the private sector?) The original target, based on a $175 million total with $10 million in municipal contribution was 16:1. Using leverage value allowed municipalities to assess the degree to which they were able to execute a project of much larger scale and impact than municipalities could have afforded on their own. Given that total cash contributions to the project exceeded $175 million, the Eastern Ontario project can be said to have exceeded its leverage value target.

- For all stakeholders, including funders, the long-term return on investment in Eastern Ontario's broadband project is expected to be seen in *improved or increased economic performance, support and/or enhancement of communities (social cohesion), and improved access to service* with corresponding positive impacts on population health, education, income and employment levels and other similar characteristics of healthy communities. Although it is too early to assess the project's success on this measure, there are early anecdotal indications of positive economic impact from individual businesses and municipalities seeing an upturn in growth and development. It is not clear how much of this impact is due to the availability of broadband but observers are noting a correlation in timing (improvements began just after broadband availability improved). At some point in the future, there would be merit in a study on this phenomenon.

4.4 Summary of Actual Results Compared to Expected Outcomes

The following table summarizes the actual results of the Eastern Ontario regional broadband initiative as compared to the outcomes expected of the project at its inception. In virtually all cases, the EORN project met or exceeded the established targets.

Expected Outcome	Actual Results
Coverage target: 85 per cent of households and businesses @ up to 10Mbps	89 per cent
Transport Network Target: 800 kms of fibre	5,855 kms (due to Bell decision to link 5,000 km into network)
No business park connection target	63 business parks connected
60 PoPs identified based on initial design	More than 160 PoPs
Speed Targets: Up to 10 Mbps download; 1 Mbps upload	10/1 Mbps available at target speeds
Access/last mile Target: ISPs in EORN access zones participating in network	Target met
Increased competition by ISPs	Increased number of ISP competitors in some EORN zones
Comparable rural-urban pricing for end users	Target met
Capital Raise Target: $160M (beyond EOWC commitment of $10M)	Exceeded by $5M
Project executed within budget for network build	Under budget while exceeding deliverables for budgeted work
Positive ROI on municipal investment	Exceeded: 16:1
Long-term economic development	Positive anecdotal reports; research needed in next 3-5 years to validate adoption

4.5 Beyond the Build: Success of the EORN Project on Other Measures

Beyond the construction and implementation of the regional broadband network, the Eastern Ontario project included other desired outcomes, associated with the network's market impact. As with the formal expectations articulated in the Contribution Agreement, the Eastern Ontario project achieved much on these broader outcomes.

4.5.1 Expectations of Increased Competition

One of the expectations of the EORN project was that pricing for end users in rural areas would be comparable to pricing in urban areas where household density makes it possible to establish a business case for provision high-speed internet service. The EORN project anticipated that the provision of public funds to address capital costs of putting the network in place would help to strengthen the business case for private sector firms and therefore increase the number of competitors at the local level, particularly Internet Service Providers (ISPs). Rural-urban price comparisons are challenging, especially over a period of years, because the ICT environment is a dynamic one; there are often consolidations/mergers in this sector, and as ISPs introduce new services and associated packages, 'apples and apples' comparisons become difficult.

The EORN initiative did result in many communities (which previously had one ISP option or none at all) having more options from which to choose. There was some consolidation among ISPs early in the project timeframe but there is no reason to think that these developments were the result of the EORN project. Through the access portion of the project, the EORN team provided opportunities for multiple ISPs to bid on access contracts; in areas where there was an existing local telephone company that met the internet service objectives, EORN did not fund an over-build.

4.5.2 Bandwidth Expectations and Congestion

At the time the EORN project was conceived, the international definition of 'high-speed' internet was a minimum of 1.5Mbps (e.g. in the European Union). EORN sought to deliver 10Mbps and took that requirement into negotiations with service providers, including it in technology and tower tests. Given the economic diversity and internet needs in the region, EORN did require its service providers to provide a range of package sizes that would provide more choice flexibility for the region's end users. As a result, providers were able to offer packages providing "up to 10Mbps".

EORN did not incur the expense of developing a firm estimate of the number of new end users that might increase their internet usage if a new regional network was in place. Part of the reason for this was based on the notion that broadband is now an essential infrastructure service so would be needed as a matter of course. Secondly, there was established literature indicating that the addition of broadband in a rural community imparts a positive social and economic impact in rural areas (roughly 0.2 to 0.3 per cent increase in GDP).

4.5.3 Broadband Access Metrics

EORN has exceeded its original target for percentage of homes and businesses with access via terrestrial solutions – from 85 per cent to 89 per cent. In addition, two new satellites launched by XCI in 2011-2012 are providing access to up to 10Mb satellite service for more than 95 per cent of all the region's residents.

The emphasis on lowering wholesale prices for ISPs has erased much of the ISP pricing disadvantage in comparison to the Greater Toronto Area and southwestern Ontario. EORN has also negotiated a long-term commitment to satellite costs that are five per cent lower in Eastern Ontario than anywhere else in Canada. These strategies have significantly improved the business case for ISPs, encouraging them to offer last mile access to rural homes and businesses.

4.5.4 Broadband Uptake

Although there was no specific target set for uptake of the newly-available high-speed internet service, there is an expectation that over time, a significant share of the 200,000 households and businesses without service will become high-speed broadband service subscribers. The first EORN zone to go live (Embrun in 2012) exceeded ISP (and EORN) expectations with congestion beginning to affect service in that zone only a few months after the go-live date. As a result, planning for service upgrades (for example, more radios on towers) that were expected to be several years away were needed for rural areas almost immediately. EORN's short-term uptake impact on communities is measurable now that all zones are live.

4.5.5 Economic Impact of Network Build

The economic impact of the Eastern Ontario regional broadband project may be assessed in three ways:

- **The short-term impact from expenditure of more than $175 million on the construction/ build phase and the follow-on adoption phase.** Although not all of the project's budget would have been spent on goods and services in the region, a conservative infrastructure construction-phase input-output multiplier of 1.25 (taking leakage into account) would suggest that the impact of the $175 million budget would have been at least $212 million, with an associated positive impact on local employment. While public funders are interested in this form of economic impact, they are typically more interested in the economic impact of broadband as it enters the operating phase.

> *"A year ago, I started this company – now we have 11 full-time employees and we're hiring more every three months. We're in Picton and we couldn't do this without Broadband."*
>
> *Craig Schoen,*
> *President and Founder,*
> *Dealer Plus Inc. Picton, Ontario*

- **The operating-phase impact of the introduction of broadband on expenditures by residents, businesses and other organizations** as they capitalize on broadband to expand their businesses, hire more people, see their incomes increase due to higher quality jobs and spend more or their money in the local economy on everything from new homes, consumer goods, entertainment or other purchases. As indicated in an earlier section of this report, it is too early to assess the project's economic impact on this basis [17]. However, macroeconomic modelling carried out through the Monieson Centre at the School of Business at Queen's University suggests that there will be a positive economic impact in the rural areas of the region. This study found that the long-term impact to a rural regional economy of greater broadband access is likely to be an additional 0.2 to 0.3 per cent on the region's Gross Domestic Product along with job retention and creation in the ICT sector and beyond. [18] Broadband projects were not found to have the same impact in urban areas that are already well served by broadband.

> *"From the Internet to biotech and even shale gas, the US State has been the key driver of innovation-led growth– willing to invest in the most uncertain phase of the innovation cycle and let business hop on for the easier ride down the way. … **A key part of this lesson should be to learn how to organize, direct and evaluate State investments, so that they can be strategic, flexible and mission-oriented**…" (emphasis added)*
>
> *Mariana Mazzucato in The Entrepreneurial State: Debunking Public vs Private Sector Myths, 2015*

- **Impact on individual businesses.** While the long-term impact cannot be assessed with any degree of accuracy yet, there is anecdotal evidence of impact on individual businesses. The impact of the Eastern Ontario regional broadband network is being cited by some businesses as an accelerator for growth and development of individual businesses. Several stakeholders were skeptical about the extent to which broadband would stimulate business development in some areas; a study of this phenomenon in the next several years could validate or disprove the ongoing economic impact hypothesis.

  Over the longer term, the region might expect to see economic growth due to the availability of broadband in its business parks. This is a service that is assumed to be present in highly-urbanized communities and it almost always is. According to Eric Duncan, Warden of the United Counties of Stormont, Dundas and Glengarry, "Expanding high-capacity, high-speed internet fibre to these business parks will help our communities to attract and retain local businesses. It is a real boon for economic development."

4.5.6 Reputational Value Impacts

Both directly and by association, stakeholders are finding that participation in the EORN project has been a positive experience – one that they identify with publicly.

- Internet Service Providers (ISPs) have been extremely active in using access to the network in their marketing and promotion, showcasing the pricing they offer as a result of the new backbone.
- EORN is attracting expressions of interest in partnerships from developers of web-based technologies and organizations rolling out online services in such sectors as health care and education.
- Because EORN has met or exceeded its targets, upper levels of government view EORN as a success and see it as a model for other regions. This conclusion has been confirmed in the stakeholder interviews (see the subsequent section).
- The EORN team regularly receives invitations to present at international conferences (e.g. Dallas, Texas, London, England and Amsterdam) and to offer advice to other regional groups on development of their own broadband initiatives. In 2013, the EORN project earned an honourable mention in the international Broadband Infovision Awards.

> *"We are very excited and thankful for the efforts by the County of Renfrew and Eastern Ontario Regional Network to finally bring broadband service to Whitewater Region. This will allow us to move forward with new business development, reliable online booking and communications with our guests and enable us to meet our guest expectations for high bandwidth communications during their stay with us."*
>
> *Margaret Maloney, Owner RiverRun Rafting and Wilderness Resort, Renfrew County*

4.6 Results Against Stakeholders' Expectations

4.6.1 Approach and Summary of Results

As a result of the in-depth evaluation discussions with the EORN Board, the consultant developed a discussion guide (see Appendix E) for use with a target list of stakeholders including federal and provincial funders, private sector partners, municipal representatives and key staff. The initial target list numbered 35 individuals, of which 26 were available for/agreed to interviews (see Appendix D). The following results summarize the feedback and perspectives of those stakeholders.

Overall, stakeholders see the EORN project has having been quite successful and many were able to identify elements of the project that had most contributed to its success. Stakeholders were also able to translate factors contributing to success into potential best practices for regional broadband projects but also had a few cautionary notes on the ease with which the EORN model might work in the future or in other areas of ICT. In general, stakeholders' assessments and advice focused on:

- The need to recognize, think through and plan for the differences between broadband and other forms of infrastructure
- The importance of all aspects of a regional project – from champions and pre-launch activity to careful project management
- The complexity of a regional broadband project, typically involving both private and public sectors, stakeholders and partners of different sizes and capacities, and the expectations of end users in a rapidly evolving digital world.

4.6.2 Ratings for the Overall Success of the EORN Project

When invited to provide a one to ten score to represent the success (or lack thereof) of the EORN project in meeting the original expectations of the project (a summary of key points having been provided in advance), all interviewees gave EORN a rating in the 7 to 10 range. Some interviewees specified a ratings range (8 to 9 was very common) and some applied different ratings to different parts of the initiative. The average rating for the entire interview group was 8.75 (which includes two interviewees who did not feel comfortable in providing a rating).

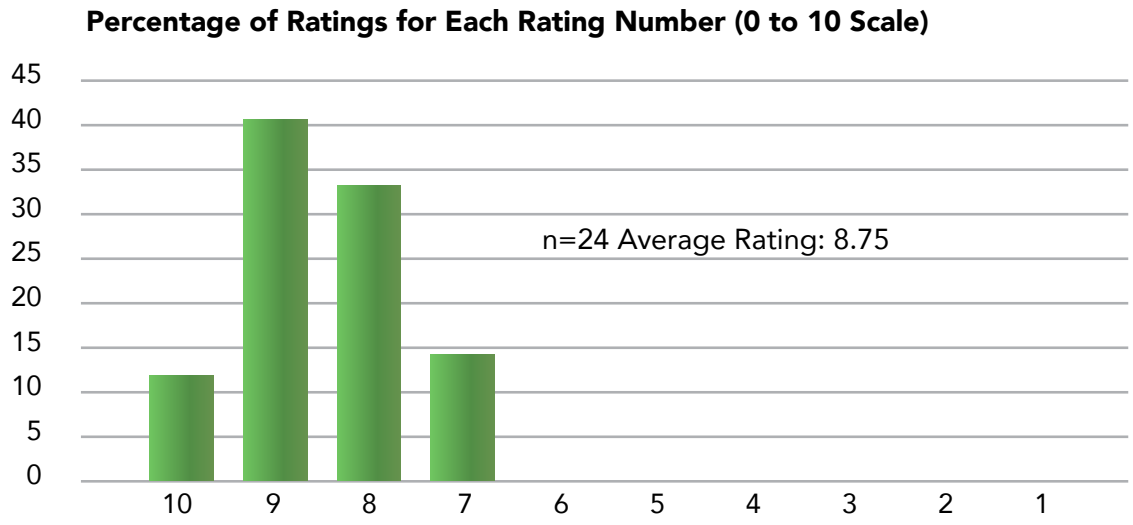


Figure 4 - Distribution of Overall Success Scores for the EORN Project (based on 1 to 10 scale)

4.6.3 Most and Least Successful Aspects of the Project

Most Successful:

Timing: Several interview subjects noted that part of EORN's success can be attributed to 'getting the timing right'. They observed that as the EOWC was bringing forward its plans to create a regional broadband network, high-speed internet was increasingly being seen as an essential service without which residents and places of employment would not be able to participate in economic and civic life. Secondly, stakeholders noted that at that same time, governments and other public organizations were seen as moving to an online world for provision of information and access to public services – with the same concern about the degree to which all citizens could access information/services via the internet.

Right Business Model: Many stakeholders commented that the specific business model used in the EORN project (serve as an aggregator and catalyst with long-term objective of private operation of the network) was the right choice for this project. (Following sections elaborate on this point in more detail).

Great People: Unsolicited, many stakeholders commented on the quality and professionalism of the 'EORN team'; their definition of the team typically included those municipal employees who took the lead on advocacy as well as the paid staff and contractors to EORN Inc. Often, stakeholders noted that the right people had been recruited for their particular assignments, handled their assignments extremely well, and maintained an attitude of openness and collegiality as the project unfolded. The descriptive terms/phrases: 'professional', 'passionate', and 'focused on the project purpose' were used frequently.

In many cases, stakeholders cited just first names when commenting on performance, indicating that they were on a first-name basis with staff and contractors (due to frequent communications), and found them all to be extremely good to work with.

Strong Administrative and Project Management Capacity: Although it would not be obvious to most observers, EORN Inc. leveraged its relationship with the EOWC to establish solid administrative processes for the broadband initiative. The full scope of finance services was provided to EORN Inc. by the County of Hastings, a long established two-tier municipal government in the region and an EOWC member.

Procurement services, considered to be best-in-class for municipal governments, were provided to EORN Inc. by the County of Peterborough (also in the region and an EOWC member). These services were backstopped by strong (contracted) legal services with experience in contract negotiations in the information technology sector.

EORN's administrative strengths were in evidence as the organization went through annual internal audits, as well as four independent audits, with 100 per cent compliance. In addition, EORN Inc. maintained comprehensive documentation for in-project changes and interpretations of Contribution Agreement language that were negotiated with provincial and federal funders. This documentation was extremely important to keep the initiative moving forward and avoid changes in interpretation, given frequent staffing changes in funder organizations.

Least Successful:

Stakeholders interviewed in the course of this review had a difficult time suggesting aspects of the project that would be considered 'least successful'. However, a few stakeholders said they were uncertain if a different business model that retained EORN Inc. as the network operator would have had advantages, potentially in maintaining the network over time and providing oversight to ensure that ISPs continued to offer comparable pricing to subscribers. The respondents did note however the potential cost of maintaining the network as technologies evolve and the fact that EORN Inc. would be providing oversight on private sector commitments until 2024.

There was some suggestion that a regionally-designed network can pose challenges for local operators and owners of existing ICT-related assets as the two levels look for ways to link these assets into a regional system, and avoid putting the regional network and local systems in direct competition with one another. There were several mentions of potential partnerships related to existing infrastructure that could have been incorporated into the regional network (but weren't) and that those partnership opportunities may still exist in the years ahead. EORN was encouraged to keep the door to partnerships open across the region.

There was also comment that the regional effort to influence pricing to subscribers posed administrative and marketing challenges to private firms that operate in jurisdictions beyond Eastern Ontario.

There was also a sense among some stakeholders that the early stages of the 'build' phase were not handled as sure-footedly as later stages (access zones), creating an impression that the backbone construction award was a 'done deal'. However, these stakeholders noted that EORN Inc. responded to the misunderstanding quickly and addressed private partner concerns quickly.

Overall, these stakeholders offering the preceding comments still consider the Eastern Ontario project to have been a major success.

4.7 Stakeholder Comment on Specific Aspects of Project

Stakeholders were invited to comment on whether EORN had 'got it right' on specific aspects of the project (reported on in this section and referenced in Appendix E). Overwhelmingly, the sentiment was that yes, the project had 'gotten it right':

Q: Was it the right or wrong choice to scope the project regionally?

A: Right choice.

There was virtually unanimous support for scoping a broadband project at a larger geographic scale than just one or a handful of communities. In this sense, EORN 'got it right'. The reasons for preferring a regional scale project varied by stakeholder but included:

- Larger projects get more attention from governments and from the private sector, particularly IT companies. Funders are interested in impact, which is perceived to be greater from larger-scale projects. In other words, the project needs to be large enough to 'move the needle' in terms of broadband accessibility or improved service levels.
- The private sector is interested in cost-effective implementation of projects; this is seen to be more likely with larger projects than smaller ones. In addition, both government and the private sector are more likely to see themselves as having a project partner that is able to provide roll-out support with potential users and Internet Service Providers.
- There was a view that, in EORN's case, the scale of the project was appropriate for the technology available for deployment and a good match for the proposed public-private partnership model.
- There was also the recognition that – especially in rural areas and small towns – broadband does not align with municipal boundaries so regional projects provide the opportunity to establish common interest across those boundaries rather than having communities viewing one another as competitors for investment resources.
- Larger projects are seen as offering flexibility within the project to adjust schedules and budgets if there are holdups, surprises or unforeseen opportunities. Budgets that are developed with 'average costs per zone' may be reallocated internally by zone if one comes in under budget but another one needs some additional financial support beyond that contemplated. With a regional project, project managers can still respond to variability in on-the-ground circumstances and maintain their commitment to deliver access and affordable pricing across the participating communities.

Many interview subjects noted that EORN had capitalized on regional project scale to achieve all of these benefits. There was some indication that regional scale may have worked against EORN slightly during the 'build' phase (discussed in another section of this Review) but sensitivity and responsiveness to these issues mitigated detrimental impact.

Q: How important was the ongoing support of an established organization (EOWC)?

A: Vital.

There was virtually unanimous endorsement of the importance of ongoing support from an established organization (in this case the Eastern Ontario Wardens' Caucus) and a cautionary note that a major broadband project could easily flounder without this kind of backing. Interview subjects provided the following rationale for the need for high-profile support:

- **Securing political support from all levels of government.** This was seen by interview subjects as critical to a broadband project getting off the ground and maintaining its momentum. Political support is viewed as an essential prelude to securing funding. Although the EOWC's initial financial commitment of $10 million represented less than 10 per cent of the proposed project budget, it signalled to other stakeholders that the municipalities in the region considered broadband to be of considerable importance, especially given the other competing demands for municipal infrastructure investment.

- **Organizational stability.** Before either government or the private sector agrees to participate in any project, they look to the robustness of the organization leading the charge. Working with an established organization suggests organizational stability, increasing the prospects that proponents will have the staying power to carry multi-year projects through to fruition. In EORN's case, the timeframe from initial conception to completion of the build and access phases was roughly a decade. Because the EOWC was an established organization, their leadership was viewed as a sign that a coalition of more than 110 municipalities would hold together to see the project through. The significant financial and reputational commitments being made by all parties argues for a strong organizational anchor for the project.

- **Appropriate direct role in project execution.** On EORN's behalf, the established organization (in this case, the EOWC) was viewed by interview subjects as having contributed mightily – and very specifically – to the project's ultimate results, particularly in the project's formative stages. Through the efforts of champions such as the two co-chairs (Messrs. Jim Pine and Gary King) as well as other municipal government employees (e.g. Mmes. Lisa Severson and Sheridan Graham), EOWC members and particular staff members contributed

relationship capital, knowledge of both municipal government operations and the expectations of upper levels of government, an understanding of the importance of engaging First Nations, a willingness to lead with their peers across the region, and engage with media to bring profile to the region's aspirations. In EORN's case, one EOWC member (the County of Peterborough) was viewed as having first-rate procurement policies and practices that EORN could deploy; the County of Hastings had ample experience serving as the financial administrator for EOWC activities and projects, and provided this support to EORN.

Interview subjects were clear in distinguishing between EOWC support for the project and taking responsibility for project management. Multiple stakeholders noted that the EOWC and EORN had resisted the temptation to have the EOWC lead the implementation of the project. In their view, creating a separate organization was arguably one of the best – and most important – decisions the EOWC made in relation to EORN (see below for additional commentary on this point).

Q: Should Proponents Create a Separate Organization to Manage a Project? (EORN Inc.)

A: Yes. Very Wise.

Based on the EORN experience, there was virtual unanimity that creating a separate organization to develop and manage the region's broadband project is a wise strategy. In Eastern Ontario, that organization was EORN Inc., a privately-held corporation of the Eastern Ontario Wardens' Caucus. Created by the EOWC in 2010, EORN Inc. has its own board of directors, with representation from the EOWC, participating members of the Eastern Ontario Mayors' Caucus, and the private sector. The Board also incorporated representation from First Nations. The rationale for creating a separate, dedicated organization for the project was based on:

- **Ability to Focus:** In the view of interview subjects, creating a separate broadband-focused organization ensured that the project would get the deserved undivided attention; with the day-to-day responsibilities of managing municipalities or other organizations, elected officials and their staffs simply could not have given focused attention to a major broadband initiative. EORN Inc. was able to access significant political capital through the EOWC, especially in the formative stages of the project, but none of the individuals undertaking these advocacy assignments were considered to be in a position to take on full responsibility for day-to-day management.

- **Buffer between Project Management and Politics:** As a separate organization, EORN Inc. was viewed as a very important buffer between elected officials and the management/business needs of a major project. The buffer responsibility was balanced against the need to ensure accountability to the 'parent' organization (EOWC). Accountability measures included regular updates from EORN to both the EORN Board (which has direct EOWC representation) and to the EOWC Board (which meets every second month; the EOWC CAOs meet on alternating months between EOWC meetings). In addition, EORN brought all contracts to the EOWC for review, prior to signing.

- **Responsiveness to In-Project Changes:** In addition to appreciating the organization's focus on achieving the prescribed outcomes, stakeholders (particularly private sector partners) also appreciated the organization's ability to respond to changing circumstances as the project unfolded, respecting what each enterprise could bring to the table, and being active players in devising solutions. With EORN, this responsiveness and collaborative spirit appeared to external stakeholders to be a mindset rather than part of a job description. Some stakeholders sensed a connection between the mindset and the EOWC's original motivation to effect positive change in the region rather than just complete a project.

- **'Buttoned-down' Project Administration:** Multiple stakeholders specifically mentioned EORN Inc.'s strong negotiating capabilities, their high-quality procurement processes, and buttoned-down project administration (from knowledgeable technical/engineering team members and project management capabilities to claims submissions and cash flow planning/ financial management).

- **Unprompted Praise for 'Top-Notch' Staff:** Although the discussion guide did not ask about staff and contractors associated with the EORN project, the quality of the people working in or with EORN Inc. was cited unprompted by the majority of interview subjects. (There were no negative comments.) They described the EORN organization as extremely professional, 'top-notch' with really good people in each aspect of the assignment: "they had the right people in the right jobs". Stakeholders mentioned that they knew who to talk to for each type of interaction and were able to work with those individuals directly on a case-by-case basis to resolve any issues quickly.

Q: Self-Management of Implementation Rather than Contracting Out?

A: It Worked for EORN.

While few stakeholders interviewed said they would always recommend creating and staffing a specific organization to implement a regional broadband project, rather than contracting out that assignment to a specialized project management firm, most believe that self-management was the right choice for the EORN project. The main reasons for this view were:

- A belief that having a team composed of individuals with a deep commitment to the outcomes of the project (as opposed to fulfilment of a particular contract) would lead to more creativity and willingness to look for new or different ways to get things done.
- The observation that the EORN team had been well-assembled with high-calibre people, who were credible in the eyes of funders and other stakeholders.

Q: Using Market Failure as a Guiding Principle in Design and Negotiations?

A: Quite Well Done.

For a region like Eastern Ontario, the urgency behind investment in broadband infrastructure was based on defining the jurisdiction as subject to 'market failure', a situation in which the conditions necessary for the normal workings of a market (in this case, for high-speed internet services) are absent. In these situations, there is no business case for private investment in these services at a price that consumers might be prepared to pay.

> *"Rather than analysing the State's active role through its correction of 'market failures'…, it is necessary to build a theory of the State's role in shaping and creating markets…"*
>
> *Mariana Mazzucato*
> *In The Entrepreneurial State: Debunking Public vs Private Sector Myths, 2015*

In cases where market failure can be demonstrated, governments may intervene in the market to reduce costs in some way, improving the private sector business case and making the service more cost-effective. While government intervention to address market failure may be justified in the name of social equity among citizens, it is not without its detractors. In EORN's case, most stakeholders acknowledged that market

failure was present in Eastern Ontario for high-speed internet services. However, some mentioned alternative descriptions of the situation, including a desire to find alternative language (e.g. 'accelerating availability of service') or the wisdom of acknowledging the skewing effects that public investment can have on the (private) competitive marketplace. Some stakeholders noted that even if a particular region has relatively few private sector firms in a market, intervention in that market will have a ripple effect outside the jurisdiction as firms consider how their packages and pricing in one market now compare to what they offer in another. In addition, small firms that have been serving an area overlooked by larger firms may now face competition from those firms with public financial incentives as a stimulant.

> *"The conceptual design was brilliant… strong partnership, the project team had outstanding people… all of them! They were absolutely instrumental in the project's success… constantly adapting"*
>
> *Comment from Funder*

For EORN Inc., managing this terrain was challenging. Private sector organizations were already active in some parts of the region but broadband coverage was far from complete. Putting a network in place to serve the region required construction of a backbone that would connect with existing services within or on the edges of the region. The approach that EORN Inc. took to balancing the desire to address market failure without making inappropriate use of public funds was to:

- Break the project into two main phases for contracting purposes. The first was to issue a Request for Proposal to build the backbone into which access providers would connect in a fair and open way. The second was to define seven 'access zones' and issue Requests for Proposal for each of those zones. In that way, ISPs could compete in whichever zone(s) they wished. EORN Inc. did not assume that there would be only one proponent selected in each access zone.
- Avoid intrusions in areas with small legacy telephone companies (offering landline telephone services) that might or might not be expanding into provision of internet services.
- Negotiating an open access provision to the network backbone that would ensure that service providers would be guaranteed the ability to connect to the network at competitive rates.
- Deploying most of the public funds toward the creation of the backbone including a dramatic increase in the number of Points of Presence, thereby reducing the capital costs for service providers, and driving availability of connection points deeper into the region.

> *"The EORN team was a delight to work with… I feel honoured to have touched this project."*
>
> *Public Sector Stakeholder*

Q: Bringing in People with Technology/Technical Knowledge While Remaining Technology Neutral?

A: Yes. Well Done.

Generally, stakeholders were pleased with, and respectful of, the technical capability within EORN. Some stakeholders reported that despite some initial reservations about whether technical staff/engineering contractors retained by EORN could be unbiased in their review of technologies proposed for the Eastern Ontario network (given their career paths), they confirmed that EORN did bring on very capable people who were able to provide strong and unbiased technical support to the organization. This question prompted unsolicited comments about other members of the EORN team.

Many stakeholders commented on the quality and professionalism of the entire EORN 'team'. For external stakeholders, the definition of the team typically included not just the paid staff, the number of which was relatively small, but also:

- Municipal employees who took the lead on early project development and advocating for resources to execute the project
- Municipal employees who supported EORN Inc. by providing procurement and financial services
- Contractors to EORN Inc. providing technical and engineering, legal, communications and marketing services, and
- Board of Directors, drawn from municipal partners and the technology sector.

From an internal perspective, the EORN 'team' was comprised of administrators and a CEO, engineers, finance and procurement specialists, and project managers, each responsible for particular functions within the organization.

External Stakeholders: Virtually all external stakeholders interviewed noted that 'the right people' had been recruited for their particular assignments, handled their assignments extremely well, and maintained an attitude of openness and collegiality as the project unfolded. Multiple stakeholders – in both private and public sector organizations – mentioned the EORN staff's accessibility (ability to contact quickly and easily), willingness to problem-solve and be flexible in order to achieve project goals, and being fundamentally committed to the project's success.

The closeness of the working relationships established between external stakeholders and members of the EORN team was underscored by the significant number of first name references to team members (e.g. "I have great respect for Jim", "David is very sharp", "Lisa did a terrific job", "Laura knew her stuff", "Claudio was on top of his work").

Q: Choosing to Be a Catalyst Rather than Owning, Managing the Network Long Term?

A: Yes. Good Choice.

There was virtually unanimous agreement among stakeholders interviewed that EORN's choice of role and business model was the right choice for this project. Reasons given included: a) concern that running an ICT enterprise was not municipal government's strength or mandate so they might not be able to execute and manage over the long term; b) closeness to government might skew decision-making away from good business and financial decisions; c) a publicly-owned entity managing a network could lead to conflicts of interest; d) philosophically, some stakeholders see ICT as being a very competitive, rapidly changing arena that is better left to the private sector: and e) taxpayers could be exposed to significant, unexpected liabilities if EORN had long-term responsibility for maintaining the network.

For others, the catalytic role was seen as the best way to get action on an important issue without falling prey to the tyranny of perfection. In these sorts of complex projects (what some might consider an unconventional public- private partnership), there is a risk that nothing will be done out of fear of criticism if it can't be done 'perfectly' (meet everyone's needs, execute without a single misstep). Those prepared to play the role of catalyst do so knowing there will be complexity and criticism… but their raison d'etre is to stimulate action. The EORN project certainly did that.

Q: Customer Relations on Behalf of End Users in Interactions with ISPs.

A: Unusual Approach but Effective.

A majority of stakeholders expressed the view that EORN's intervention with service providers was atypical for a network build project (given that the contractual relationship is between the subscriber and the ISP). However, EORN's efforts to establish respectful relationships with ISPs so that recurring issues could be flagged and potentially resolved in a collaborative way was noted. A minority of stakeholders thought this role was inappropriate for EORN but a larger number suggested it was necessary and advisable for EORN to "keep its hand in" to provide oversight, ensuring that the ISPs "lived up to their commitments." This can be a challenging role when the issues that subscribers are facing are related to network-level demand outstripping supply, and the lag time inherent in adding new capacity.

Q: Incorporating First Nations into the Initiative from its Earliest Formulation?

A: Yes, For the Most Part.

Relatively few stakeholders were able to comment on this question due to lack of exposure to these considerations in the project. However, those that did tended to see EORN as appreciating the importance of their duty-to-consult obligations even if they did "scramble a bit at the beginning" to launch this part of the project's design and implementation work. Others commended EORN for going beyond the consultation requirement to engage First Nations in broadband projects in their own communities. EORN also provided for First Nations' representation directly on the Board of Directors. As one respondent noted "EORN Inc. and Lisa Severson in particular took the duty to consult very seriously and did a great job at it."

Q: Including Comparable Pricing for Services in Negotiations with Internet Service Providers?

A: Mixed Responses

Some stakeholders were unaware of EORN's efforts to secure comparable (rural-urban) pricing for high-speed internet services and some considered these efforts to be an awkward intervention into the marketplace. When an ISP serves areas in and outside of Eastern Ontario, multiple price structures can be challenging in terms of marketing and sales, finance, and customer service. Others considered the effort to secure comparable pricing to be an essential element of the project, inextricably linked to accessibility and social equity.

As noted elsewhere, EORN's negotiations have significantly reduced the region's pricing disadvantage in comparison to the GTA and southwestern Ontario. EORN has also negotiated a long-term commitment to satellite costs that are five per cent lower in Eastern Ontario than anywhere else in Canada.

Q: Managing Expectations in an Era of Exponentially Increasing Demand for Broadband Service?

A: Ongoing Challenge. EORN has done well so far.

Most respondents provided a qualified answer to this question, noting that the dramatic increases in demand from broadband are an industry-wide challenge, not just one faced by one region or one organization. In the face of this phenomenon, EORN was considered to have done reasonably well. Although the upsurge in demand may not have been not quite as apparent when the EOWC first decided to take on the high-speed internet challenge a decade ago, EORN was credited with building in network scalability (to support future expansion) and set the speed target higher than what was defined as 'high-speed' at the time. Stakeholders suggested that it would not be possible to meet consumer expectations for very long, particularly not in a single project undertaken at one point in time.

Some stakeholders also questioned whether it was realistic to strive for 100 per cent coverage/availability of broadband service (which EORN did not do, but citizens might have expected) given the extremely high marginal cost to provide service in some areas. It was viewed as more important to establish *minimum* download and upload speeds to be achieved – fast enough for the most common uses for which subscribers are likely to use the network. To that end, several stakeholders commended EORN for setting a target download speed of 10Mbps in an era when 1.5Mpbs was considered the standard definition of high-speed internet. At the time the EORN project was being developed, online video/live streaming was just gaining steam. Other stakeholders suggested that EORN would have been wise to specify the same download and upload speeds.

Q: Was the Eastern Ontario Regional Network Investment Good Value for Money?

A: Yes, as Defined by Stakeholders

In a separate 'wrap-up' question, interview subjects were invited to provide an assessment of whether the EORN project was good value for the money invested in it. Virtually all stakeholders agreed that the public (and private) expenditures on the Eastern Ontario Regional Network initiative had achieved good value for the investment. However, the definition of 'value for money' tended to vary from stakeholder to stakeholder. Provincial and federal stakeholders tend to assess value for money based on the degree to which the investment helps to meet equity commitments. Municipal stakeholders tend to view 'value for money' from the points

of view of a) leveraging municipal resources, and b) stimulating economic development at the local level. Private firms tend to view 'value for money' based on what can be achieved in terms of technology deployment and ongoing subscriber business in their service areas. Others use measures related to percentage share of total budget devoted to cost of administration and project management or cost-effectiveness of the EORN ('reach' for budget resources) as compared to other similar projects. Regardless of measures, the EORN project was viewed as having delivered good value for money.

> *"It has been one of my career highlights to have worked on this project."*
>
> *Stakeholder with direct involvement in EORN Project*

Q: Importance of Broadband for Long-Term Health of Rural and Small-Town Economies?

A: Very important.

As noted in Hambly et. al (ibid), "stakeholders should understand that technology is necessary but not sufficient for rural and regional innovation and societal transitions." Hambly suggested that use of digital technologies "best align with strategies for diversified financing or revenue streams, risk management, social media engagement, skills training and marketing." However, stakeholders commenting on the importance of broadband for the long-term health of rural and small-town economies sounded a more urgent note. In their view, the absence of broadband in a region constitutes a significant long-term disadvantage to the people and businesses in that region, making service accessibility, human development, social inclusion, employment growth, and business growth and development extremely challenging. In effect, stakeholders reported that in their view the absence of broadband infrastructure puts a region at a long-term disadvantage from which it is unlikely to recover.

> *"The more isolated you are, the more you need (broadband) technology."*
>
> *Stakeholder commenting on the importance of broadband*

Examples of the responses offered by stakeholders were:

- "If you're communicating with the rest of the world you need broadband."
- "For the last five years, rural areas have needed broadband for banking, healthcare, business applications, customer relationship management software, collaboration spaces, tourism, business-government services… How are you going to function if you don't have it?"
- "If you unplug it [broadband], they're dead... It can stop people from having to flee rural areas."

- "We need to focus more on urban areas, not more remote areas."
- "It's difficult to imagine how individual communities will be sustainable without broadband."
- "There is not one employee who doesn't need it as a work tool; they can't do without it."
- "You're going to be cut off doing business (if you don't have it)… It's incredibly important. It's also important for your personal needs; governments have moved to digital platforms and citizens need to be able to access them."
- "Broadband is critical… You can't get people to move to rural areas without it. It also matters to cottagers. It's valuable for video links for education and for engagement of First Nations communities."
- "It's incredibly important… Now Internet is more important than TV. It's important to farming/agriculture, to SMEs, and to other commercial enterprises."
- "Some of the most important benefits of broadband are telehealth, business education and tourism… It's the IT superhighway."
- "Broadband is important but it is a double-edged sword, raising the question of rationalizing additional health services. Internet does open up massive availability of information."
- "Broadband is extremely important – affordability and reliability are key. Without broadband, people are 'out of the loop'; people would otherwise be running to the cities. Urbanization has economies of scale, but it also has higher crime levels, stress, pollution, smog… The nation will lose on other levels."
- "Broadband is an essential service now. You can't get people to move to your community without it."

The centrality of broadband infrastructure suggests that governments risk entrenching weakened social and economic conditions in a region by waiting for the emergence of a business case for private sector response. This situation may never materialize. As a result, many stakeholders felt that public investments in projects like the Eastern Ontario regional network initiative were justified as a way to keep target communities "in the game," let alone experiencing development. Without this technology, stakeholders foresaw deepening economic and social need, with the attendant draw on public resources to maintain basic standards of living and/or community sustainability. Overall, their sentiments represent a powerful call to action for any rural/small town or city region that has not acted to improve high-speed internet services.

5 Lessons Learned

5.1 Lessons Learned – Project Design and Organization

At its heart, a regional broadband initiative is not a technology-driven venture. Rather, it is a way to utilize financing from public and private sources to ensure that an essential form of infrastructure and utility-like service is in place to support needs and aspirations of a region's citizens and organizations that are not being addressed through a conventional market-based approach. According to stakeholders familiar with the Eastern Ontario project, the EORN initiative offers many 'lessons learned,' all of which are noteworthy for similar future projects. In particular, stakeholders noted the importance of:

- **Recognizing that a broadband network is a different kind of infrastructure and must be structured and executed accordingly.** Such a network spans different geographic distribution patterns that do not normally align with political boundaries. It is often heavily regulated with 'public good' characteristics in mind, while simultaneously being largely private sector in both ownership and operation. The EOWC quickly understood that the ultimate success of its initiative would be dictated in significant measure, by their ability to change funders' notions of appropriate business models and agreements through which to deliver regional broadband infrastructure.

- **Seizing the moment.** In addition to developing an unconventional public-private partnership approach (typically described as a '3P'), the EOWC chose to act at a time when the importance of Information and Communications Technology (ICT) was growing rapidly, and governments were eager to invest to support their commitments to social and economic development, as well as be part of the emerging transformation to a knowledge-based economy.

  At the time the Eastern Ontario initiative was conceived, it was clear that the early stages of a revolutionary societal transformation based on digitization, were under way. This transformation is now highly visible through the Internet of Things (technology embedded in machines and devices), significant data traffic shifts from desktops to mobile devices, and exponential increase in bandwidth requirements. The EOWC chose the right time to act.

- **Identification of enduring champions early and nurturing them throughout the initiative.** Broadband infrastructure is a long-term, capital-intensive proposition; municipalities and other investors need to add it into their capital asset plans, particularly in regions where it is unlikely there will be a (private) business case any time soon. In the case of Eastern Ontario, development and execution of the Eastern Ontario network was a decade-long initiative. Proponents of the regional network placed early and regular emphasis on identifying and nurturing enduring champions – those that were committed to staying the course on what promised to be a challenging, decade-long project. In contrast to other types of infrastructure (e.g. roads, water/wastewater treatment facilities etc.), regional broadband is likely to require a long-term view. Yet, with rapid ongoing advances in information and communications technology, stakeholders understand that they will need to keep an eye on the sufficiency of the regional network, and be prepared to champion and make additional investments to keep pace. Long-term engagement by champions becomes extremely important.

  Eastern Ontario's ability to identify, activate and nurture regional champions with a long-term commitment, was key to navigating ever-changing public policy landscapes, turnover and transitions in both funder and regulatory organizations, and energizing those at the forefront of efforts to obtain approvals for, and launch the regional broadband initiative.

- **Capitalizing on the political support, reputation and credibility of the champions.** The Eastern Ontario regional broadband initiative was conceived by the Eastern Ontario Wardens' Caucus, an organization representing more than 100 local governments across the region. At the time the EORN project was conceived, the EOWC had already earned credibility with upper levels of government on regional issues and development of strategies/policy positions to address those issues; as a result, the EOWC's mandate and scope of influence was congruent with those of a regional broadband initiative. Therefore, the EOWC was an effective and appropriate spokesperson/advocate for a regional broadband project. Through the EOWC, EORN Inc. became a strong supporter in capturing and holding the support of elected officials and senior public servants throughout the project.

  In addition to advocacy support, the EOWC – and its members – also provided vital assistance for such business functions as cash flow management, procurement, and financial services. EORN Inc. has built on the EOWC's reputation (as well as establishing its own) to advocate with the Canadian Radio-Television and Telecommunications Commission (CRTC) for spectrum allocations for municipal services, as well as for mobile broadband.

- **Deciding to create and staff a separate organization (EORN Inc.) for this initiative was the right choice for Eastern Ontario.** A separate organization allowed those working on the project to focus solely on bringing the high-profile, multi-year, large-budget network to life, rather than being expected to execute the project 'off the side of their desks'.
- **Deciding early on the appropriate role(s) and a congruent business model for a regional broadband project.** In Eastern Ontario, the decision was to take a catalytic role rather than a long-term, owner-operator model. This strategic choice set the stage for use of a business model that positioned EORN Inc. as an implementation, financial, legal, risk and accountability management organization, using specialized external resources (partners) on a time-limited, targeted basis rather than being directly responsible for all aspects of the project. In this role, EORN Inc.'s governance relationships included having a Board representative of funders as well as possessing domain expertise, and regular reporting to the EOWC, under whose auspices EORN Inc. had been created. Business model innovation is now recognized as one of the many forms of contemporary innovation [19], [20].
- **Aligning the staffing model with the governance and business models.** The Eastern Ontario project used what could be described as an 'empowered 3P' staffing model (professional, passionate, purpose-driven). These terms were used repeatedly by stakeholders to describe EORN staff and champions, and were seen as a key factor in EORN's success, matching role and outcomes that the EOWC and other funders anticipated.

Definition of Best Practice:

A method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark.

http://www.businessdictionary.com/definition/best-practice.html

5.2 Lessons Learned – Project Execution

- **Building the dedicated organization's (EORN Inc.) operating style** based on a firm commitment to achieving the project's original objectives combined with a constructive problem-solving attitude, creativity, flexibility and nimbleness to respond to in-project challenges, all on a solid administrative foundation that ensured accountability to partners and investors. The operating style was one that aligned with the 'empowered 3P' staffing model.

- **Creating and implementing a project plan with built-in flexibility,** conferred by the regional nature of the project (allowing different approaches in different parts of the region). A phased approach allowed in-project learning – for EORN Inc. and internet service providers – and recalibration for future work in response to unexpected challenges and opportunities. This approach to project design and implementation was consistent with the governance and business model, and the operating style adopted for EORN Inc.

- The **diversity of landscapes, population situations, and appropriate technologies** to deliver broadband services varied significantly across the Eastern Ontario region. This created a demand for customized solutions in particular areas.

- **Designing the network for maximum accessibility,** both in terms of geographic coverage and end user pricing, even if that means a mix of technology solutions (which was the case in Eastern Ontario).

- **Structuring implementation based on multiple competitive bidding processes** that provided an opportunity for firms of all sizes to participate in the network's construction, operation and utilization.

- **Making significant investments in relationship management (stakeholders and subscribers) and communications,** despite the challenges of working indirectly (e.g. through/with ISPs on behalf of subscribers) and seeking customized solutions. While it would be expected that any infrastructure investment project would include an ongoing program of partner and stakeholder engagement, as well as communication from the project's inception through to completion, the Eastern Ontario project found expectations management to be especially challenging.

- **More project emphasis on the elusive nature of 'enough' broadband** would have been useful given that the project unfolded in an era of **exponentially increasing demand for bandwidth**. This phenomenon has not abated and appears to be accelerating. Despite having set what was at the time, a relatively high speed target (10Mbps down; 1Mbps up), and building in significant capacity to scale up the backbone as demand increased, the available bandwidth is being taken up faster than anticipated. As a result, there has been network congestion between the backbone and the end user, in some parts of the region.

  For EORN, the lesson is that the quest for more bandwidth will likely be a long-term challenge; as a result, a broadband project is unlikely to ever be 'finished.' Broadband proponents, particularly for initiatives in rural areas, are well-advised to convey to subscribers the elusive nature of "enough" bandwidth. Whether for personal use (such as Netflix which was just emerging as the Eastern Ontario project got underway), for public services (such as education or healthcare), or business purposes (videoconferencing, training, product installation guidance, or a host of other applications), video streaming is placing ever increasing demand on available bandwidth generating network congestion, usage-based overage charges, and/or throttling of download speeds. While understandable (and, in fact, a sign of strong utilization of the network), these issues require finely-tuned attention to expectations management. Without it, as EORN has found, some subscribers can end up feeling as though the network's promise has not been fulfilled.

- **Knowing that success is only attained if the completed network is used** by those for whom it was created. As a result, EORN Inc.'s plan for a second phase to the project, in which the emphasis shifts from the 'build' phase of the network to encouraging adoption is important to the network's long-term success.

6 Best Practices

A review of the Eastern Ontario project and the operation of EORN Inc. suggests the following best practices (grouped by categories identified in best practices literature – see Appendix B). Within each best practice description, key words/ phrases are highlighted to link the insights to a particular best practice category.

6.1 Best Practice Actor(s)

1. **Help champions, funders and other stakeholders recognize from the outset that broadband is a different kind of infrastructure** than is normally an investment target for ***public authorities***. A network operates across political boundaries, and has historically been owned and operated by the private sector. These factors introduce new policy and contractual considerations beyond those found in the types of infrastructure typically funded or managed by ***governments*** (example: water and waste water treatment facilities, recreational facilities or libraries, roads and bridges). For that reason, they can be perplexing and challenging for those working in traditional governance structures. ***Project leaders*** need to be prepared to listen and develop creative solutions so that a broadband project will move forward. In these situations, avoidance of project 'mission drift' will be dependent on the degree to which stakeholders can maintain a focus on the desired outcomes associated with the project.

   The useful life of technology that forms a broadband network is significantly shorter than for traditional infrastructure assets, and in most jurisdictions, is owned and operated by (regulated) ***private firms***. A broadband network is also a distributed asset, typically covering a large geographic area rather than being sited on a specific parcel of land in a single jurisdiction. As a result, ***proponents, funders, suppliers and end users*** must apply policies and rules differently (or develop new ones specific to the sector), negotiate with a multitude of actors, and be prepared to acknowledge the diverse circumstances (from terrain and existing technology assets to socioeconomic characteristics and other factors that may influence project costs and costs of access. Stakeholder interviews made it clear that the EORN project did not fit the provincial or federal infrastructure funding programs, resulting in rethinking of broadband-related policies at upper levels of government.

2. **Understand your region thoroughly** – this knowledge is key to network design, structuring budgets and financing, creating effective procurement processes and contract negotiations, and the ability to work with ***existing service providers***, and stakeholders to deliver intended outcomes.

   Do your homework in terms of the scale of the challenges before you and the assets you have to work with in scoping and executing a project. The challenges and assets may be related to ***political champions, early financial backers***, technology, the state of broadband and other telecommunications technologies across the region, the number of ***technology providers*** and ***internet service providers***, and the state of competition among them, geography/terrain, ***available expertise/people***, and even timing. This knowledge is key to being able to structure a project that can attract and retain stakeholder engagement, to developing project budgets and to securing the financial support that will stand the test of time, and ultimately being able to achieve project goals.

   While a gap analysis is almost certainly a cornerstone of your regional analysis, understanding your region goes beyond current availability of broadband service. It is also important to understand the number and types of technologies in use, and internet service providers currently in the region or potentially available to be part of your project. Take note of ***existing business relationships*** and the changing business landscape in your region. Your business case – and ultimately your project plan – will be heavily influenced by this information.

3. **Identify *champions* who will lead the charge and stay the course** – regional broadband projects are a long-term venture. Champions must understand that their contributions will be needed for years not months.

4. **Get political support early and often** – in part because of the long-term nature of the project, and because the scale of public investment for a regional project will be larger than for those focused on ***individual communities***. In addition, inter-governmental participation can raise multiple sets of expectations that must be negotiated. Regular communication and re-engagement can build consensus and willingness to compromise in order to see the project move forward.

   Many stakeholders commenting on the EORN experience noted that any regional broadband project will need ***champions*** across the targeted region – at the ***local/community*** level, at the ***regional*** level, and within ***financial or funding organizations***. Make sure you pay attention to building awareness support and active champions in securing political approval with upper levels of government. The EORN team and many stakeholders emphasized the value of having maintained ongoing awareness-building, communications and advocacy programs throughout their project, both with ***elected officials*** and ***public servants*** responsible for funding program implementation, oversight and evaluation.

Upfront political buy-in is extremely important, whether that is from ***municipal councils*** and their ratepayers, or from senior members of ***upper levels of government*** who will be asked to help underwrite at least some of the costs of these projects. Furthermore, that buy-in must be maintained throughout a resulting project, accompanied by careful attention to accountability and transparency. Proponents ought not to underestimate the length of time it can take to bring stakeholders from independent organizations together in support of a regional initiative. In EORN's case, that process took several years but the result was a regional collaboration at a political level that endured through the entire project, and was acknowledged by virtually all stakeholders as having been a very important contributor to the project's success.

6.2 Best Practice Characteristics

5. **Consider the wisdom of *technology agnosticism*** – because potential partners may want to propose different technology solutions for different applications within the larger regional project, and because technologies that were not mainstream at the project's inception may be so by the time you finalize the network design and begin to build. Early commitment to relatively few, specific technologies (such as specifying them in an ***RFP***) can lead some potential suppliers and partners to decline participation if they believe they will be at a disadvantage without the identified technologies.

   Technology can change rapidly although that does not mean recently installed equipment is useless. It does suggest though that proponents would be wise to remain technologically agnostic if possible. In competitive bidding situations, this allows bidders to recommend the technology options that best meet the request for proposal or request for information (RFP or RFS) and potentially differentiate their bid in ways that best serve a particular project. Taken together, this suggests that the project will hear about the best the industry has to offer.

6. **Consider your *business model* carefully** – it affects investor/funder, partner and stakeholder perceptions of the project, their willingness to work with you, and invest their own resources in the initiative. It also affects the ***risk profile*** of the venture since there are different types of risks – and opportunities – associated with different business models. While most stakeholders associated with the Eastern Ontario project believe EORN Inc. was the right business model and might well work in other jurisdictions, there was a cautionary note that any business model needs to be assessed against a region's particular circumstances and needs. Similarly, a business model that works well for one ICT project may be inappropriate for another one (for instance, cellular or mobile broadband).

In EORN Inc.'s case, the hallmarks of the business model were:

- A separate organization created by the sponsoring organization (Eastern Ontario Wardens' Caucus)
- Self-managed rather than contracting with a specialized project management team. In EORN's case, the team was a mix of permanent and seconded employees along with consulting support in specific areas.
- Catalytic in its actions rather than aspiring to long-term ownership of the network. In EORN's case, this meant aggregation of demand for high-speed services across the region; acting as the region's negotiator on the project's legal, financial and project scheduling matters; and taking on the responsibility for ensuring accountability for use of funds as well as the project's ability to deliver on the intended outcomes.
- A unique form of public-private partnership with EORN contracting with the private sector on behalf of funders, according to terms specified in contribution agreements.

Virtually all stakeholders interviewed strongly endorsed this business model and recommended it to others seeking to undertake a regional broadband initiative. The caveats to this endorsement would be that a) the sponsoring organization must contribute to the project, especially in terms of building early buy-in among stakeholders including funders, and b) great emphasis must be placed on hiring staff/retaining consultants who have a passion for the project, are truly experts in their respective fields, can function well as a team, and never lose track of the main objective(s) of the project.

7. **Invest in *risk management* and *top-notch talent*** – the scale and complexity of a regional broadband network, and the comfort level of funders, argue for significant attention to risk management. To support their accountability requirements, the Province of Ontario emphasized EORN's participation in provincial risk management training and incorporation of these principles into project execution. The EORN team repeatedly noted the value of the training and having paid attention to risk management throughout the project.

   Since a significant share of the risk is either 'baked in' or avoided in the project's initial stages project, securing top-notch talent for such assignments as legal work, procurement and contract negotiations, technology and engineering, governance oversight and project management, communications, and customer relations will pay dividends in avoiding costly or damaging mistakes and in cost-effective project delivery. Remember that these costs are a small proportion of

total project costs (in EORN Inc.'s case, 5.7 per cent per cent of total operating expenses). Scrimping on these expenditures will not free up significant resources to cover implementation costs. Finally, funders, partners and other stakeholders will have greater confidence in a team that demonstrates exceptional professionalism and expertise, and may be more willing to consider changes in strategy or reallocation of resources to deliver better results.

The EORN experience suggests that investing in top-notch talent means more than just finding people with good technical/professional/domain expertise; the degree to which a large, multi-year initiative achieves its original outcomes correlates with the degree of ***passion and commitment*** that staff have to finding solutions that address the inevitable challenges and opportunities that emerge during a project supplementation. In turn, finding those solutions means being willing to be ***open and transparent*** about those challenges, and what a project team can or cannot do to address them.

8. **Project design and rollout can accomplish *objectives beyond getting a network built* and subscribers online.** The scale of a regional broadband network can have a significant short-term direct economic impact within the region, as well as sparking longer-term impacts during the network's operating phase. Based on the EORN experience, project design and rollout can help to achieve objectives beyond the obvious digital goal (putting a network in place). Sometimes there will be ***market objectives*** (e.g. stimulating competition in service provision), or ***business objectives*** (e.g. providing opportunities for many companies to bid on aspects of the project that are their strengths, or ***avoiding direct head-to-head competition*** with established private sector organizations; ***enhancing the brand or reputation*** of the region and participating stakeholder organizations), or ***socioeconomic objectives*** (e.g. negotiating pricing that is roughly comparable between urban and rural areas, supporting community development aspirations). The aforementioned examples are all drawn from the EORN experience and were achieved, primarily by designing and implementing the project in ways that supported those objectives. Proponents for other projects may well have different objectives depending on their particular situation. In this case, the best practice is identifying those objectives up front and designing the project to support their fulfilment.

6.3 Best Practice Implementation

9. **Choose intended *project outcomes* carefully** – agreements with funders will almost certainly contain specific outcomes you will be expected to deliver. Make sure you choose outcomes that are relevant for your region, that you can deliver, and that you can afford. For jurisdictions striving to close a broadband gap or significantly improve broadband services in a region, project results may be defined (as they were in the EORN project) in terms of ***accessibility*** (the percentage of your region that actually can access high-speed internet at any price), ***network bandwidth*** (the amount of data that can be sent across the network at the same time), ***latency*** (the time taken to move data from point A to point B), the ***speed*** available to subscribers (download or upload speeds, determined in part by bandwidth and latency), and ***pricing*** (the impact of regional broadband projects on pricing for subscribers through ISPs, sometimes compared to subscribers in nearby areas that are not subject to conditions of market failure). There are ***project cost implications*** for all of these project outcomes, many of them are ***interconnected***, and many of them will have to be ***negotiated*** with partners and funders. Choose your intended project results carefully, and be prepared to be flexible and creative.

10. **Hand the implementation assignment to an *organization or team that is focused* on one mission.** An expectation that a regional broadband network project can be executed by an organization or team with multiple priorities is ill-founded. Such a project is too large, complex and fraught with risk to be undertaken as part of a suite of projects or responsibilities.

11. **Structure the project to build in *flexibility*** – in part, because regional projects are often introduced in regions with significant on-the-ground variability and because the multi-year nature of a regional broadband project may generate surprises. Use the scale of a regional project to 'average out' variations and to be able to respond to surprises (that may be opportunities, not problems).

    In building project plans, look for ways to build in flexibility so that you can adapt to changing circumstances as the project unfolds. There may also be opportunities to increase participation by external stakeholders; these may be helpful in fulfilling project objectives as well as stakeholder satisfaction. A regional broadband project is likely to be multiple years in the making and multiple years in implementation. Technologies, legal and policy environments, and the availability of financial resources can change. Different engagement strategies may be needed for different stakeholders, and opportunities to execute the project differently may present themselves.

The project's ***decision-making*** style should align with the flexibility mind set. In the case of all EORN, decisions were guided by an 80 per cent consensus criteria. Flexibility means being ***open-minded*** about new ideas and solutions, as long as they advance the initiative toward the agreed-upon outcomes. Staff must feel confident that the project's design encourages them to take on the mindset that every opinion is worth hearing; both internal and external stakeholders reported that this open-mindedness was present with the EORN initiative and contributed significantly to problem-solving and effective relationship management. For senior management, this means managing the project through a dual lens: that of internal stakeholders/staff, and that of a governance board.

Preserve the *capacity to be nimble.* With the need to continually evaluate new technologies, adapt as a project unfolds, and respond to unexpected circumstances, proponents are wise to remain technology neutral if possible, focusing on the end goal, which is likely to be related to some combination of extending access to unserved areas and perhaps improving existing services (e.g. speed, pricing). Adopting a mindset of nimbleness, being willing to change direction (without compromising the end goal) will be important to overall project success. In EORN's case, nimbleness was built into the project in multiple ways:

> *"You've got to be creative… flexible enough to look at the possibilities… Our investment helped a lot of families and businesses… improvement (to broadband services) would have been slow otherwise."*
>
> *Municipal representative*

> *"EORN needed to be able to turn on a dime."*
>
> *Municipal representative*

- By defining the desired project outcomes in ways that would encourage a change in direction if doing so would solve a problem or capitalize on an opportunity directly related to project outcomes.
- By negotiating specific provisions into contracts to engage private sector partners in meeting the project objectives.
- By taking a regional approach, allowing the project team to use the region's diversity to advantage, adjusting plans and reallocating resources across the region to ensure that the articulated needs of each area could be met. Although strongly recommended by virtually all stakeholders, some proponents may not be able to undertake a regional project. In these cases, alternative means of staying nimble should be sought (see preceding comments).

12. ***Managing expectations*** **is key to perceptions of success** – especially in an era of rapidly advancing technologies and applications. For instance, it is now clear that demand for broadband services (faster speeds, more data requirements due to intensifying downloads and streaming services, use across multiple devices) will continue to ***grow dramatically*** (some say exponentially) calling into question whether a project like EORN is ever really finished. If internet use (and network capacity utilization) climbs faster than a ***proponent forecasts***, the degree to which scalability is built into the network design – as well as service providers' ability and willingness to respond – becomes extremely important.

    Service providers' ***ability to respond*** by adding more capacity may be faster if the network was built to scale from the beginning (rather than having to go back and add to/extend the original backbone build.) The EORN network is ***scalable*** however, ***capacity utilization*** is ramping up faster than EORN (or perhaps service providers) projected so network congestion (slowdowns) can lead to subscribers feeling that they did not get the promised service… until network and ISP capacity can be increased. Make sure you can deliver on the expectations you are setting with ***partners, stakeholders, end users, citizens and funders.***

13. ***Communications*** **– early and often – is a vital tool** in managing user expectations in the fast-paced world of Information and Communications Technology (ICT). In EORN's case, the expectations challenges were two-fold:

    - Helping some ***potential subscribers*** understand that ***variable terrain*** can make it impossible to ***cost-effectively*** deliver high-speed internet/ broadband to a specific home or business, other than by satellite. Although satellite services have improved dramatically over the past decade, some users thought of it as a second-best solution and interpreted EORN to have failed them. For those relatively few subscribers who could not get improved broadband access through the EORN project, it is possible that early intensive, targeted communications in 'high risk' areas might have dampened the disappointment somewhat.

    - Helping some subscribers understand that despite the network's scalability, there may be ***congestion*** (and slower speeds) in a specific geographic location if the ISP's available tower equipment (for wireless) or fibre from the node/Point of Presence (for fibre to the home) is being heavily used. Congestion can become a bottleneck leaving subscribers disenchanted; they do not differentiate between the backbone and the service provided to the subscriber by the ISPs (who may be challenged to keep up with demand).

- Communications is also deeply intertwined with ***governance practices and accountability.*** The EORN team provided regular reports to, and sought approvals from, both their own EORN Inc. Board and the EOWC Inc. In addition to providing updates on implementation progress and ensuring transparency on contractual, financial, and legal matters, these reports provided champions with vital information about the impact of the broadband project on both a regional and local basis. This approach provided reassurance, particularly to EOWC members, the project would deliver benefits across the entire region (not just the easy-to-serve areas).
- In addition to Board reports and in-project communications, EORN Inc. made more than a dozen presentations to the region's stakeholders, providing information on the overall success of the project, as well as ***Return on Investment (ROI)*** at both the local and regional level.
- EORN Inc. and EOWC Inc. have been active on ***advocacy to make spectrum available*** for rural/less densely-populated areas, including but not limited to direct representations to the CRTC. These representations have been designed to protect both public and private sector investments in the expansion of broadband services across the region; while not a direct responsibility of either stakeholder, spectrum is a 'gate-keeping' asset with enormous influence over the success of any regional network.

Given the relative paucity of evaluations and best practice derivations for regional broadband initiatives, the preceding 'lessons learned' and best practice considerations are presented as an early contribution to this field of analysis. By virtually all measures, the EORN initiative has been deemed successful – a conclusion borne out by this review (for which evidence has been presented). For that reason, the conclusions of this report warrant more than passing interest for anyone considering a regional broadband project or having best practice interest in the ICT sector.

7 Would Additional Research be Useful?

As additional investments in large-scale broadband are made, there is merit in additional research in the regional broadband sector to:

- Test the approaches and methodologies deployed in this Review, and suggest improvements.
- Validate, refine or supplement the factors identified in this Review, and suggest any limitations to their use, or describe the circumstances in which particular factors are likely to be most potent.
- Quantify the short and long-term impacts that should be expected from regional broadband investments, the timeframe over which these impacts should be expected, and the degree to which these impacts can be attributed to broadband investments as opposed to other developments or changes in the target region.
- Develop a list of Critical Success Factors that would allow a region, funders or stakeholders to assess its state of readiness for a major broadband investment, and continue to add to best practices research.
- Return to the EORN project in five (5) years' time, to make a longer-term assessment of the project's impact on the region's economy and communities.
- Assess the degree to which broadband investments, themselves, can be expected to change the trajectory of the region's economic and social development, or whether there are concomitant actions required to extract value from these investments.

8 Where to from Here for EORN?

In the interview introduction, the consultant noted that the results of this best practices review would be taken into account by EORN Inc. as it defined its future roles (if any) related to ICT. Interviews with stakeholders revealed two different perspectives on what should happen to EORN Inc. once the current project is complete. One group believes there is opportunity for EORN Inc. to use its project development and implementation capacity, and expertise to help other jurisdictions or to transfer organizational know-how to other similar projects. Another group of interview subjects believes that having achieved its stated objectives, EORN Inc. should wind up its operations, allowing the long-term transitional plan (network assets transfer to private sector in 2017) to unfold as agreed by all parties. Some members of both groups cautioned EORN Inc. to check any assumptions about whether the same business model would apply to other ventures, even if in a field closely related to broadband (e.g. mobile broadband/cellular services).

As more and more aspects of daily life become digitized, and society moves further into the era of the Internet of Things (IoT), EORN Inc. has an opportunity to share what it is learned about broadband infrastructure project business models, financing, resource deployment, and project implementation with other jurisdictions seeking to undertake such projects. However, given that technology continues to race forward, it is likely that the availability of quality internet service within the region will require continuing attention. Examples of the issues that remain on EORN's plate, each of which has an embedded risk, are shown below.

Issue	Risk to EORN and EOWC
Exponential increases in demand for bandwidth	- Persistent network congestion - Erosion of end user satisfaction
Continuing traffic shift to mobile applications	- Inability to address gaps in mobile broadband/cellular coverage, and/or growth in associated backhaul utilization
Service providers' responsibility to 'refresh' network technology	- Inability to ensure network technology 'refresh' erodes support for business model
Service providers' packages and associated pricing	- Significant price increases to subscribers - Erosion of comparable rural-urban pricing
Utilization/uptake by potential new subscribers	- Limited uptake/utilization by potential new subscribers
Continued economic and social impact of digitization	- Job destruction from technology utilization considered EORN/EOWC's responsibility
Future ICT challenges less regionally pervasive than broadband	- Fractures in regional partnerships
Ability to retain/attract/'grow' 'professional, passionate, purpose-driven' team	- Changing mandate/mission, retirements, natural career progression limits EORN's ability to execute

Because EORN Inc. has contractual commitments with funders and technology providers until 2024, the organization will continue to function at least until that time. The commitments are related to contracts which require technology providers to maintain broadband network assets at their own expense from 2018 to 2024 inclusive; full ownership of the assets transfers to private sector partners as of 2017. At the same time, EORN is likely to maintain a 'standing watch' for technology opportunities to bring broadband to the relatively few hard-to-serve communities in the region. Through its digital strategy, EORN will continue to encourage and provide regional leadership on the application of software utilizing broadband technologies for public and private service provision (e.g. emergency services and Public Safety, infrastructure monitoring, civic engagement, creation of local business clusters and innovation networks, marketing and communications, healthcare diagnostics, education and training, logistics and transportation, cyber-security etc.)

In addition, EORN Inc. will continue to undertake advocacy related to broadband, funding for mobile broadband/cellular infrastructure, and related public policy issues. EORN is also testing out the flexibility, adaptability and fit of its approach to regional broadband with other jurisdictions such as the Province of Nova Scotia, for which EORN has recently provided support for the development of the province's 'middle mile' strategy.

9 Conclusions

This Best Practices Review finds that the Eastern Ontario regional broadband network project was a major success on the following fronts:

1. EORN Inc. fulfilled or exceeded its commitments under the Contribution Agreements signed with provincial and federal funders, and its original champion: the Eastern Ontario Wardens' Caucus.
2. EORN Inc. pioneered the use of a new form of public-private partnership – one that tested prevailing models in use by provincial and federal funders, and prompted contemplation of new approaches by upper levels of government. This model is considered by most stakeholders to be transferable.
3. The project demonstrated the willingness of municipal champions, particularly the Eastern Ontario Wardens' Caucus, to provide leadership on addressing regional issues, and taking an inclusive approach to project involvement with separated cities and towns, and First Nations communities.
4. The project demonstrated strong technical and project management, financial and governance accountability, with acknowledged attentiveness to stakeholder relations and willingness to adapt plans as the project moved forward.
5. EORN Inc. remained focused on project objectives throughout the project, and demonstrated willingness to listen to the region's stakeholders, rethink implementation plans and adapt quickly to maximize regional benefits and partners' needs and expectations.
6. The Eastern Ontario project has identified many potential best practices – in the design and implementation stages – for use in other similar projects.
7. While EORN Inc.'s work is not done (the organization has commitments in the region until at least 2024), there are many follow-on opportunities to deliver valuable service to the Eastern Ontario region and beyond.

10 Appendices

Appendix A: Glossary of Terms

Backbone – a principal data route between large, strategically interconnected networks and core routers on the internet. Backbones require high-speed bandwidth connections and higher-performance servers/routers to handle the data traffic associated with modern internet utilization.

Backhaul – the intermediate links between the backbone and the smaller networks at the edge of the entire network. In some cases, the backhaul uses out-of-the-way routes to get data to its destination sooner or to contain costs.

Broadband – refers to high-speed internet access that is always on and faster than dial-up access.

Business Model – the means by which an organization captures value from its business. It describes how the organization is going to earn revenue, how it will work with internal players (employees and managers) and external players (customers, suppliers, investors/financiers, regulators etc.) The business model describes how the organization adds value. [Based on definition from Financial Times]. In the internet era, a new business model has emerged (as an alternative to the traditional pipe: the platform.

Cybersecurity – the protection of systems and information they contain from theft, damage, and disruption.

Digital Subscriber Line – the way a computer connects to the internet at high speeds, using telephone lines. DSL is a communications medium used to transfer digital signals over standard telephone lines and along with cable internet, is one of the most popular ways that ISPs provide broadband internet access. [Based on definitions from yourdictionary.com and techterms.com]

Economies of Scale – the cost advantages that enterprises obtain due to size, output, or scale of operation, with cost per unit of output generally decreasing with increasing scale, as fixed costs are spread out over more units of output.

Firewalls – a network security system that monitors and controls the incoming and outgoing network traffic based on predetermined security rules.

Gigabit – a unit of information equal to one billion (109) bits.

Hardware – the physical elements of technology that makeup a computer and/or network system.

Information and Communication Technology (ICT) – the application of computers to store, retrieve, transmit and manipulate data, often in the context of a business or other enterprise.

Internet of Things (IoT) – the network of physical devices, vehicles, buildings and other items; embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.

Internet Protocol (IP) – a set of rules governing the format of data sent over the internet or other networks.

Interoperability – the capacity of one system, application, or resource to function with others.

Legacy – an old method, technology, computer system, or application program that has been in use, which might be becoming outdated.

Open source – refers to software that can be used, shared or changed freely.

Personal Information Protection and Electronic Documents Act (PIPEDA) – a Canadian law relating to data privacy. It governs how private sector organizations collect, use and disclose personal information in the course of commercial business.

Point of Presence – a demarcation or interface point connecting one point on a network to the rest of the network, for the purposes of increasing accessibility to the network. Hardware typically found at a POP includes optical switching equipment, routers, digital/ analog call aggregators, servers.

Request for Proposal (RFP) – is a formal request for a business proposal to potential suppliers.

Spectrum – refers to the radio frequencies allocated for communication over the airwaves. The allocation of radio frequencies to various users determines who can use those frequencies for what purposes. If spectrum is auctioned to the highest bidder, major companies can control access to the airwaves and effectively exclude smaller organizations with local applications such as emergency services. EORN Inc. has advocated for designation of at least some spectrum (frequencies) for such purposes.

Web 2.0 – the transition from static web pages to a dynamic web presence including advanced applications.

Appendix B:
Summary of Best Practices Design Template

The following summary was drawn and adapted from "*Applying a Template for Best Practice Documentation*" by Meshari Alwazae, Erik Perjons, and Paul Johannesson, Department of Computer and System Sciences, Stockholm University, Stockholm, Sweden, presentation to Third Information Systems International Conference, 2015; Published by Elsevier B.V. Open access article via creativecommons.org license. Adaptation undertaken to allow use of IT-focused template for a regional broadband initiative.

Summary

- Title
- Summary/short description of contents

Best Practice Description

- Statement of problem, solution and context
- Author contact information
- Revision information

Requirements for Application of Best Practice(s)

- Goal: intended effect of application of best practice(s)
- Means: what is needed to apply the best practice(s), including people and technology
- Skills: skills and competence required of end user for application of best practice(s)
- Cost: estimation of costs for application of best practice(s)
- Barriers: obstacles and/or problems that may occur before, during, and after application of best practice(s)
- Barrier Management: procedures to follow if obstacles or problems are encountered

Best Practice Actor(s)

- Community of practice with interest in best practice(s)
- Champion: need/role of champion re: best practice(s)
- Owner of best practice(s)
- Training Needs: degree to which training is required to use the best practice(s)
- Acceptability: degree of best practice(s) acceptance by domain experts

Best Practice Characteristics

- Usability (ease-of-use)
- Comprehensiveness of best practice(s) in addressing problem/solution
- Relevance (significance of problem addressed by best practices)
- Justification (degree of evidence that best practices solve the problem)
- Prescriptive (degree to which best practices offer concrete proposals to solve problem)
- Coherence: degree to which best practice(s) are related
- Consistency with existing knowledge and vocabulary used in target industry sector or knowledge domain
- Granularity: appropriate level of detail
- Adaptability: degree to which best practice(s) can be modified and adapted to other situations
- Activity: identification of tasks to be carried out for best practice(s) application
- Integration: degree of integration with other best practices and/or knowledge management components

Best Practice Implementation

- Demonstration of Success: a case where best practice(s) have been successfully demonstrated
- Installation Time: time required to introduce and implement best practice(s) in an organization
- Application Time: time required to apply best practice(s) in an organization
- Experiences and Feedback: users' opinions, advice and experience(s) with the best practice(s)
- Measurement: indicators for measuring quality and performance of best practice(s)

Appendix C: Documentation Review

(also serves as references as cited in the Review)

References Cited in the Review:

1 Based on data extracted from 2011 Government of Canada census.

2 Multiple analyses can be found at: www.eowc.org/en/mediareleases/2013-2014.asp

3 Information provided by Eastern Ontario Regional Network Inc.

4 Final Report on the Eastern Ontario Regional Broadband Network (EORN) Proposal, an initiative of the Eastern Ontario Wardens Caucus Inc. under the Major Infrastructure Component of the Building Canada Fund (EORN Inc.), March, 2010

5 EORN Project, Governance and Business Case Review (D. Fell, EORN) – June, 2016

6 EORN Project, Funding and Contract Negotiations Highlights (D. Fell, EORN) – June, 2016

7 EORN Project, Procurement Process (S. Graham, EORN) – June, 2016

8 EORN Project, Project Management and Document Management (C. Menendez, EORN) – June, 2016

9 EORN Project, Satellite and XCI (D. Fell, EORN) – June, 2016

10 Evaluation of the Eastern Ontario Development Program – FedDev Ontario; http://www.feddevontario.gc.ca/eic/site/723.nsf/eng/h_00553.html. "In 2006, EODP funded a broadband gap analysis is Eastern Ontario, particularly with respect to high speed/broadband internet access, which concluded that 65 per cent of the study area was un-serviced or under-serviced. EODP further supported an implementation study, which identified cost considerations to close the service gap. While these studies were completed outside of the study period, EODP, along with other partners, funded further work in this area in 2009 to update both the implementation study and the gap analysis. This support contributed to securing government financing to create the Eastern Ontario Regional Network (EORN). The goal of the network is to achieve 95 per cent coverage in Eastern Ontario by 2013."

11 http://searchsoftwarequality.techtarget.com/definition/best-practice.

12 Girard, J.P., & Girard, J.L. (2015). Defining knowledge management: Toward an applied compendium, *Online Journal of Applied Knowledge Management*. 3(1), 1-20

13 "Applying a Template for Best Practice Documentation" by Meshari Alwazae, Erik Perjons, and Paul Johannesson, Department of Computer and System Sciences, Stockholm University, Stockholm, Sweden, presentation to *Third Information Systems International Conference*, 2015; Published by Elsevier B.V. Open access article via creativecommons.org license.

14 Outcome Analysis of Rural Broadband Programs: A study of rural small businesses and community organizations served by phase one of the Eastern Ontario Regional Network – a high-speed internet initiative (L. Pant and H. Hambly Odame) – 2014

15 Successful Municipal/Regional Projects to Overcome Broadband Supply Gaps, A Survey of the Federal Ministry of Economics and Technology; Authors: Gordon Albrecht, Eike Gutt, and Jörn Henrich-Matejka, Germany, February 23, 2010

16 List of Identified High Speed Broadband Good Practices, ENGAGE, High Speed Broadband for Rural Europe, INTERREG IVC, Innovation and Environment, Regions of Europe Sharing Solutions, European Union Regional Development Fund (Undated but post 2005)

17 EORN Rural Broadband Strategic Research and Impact Analysis: Development of a Partnership and Evaluation Framework for assessing the Social and Economic Impacts of Provincial Broadband Investments (Y. Chan, Queen's University at Kingston, Ontario) – August, 2011

18 The Employment and Wage Impact of Broadband Deployment in Canada (O. Ivus and M. Boland, Queen's University at Kingston, Ontario) – 2012

19 The 12 Different Ways for Companies to Innovate, Mohanbir Sawhney, Robert C. Wolcott, and Inigo, Arroniz, MIT Sloan Management Review, Vol. 47, No. 3 Spring 2006, http://mitsmr.com/1qY1iJg

20 Why Business Models Fail: Pipes vs. Platforms, Sangeet Paul Choudary, 2013 https://www.wired.com/insights/2013/10/why-business-models-fail-pipes-vs-platforms/

Eastern Ontario or EORN-Specific:

21 Broadband – Critical Infrastructure for Rural Vitality (C. Cope, City of Ottawa) – May, 2008

22 Revitalizing Rural Economies, A Guide for Practitioners (Y. Chan, J. Dixon, C. Dukelow, McGill-Queen's University Press) – November, 2013

23 Public Opinion Research: Eastern Ontario Poll (Innovative Research Group, Toronto, Calgary, Vancouver) – June 2014

24 Digital Strategy, A Road Map to Digital Leadership (Eastern Ontario Regional Network) – 2015

25 EORN Finance Highlights Presentation to EOWC – April 24, 2015

26 Investment in EORN by County (spreadsheet, EORN) – June, 2015

27 Telecom Notice of Consultation CRTC (EOWC/EORN) – July, 2015

28 EOWC/EORN Responses to requests for information/interrogatories addressed to EOWC/EORN from CRTC and Rogers Communications (EOWC/EORN) – September, 2015

29 Mapping the Innovation Ecosystem in Eastern Ontario, Towards an Inclusive Canadian Innovation Strategy, (W. Cukier, K. Stolarik, O. Ngwenyama, M. Elmi, Ryerson University), – March, 2016

30 Municipal Public Wifi, A Sound Investment? (EORN Inc.) – Summer, 2016

31 eBusiness Toolkit for Small and Medium-Sized Business (EORN Inc.) – October, 2016

32 News release – December 22, 2016: EOWC and EORN applaud CRTC ruling on broadband

Publications on Other Broadband Projects:

33 Best Practices in Broadband: Lessons from Canada, Japan, Korea and the United States (R. Frieden, Penn State University, USA) – 2006

34 Audit of the Broadband and Northern Development Pilot Program (Industry Canada) – July, 2007

35 Evaluation of the Eastern Ontario Development Program (FedDev Ontario) – 2011

36 Rural Broadband: How Do We Determine Impact? (K. Wood/Monieson Centre, Queen's University at Kingston, Ontario) – 2012

37 Google Fiber Huntsville Deal Could Remake the Broadband Market – (Brookings Institution at www.broadbandcommunities.com) – March 2016

38 Regional Broadband Investigation, Needs, Opportunities and Approaches at the Local Level and for the Calgary Region, Municipal & Regional Opportunities and Options (taylorwarwick Consulting Limited), September, 2016

39 Building Support for Community Broadband (BBC Staff Report at www.broadbandcommunities.com – January 2017

40 Driving the Digital Highway, The United States needs two regulatory roads – one for urban areas and one for rural (Bandwidth Hawk at www.broadbandcommunities.com) – January 2017

41 Advancing Digital Adoption Amongst Small Businesses in Canada (Startup Canada) – February, 2017

Publications on Related Topics (Innovation, Rural Development, Entrepreneurship Etc.)

42 Exploring Risk Appetite and Risk Tolerance (RIMS Executive Report, The Risk Perspective (RIMS at www.RIMS.org) – 2012

43 A Standardized Case Study Framework and Methodology to Identify "Best Practices", (D. Battisto, D. Franqui, Clemson University, USA) - 2013

44 The Entrepreneurial State, debunking public vs. private sector myths, (M. Mazzucato, Anthem Press) – 2015

45 The Innovation Illusion, how so little is created by so many working so hard (F. Erixon and B. Weigel, Yale University Press) – 2016

46 Entrepreneurial Communities, Canada's top places to start and grow businesses in 2016 (T. Mallett, A. Bourgeois, and S. Gaudreault, Canadian Federation of Independent Business) – November, 2016

47 The Future of New Product Development, Learn how to develop innovative new products for increasingly global and digital markets (MIT Sloan Management Review) – Spring 2017

Appendix D:
List of Individuals Consulted

Andrew Clemens
(Former Marketing) Product Manager,
Xplornet/XCI

Barry Hohol
Customer Care/Sales Cogeco

Bill MacDonald
Vice-President – Relationship Manager for Build,
Xplornet/XCI

Campbell Paterson
Technical Specialist, Utilities Kingston,
City of Kingston

David Henderson
Mayor of City of Brockville

Deryk Trehearne
former Director General,
Infrastructure Canada,
Government of Canada

Gary King
Chief Administrative Officer,
City of Peterborough; Co-Lead EORN

Gerard Hunt
Chief Administrative Officer,
City of Kingston

Jason St. Pierre
Project Technical Manager,
Bell Canada

Jeff Dixon
Associate Director, Monieson Centre,
Smith School of Business,
Queen's University

Jim Hutton
Chief Administrative Officer,
County of Renfrew

Jim Keech
President, Utilities Kingston,
City of Kingston

John Downs
Owner, Nexicom

John Swantee
Senior Project Manager,
Bell Canada

Joseph Cillis
Claims Processing,
Ontario Ministry of Agriculture,
Food and Rural Affairs

Kathy Kennedy
(Former) Claims Processing,
Ontario Ministry of Agriculture,
Food and Rural Affairs

Kurt Greaves
Chief Administrative Officer,
Lanark County

Larry Keech
Chief Administrative Officer,
County of Lennox and Addington

Lisa Hirvi
former Chief Financial Officer,
Eastern Ontario Regional Network Inc.

Lisa LeClerc
Aboriginal Consultation Specialist,
Ontario Ministry of Agriculture,
Food and Rural Affairs

Mike Marcalongo
Technical Specialist,
Ontario Ministry of Agriculture,
Food and Rural Affairs

Paul McCarthy
Infrastructure Canada,
Government of Canada

Peter Emon
Chair, Eastern Ontario Wardens Caucus;
Warden, County of Renfrew

Ronda Fraser
former Claims Processing,
Ontario Ministry of Agriculture,
Food and Rural Affairs

Yolande Chan
Professor, School of Business,
(former) Director, Monieson Centre,
Smith School of Business,
Queen's University

Participating in Group Consultation with EORN Inc. Board:

Bob Sweet
EORN Board Member;
Mayor of the Town of Petawawa

David Burton
Chair EORN Inc. Board of Directors

Dick Shannon
EORN Board Member and
former Chief Administrative Officer,
Prince Edward County

Erika Demchuk
EORN Board Member;
Mayor of the Town of Gananoque

Jim Pine
Chief Administrative Officer,
Hastings County and co-chair, EORN

Joanne Albert
EORN Board Member;
Mayor of Tweed

J. Murray Jones
EORN Board Member;
Warden of Peterborough County

Sheridan Graham
County of Peterborough/Procurement Specialist
- EORN

Warren Arsenault
EORN Board Member

Also in attendance:

Anita Prosser
CSRO support, EORN

Claudio Menendez
Project Management Specialist, EORN

David Fell
Chief Executive Officer, EORN Inc.

Linda Little
Finance Department, County of Hastings;
Financial Administration – EORN

Lisa Severson
Customer Service Representative (CSRO?),
EORN

Paula Preston
Technical Engineer, EORN;
private firm: Actionable Intelligence.

Appendix E:
Consultation Discussion Guide

Discussion Guide – Eastern Ontario Regional Network Best Practices Review

September 2016

Discussion with Kathryn Wood 613-376-6006 or kwood@ncronline.ca

- From your perspective, when did you first hear about or get involved in the initiative we now know of as EORN (improvement of access to high-speed internet across rural Eastern Ontario)?

  What specific roles/responsibilities and/or interests did you have related to the project?
- Based on your understanding of the EORN objective(s), how would you assess the success of the initiative to date? If it helps, think of rating the success on a 1 to 10 scale where 1 is not very successful at all and 10 is wildly successful. [see page 3 for short description of objectives}
- From your knowledge of EORN, what aspects of the project have been most successful? Least successful?

  What do you think lies behind the success or lack of it? Think of the two or three most important factors….
- Looking at the list below, are there any aspects of the EORN initiative that you consider important to flag for others who might want to undertake an initiative similar to EORN (regional broadband)?

  Are there any where you think EORN got it right'?

  Are there any where you think EORN 'got it wrong'?

  - Scoping the project regionally rather than in a single or handful of communities
  - Early and continuing support of an established organization
  - Public-private partnership model
  - Creation of a special-purpose organization to focus on the project
  - Self-management of implementation (rather than contracting out)
  - Managing expectations in an era of exponentially increasing demand
  - Bringing in people with technology/technical knowledge while remaining neutral
  - Engaging industry and avoiding competition with private sector using public funds
  - Negotiations with private companies to meet project and end user expectations
  - Using 'market failure' as a guiding principle in design and negotiations
  - Choosing to be a catalyst rather than owning & managing the network long-term
  - Customer relations on behalf of end users in interactions with ISPs

- Incorporating First Nations into the initiative from its earliest formulation
- Including comparable pricing for services into negotiations with Internet Service Providers
- Anything else?

- Looking back, do you think that the EORN initiative has been good value for money? How would you personally evaluate value for money on broadband projects?
- How important (if at all) do you think broadband is for the long-term health of rural and small town economies?
- Based on our conversation today, what would you say are the top two or three 'best practices' that should be shared with others undertaking similar projects?

  What cautions would you have for others considering an EORN-type approach to addressing broadband connectivity?

Original Expectations:

Short-term:

- Address market failure that left many in rural areas with little or no access to a vital form of infrastructure
  - 85 per cent penetration of homes and businesses
  - Up to 10Mb service
  - Raise $50M in private capital
- Bridge the urban-rural pricing gap
- Improve customer choice (give them options) through greater competition; be technology neutral
- Provide opportunities for large and small organizations to participate
- Ensure open access to network use
- Build in scalability
- Be sensitive to competitive issues in an already hotly contested sector
- Ultimately, transfer the network to the private sector
- Get 5,500 kilometres of fibre in the ground with 60 POPs… with satellite option available

Long-term:

- Advance innovation and economic development opportunities
- Improve delivery of government and public sector services
- Enhance public access to government services and information
- Expand use of e-Health technology, such as remote diagnostics
- Improve education and training opportunities for youth (expanding access to e-learning)
- Support green technology, reduce energy consumption and protect the environment
- Sustain previous investments in internet access
- Contribute to economic progress across the region

imagine. transform. sustain.

Natural Capital Resources Inc.