The Ecology of Broadband Enabled Technologies: A Case for Wellington County

by

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ABSTRACT

THE ECOLOGY OF BROADBAND ENABLED TECHNOLOGIES: A CASE FOR WELLINGTON COUNTY

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This study explores the role of broadband enabled information and communication technologies (ICTs) and its impact on Wellington County’s agricultural-food sector for individual farm families and healthcare programming found in telehealth. Using an exploratory, qualitative approach, the objective seeks to investigate and understand the gap in broadband adoption practices, its realization and ultimately its strengths and short comings to provide internet connectivity and document these experiences and perceptions. Research findings indicate an overwhelming interest for acquiring access to connectivity for improving livelihoods socially and economically. However the lack of readily available standardized service provision and a lack of locally driven innovation in its use only served to perpetuate the digital divide. Through the use of a framework based on the information, communication and innovation ecologies, this study suggests the need for proactive policies and actions to increase the responsiveness of broadband use into marginalized communities to help establish digital inclusion.
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CHAPTER 1: Introduction

Overview of Topic

The importance of information and communication technologies’ (ICTs) integration into communities is becoming more and more vital for the growth and sustainability of rural economic and societal development for Wellington County and surrounding rural south-western Ontario. This study focuses on examining the information gaps in adoption, realizations and implications of broadband enabled ICTs on Wellington County’s agricultural-food sector for individual farm families and healthcare programming found in telehealth.

Research Rationale and Problem Statement

In one sense ICTs are simply tools either well-suited or not to the tasks at hand. The value of a specific ICT to development cannot be answered in abstract terms since it depends if the ICT is ideal for the project at hand - just like a hammer is better built to hit a nail and not change a light bulb. In another sense, ICTs are tools unlike anything in the past. ICTs can be applied to a wide spectrum of environments where they are virtually transforming every sector of society. The digital world is creating new opportunities to improve health and wellbeing while expanding knowledge and bringing empowerment to people otherwise unable.

The information revolution has brought about dramatic changes during the latter half of the 20th century. The truly revolutionary impact of today’s information age is just only the beginning. More notably, it is not the “information” that is fuelling progress but rather it is the explosive emergence of broadband connectivity that practically no one foresaw. The concept of a “global village” has brought worldwide distribution of knowledge and information in a manner that has influenced societies, politics, the environment and above all, the way we see the world and ourselves in it. Just as the railroad was a revolutionary element of the Industrial Revolution that rapidly changed the geographical landscape by offering true mobility, so too has the information capacities found through the Internet and its technologies. It is acknowledged over and over
again that we are living in an ‘Information Age,’ and indeed, this is a truth that seems self-evident: just take a look at how communications and information technologies (ICTs) have pervaded our homes, our workplaces, our schools, even in our own bodies! Yet, the same technologies’ true impact is not being utilized for the development that is possible from them. Chances are that if you are reading pieces online, watching a video clip online, socializing and networking online, you have access to readily available telecommunications network of global proportions. However, not everyone is equally lucky to have such access.

Almost all communities in Canada have been influenced by broadband in one way or another. However some communities, more so than others, have fallen under the wrong side of what is identified as the “digital divide” – a term that refers to:

The gap between individuals, households, businesses and geographic areas at different socioeconomic levels with regard to both their opportunities to access information and communication technology (ICTs) and to their use of the internet for a wide variety of activities. (OECD, 2001a: 8) (Looker & Thiessen 2003)

In Ontario, the rural digital divide is evident not only between those who do and do not utilize computers and/or the internet, but also a divide within nonusers distinguished by their reasons not to participate in the digital society because of a range of determinants from access and affordability to varying interest levels. Barriers to ICTs and differences based on income, education, gender, geography, age, disability and aboriginal status have been documented suggesting that these gaps and divisions are overlapping thereby perpetuating the digital divide (Looker & Thiessen 2003). There are currently no best practice standards or guidelines for implementing an effective broadband strategy for closing the digital divide and reforms in the telecommunications sector that facilitates socioeconomic development for different industries of society. However, what is known is that the internet has infiltrated every level of our society via broadband technologies that influences relationships, expectations, businesses, government processes and interactions while creating new ones. Therefore it is imperative to compare and analyze issues that persist the digital divide especially at a time where there are significant
advantages for staying aware of emerging trends of ICTs and broadband networks that are changing and evolving at exponential rates.

Many Canadians residing in south-western Ontario are currently disengaged with the societal level goals that aim to enhance the impact of the digital economy due to the severe lack in ubiquitous access to broadband services for communication and socioeconomic prosperity. Industry Canada’s vision of a “Connected Canada” established in 1999 has been at best subtle rather than impressive (Middleton, 2007). While initiatives like SchoolNet, VolNet and Smart Communities exist, others like Community Access Programs have been cut off from government funding, which only further alienates the goal for a connected nation. Both Canada and the U.S. were among the first governments to privatize the telecommunications sector. The similarities end there between the 2 countries – Canada pursued investment in digital communications infrastructure by encouraging public-sector investment of telecommunications services. The focus was to invest in schools, libraries, and other forms of cultural content production. Since the early 1990s, Canadian policies promoted the transition to an information society as efficiently as possible, however Canada’s geography, history and culture have created significant gaps in technical knowledge, a robust infrastructure and relevant content between urban and rural communities that prevented a smooth transition into the information society. The repercussions have led to fewer job opportunities, less access to government information portals, disparities in civic engagement, and limited access to new developments in healthcare and agri-food innovation.

Garth Graham (2011) suggests that the integration of technology must strike a balance between adoption and use in order to view the complex realities for social change and governance within a connected information society. It is important to acknowledge that economy is embedded in the society and not the reverse just like it is important to ask if full privatization of our telecommunication infrastructure develops, what will remain Canadian? Industry Canada’s ineffective attempts to direct e-development into rural, remote communities have limited social growth, innovation and economic prosperity. This study aims to address the gap in broadband adoption, availability and impact by examining the gap in broadband provision for rural Wellington County. The ongoing problem attributed to the lack of competition in
telecommunication companies in Canada has limited broadband network availability while creating boundaries that prevent users to utilize the network to the capacity required. Canada has embraced a policy environment that is guided by the Telecommunications Act and the Spectrum Policy Framework of Canada whose objectives are to encourage facilities-based competition where competing infrastructure providers (i.e. cable and telephone companies) offer broadband services on competing platforms. This research study’s objective will be to review the strengths and short comings of broadband networks and their abilities to provide connectivity services within the context of agri-food farm businesses and health organizations in Wellington County.

Internet connectivity and its availability to Canadians has been the subject of considerable debate among consumers and businesses as the world economy is rapidly becoming smaller and more digital thanks to the transformative impacts of more and more people developing and adopting broadband technology. As a result, there has been a growing need for a greater understanding of the necessities for universal access and support for broadband connectivity in rural communities. Industry Canada’s policy objectives have revolved around sustaining business competition, supporting robust investment and innovation by wireless telecommunications carriers and advocating the availability of these networks in a timely fashion. As such, this research study examines the impact and implications of rural broadband for agri-food and mobile health systems through a case study approach to each sector for Wellington County. The key problem being addressed is defined to identify and describe what the key capacities required to develop a sustainable broadband network that is equitable to all southwestern Ontarians. This is based on the study’s unit of analysis – the experience/perceptions of broadband technologies and the rationale (decision-making process), strengths, weaknesses, and effectiveness of broadband connectivity for socioeconomic development and human interaction and their propensity to communicate.

**Research Goal and Objectives**

The goal of this study is to explore the role of broadband technologies and ICTs for rural socioeconomic development in agencies situated across agriculture and health. This research focuses on rural connectivity for southwestern Ontario, more specifically Wellington County, as
a way to understand how broadband access impacts technical and institutional capacities by exploring 4 themes to broadband adoption and utilization: accessibility, affordability, value and usability.

The specific objectives are:

1. To identify contextual factors for broadband deployment and its role for new information technologies to foster better communication and innovation processes
2. To understand how rural broadband capacities can be supported in order to develop strong systems of equitable and sustainable socioeconomic development
3. To describe and analyze the interactions and partnerships between individuals and social structures by characterizing cross sector co-creation of knowledge and understanding of connectivity processes

**Significance of this Research**

Broadband technologies are increasingly being recognized as an important social and economic need for facilitating not only effective communication processes but also as an accelerator of economic development by enhancing productivity and efficiency. The advent of broadband has made many applications possible or enhanced applications beyond their current capabilities when compared to dial-up speeds of internet access. The availability of broadband services with sufficient capacity can allow a variety of applications such as videoconferencing, VoIP (Voice over Internet Protocol), P2P (person-to-person), telemedicine, e-entertainment, e-governance and many more. Therefore understanding broadband will be an essential condition for improving its implementation and services and applications so that it can function effectively to even the most rural and remote populations of Canada.

From a capacity development perspective, this research offers an opportunity to explore the access and effective use of broadband technologies in a rural setting. In turn, this can provide significant insight to identifying the obstacles that prevent ubiquitous access to broadband, how broadband is utilized and what are the main challenges when working with broadband connectivity. This study will help formulate a greater understanding of how ICTs and
connectivity helps to develop networks in the Information Society and their contributions to improving social livelihoods and greater economic opportunities. Efforts to qualify, quantify, analyze and draw conclusions regarding the impact of how health services and agri-food businesses are affected by broadband will be essential to accomplish a basis for advocacy. Identifying the needs of the end-users of ICTs and exploring how new technologies contribute to development will advance the generation of key social indicators around the goals, motivation and existing interactions of broadband users and non users for agri-food businesses and health organisations across Wellington County.

Finally, this study hopes to use the information gathered and the analysis conducted to highlight the impact of broadband connectivity and challenges behind the abilities of how broadband leads to opportunities to innovate, manage resources and operate businesses and social structures. The findings of this will be used to inform government institutions, policymakers, practitioners and academics that can promote knowledge sharing and information delivery to better serve communities in a digital platform. The significance will stem from 3 focus areas – knowledge creation, policy recommendation and improvements in practice.

**Limitations**

There are a number of limitations to be considered for this study. Due to the fact that this study focuses on a case study approach to ICT usage amongst health organisations and agri-food businesses, the strengths of the research primarily lies in identifying specific outcomes that are representative of only a small population of Wellington County. Therefore, the findings that have emerged from this study are context-specific and cannot be expected to be replicated elsewhere. Another limitation was timeline and financial constraints which become relevant to the outcome of the study due to the shortened period for data collection and financial barriers that prevented access to participants that were geographically dispersed. A limitations associated with data collection methods employed was the assumption that all participants cooperated in a transparent and honest manner with the researcher. Further information regarding the limitations of the methodologies employed by this study can be found on Chapter three.
Following the Introduction Chapter, Chapter two discusses the literature review that was conducted for this study and the conceptual framework. The data collection methodology that was carried out for this study as well as its epistemeological approach, contextual factors and research design can be found in Chapter three. Chapter four presents the findings of the study based on the results obtained from the interviews, surveys and content analysis. The discussion of the findings is reported in Chapter five using the conceptual framework found in the literature review as a basis to characterize the key findings of the study. The final Chapter (Chapter six: Conclusions) focuses on how the discussion of the findings address the objectives identified for this study. This Chapter highlights how each objective and components of the study relates back to the discussion of the findings and the data that was obtained through the study’s research design and methodology. This chapter concludes by offering key strategies and recommendations to support and encourage digital inclusion and participation using information and communication ecologies as the framework lens.
CHAPTER 2: Literature Review and Conceptual Framework

Introduction

This chapter’s objective is to explore the theories and concepts behind communication for social change within the context of broadband enabled technologies. The chapter opens with a discussion around the role of ICTs and characterizes their effective use for modifying today’s society in facilitating socioeconomic growth. This leads into the understanding of what is considered to be broadband and how the definition has changed over the last few years thereby signifying the fluidity of the definition itself. Examining Canada’s digital divide is important for this chapter in order to have a grasp of Canada’s national broadband strategies and some of the initiatives that have led to the broadband environment that Canada as a nation finds itself in today.

Following the overview of national and provincial broadband deployment strategies, this chapter discusses the role that broadband plays in the agri-business and health sectors for Ontario. Assessing broadband infrastructures based on its affordability, accessibility, usability, and value of adoption and acceptability is written as a primer for the benefits that can be derived from using broadband technologies and how communication for social change (theories from Manuel Castells’ Network theory, Evert Rogers’s Diffusion, Paulo Freire and Wilbur Schramm’s communication model) has developed and subsequently how broadband was influenced by this development. The conceptual framework of the study is then discussed, followed by a more in depth examination of an information ecology, communication ecology and innovation ecology. The chapter concludes by examining more recent literature surrounding information ecology and communication ecology as well as innovation. The chapter concludes with a summary of the literature review and the information gaps that this study identifies and aims to address.
ICTs for Development

What are ICTs?

Chapman and Slaymaker (2002) defined information and communication technologies as tools used to interlink devices composed of information technology such as personal computers with devices composed of communication technologies such as telephones and their telecommunications network. The conceptualization of ICTs is not limited to this definition; among others is the idea that ICTs can be comprised of numerous technical and social configurations that are flexible, adaptable, enabling and able of redefining social relationships and transforming organisations (Michiels & Crowder 2001). Today’s era in the information age means that new and upcoming information and communication technology is causing rapid changes in social organisation and its relationship to time. Communication through broadband technologies is decentralizing operations and focuses of control thereby increasing the effectiveness of networks. The internet and computers are providing new abilities to search and receive information quickly and efficiently where digital media has created a digital world united from across continents to work, play and share ideas with one another. Moreover, broadband ICTs have pervaded our homes, workplaces, schools, and our social networks. One of the debates over broadband ICTs for development is the level of accessibility and adoption to an internet connection.

Catharine Middleton (2008) describes two different characteristics of users when it comes to connectivity, there are internet ‘near’ users characterized as those who do want to connect with the information society (i.e. participating in online and communicative activities) but do not have the economic or technical capacity to do so and then there are the internet ‘far’ users who may have the economic or technical capacity to have access to the information society but have a less aptitude to fully participate in an ICT-enabled society. However, it can be argued that many internet far users have not been exposed to the knowledge and potential that ICTs and broadband technologies can provide to a household or organisation while other internet far users dispute that
technology has a potential to implicate even larger marginalization of communities in order to remain competitive in the race to modernization.

The impact of ICTs for socioeconomic growth cannot be ignored; the implication of ICTs from civil society to governance has shown that new advancements in the ways communication is channelled have modified the world. The World Summit on Information Society (WSIS, 2003-2005) therefore proposed a new vision by which technologies and social agents play a role in development. Gerster and Zimmermann (2003) identified four different characteristics to modern ICTs:

a) Interactivity: ICTs as effective two-way communication technologies
b) Permanent availability (i.e. ICTs are available 24 hours a day)
c) Global reach: overcoming geographic boundaries
d) Reduced cost by many: relative costs for communication have decreased from previous levels

Many of these characteristics are missing in rural Southwestern Ontario’s rural economy that suffers from pockets of broadband availability (Ookla Speed Test Data, 2011-12). Access to ICT and broadband technology can bring empowerment to communities and socially disadvantaged groups more readily through effective skills development, confidence, and information that they need in order to autonomously articulate their own intentions and motivations. Many of these advantages are not experienced due to the burden of overcoming both social and economic barriers to ICTs, therefore ICT provision in rural southwestern Ontario are not fully capable of being adaptable, flexible or enabling.

It is becoming more vital to understand the potency of ICTs incorporated into daily practices of communities. One of the internet’s most important contributions to societal development is its capabilities of use as an interpersonal communications tool which can be the foundation of participatory communication. Participatory communication can be defined as taking a community-based approach to communication where locals take control of their own content and development strategies. Therefore it is not access to ICTs and broadband technologies that is sufficient to development but how this access creates new competencies to communicate.
Understanding Broadband

Development of broadband internet infrastructure can be defined in its simplest terms as achieving faster internet speeds than a dial-up telephone connection speed. Broadband is derived from bandwidth which is the radio frequencies utilized for the transmission of signals (Ramírez 2007). Broadband would include a wide range of frequencies compared to narrowband which includes a narrow range of frequencies (Hz or Hertz per second). However this broad definition cannot be sufficiently be relied upon to build a national broadband strategy that enhances productivity and competition. Technically speaking, a broadband connection transmits data of at least 200 kbps (kilobits per second) in one direction otherwise known as a minimum download speed of 1.5 Mbps (megabits per second) as according to the International Telecommunication Union. However generally speaking, there are large discrepancies of the threshold that defines broadband (Middleton & Bryne, 2010). The 1.5Mbps T1 line is often considered only the starting point for broadband speeds, other nations like South Korea offer DSL speeds up to 50Mbps while 1.5Mbps is considered their “light” service tier.

From a dial-up telephone connection to the advent of the cable modem and finally to broadband connectivity has allowed faster methods of signalling that can handle a wide range of frequencies to connect individuals across small and large geographical distances. Fixed broadband connectivity provides internet access (like DSL, cable modem and fibre-to-the-home FTTH) via a specific location like people’s homes. This connection can be shared by family members through a wireless router applied to a fixed broadband connection within the confined premise of the home. Nomadic broadband refers to connectivity offered in a variety of locations i.e. in a hotel, public place such as library or park etc (Middleton & Bryne, 2010). Users of Mobile broadband services gain connectivity while they are moving, for example while travelling in a car or airplane. Cellular networks usually provide mobile broadband connections under 2 categories: 3G (third generation cell networks) and 4G (fourth generation) or 4G LTE networks. Long Term Evolution, or LTE, is considered to be the next generation mobile network technology and the future of Canada’s wireless network that is to be the standard for wireless communication of high-speed data for mobile phones and data terminals. Table 1.0 of the appendix describes the different broadband infrastructure types and their providers. Broadband in
2001 is now considered narrowband for today’s standards and users. Figure 2.0 of the appendix represents the comparison of different internet speeds (Middleton & Bryne, 2010).

**Examining Canada’s Digital Divide**

According to the Organisation for Economic Co-Operation and Development (OECD), the digital divide is an outcome of differing levels of socioeconomic activity within individuals, households, businesses and geographic areas and the gap that prevents equal opportunities to access ICTs and broadband technologies for a wide array of activities. Many commonly identify the digital divide between the technological ‘haves’ and ‘have notes.’ The Intelligent Communities Forum remarks the important issue that the current digital divide is more than the exclusion of individuals and households reaping the benefits of connectivity through computers or cell phones but it is about the missed opportunity to revive the local and global economy. Capitalizing on the opportunities of ICTs depends on the existing infrastructure in place, accessibility as well as the existence of ICT related human capacity. The World Summit on Information Society depicts the digital divide as the separation of those who are connected to the digital revolution in ICTs and those who have no access to the benefits of the new technologies. Furthermore, the Declaration of Principles of WSIS says:

> Education, knowledge, information and communication are at the core of human progress, endeavour and well-being. Further, Information and Communication Technologies (ICTs) have an immense impact on virtually all aspects of our lives. The rapid progress of these technologies opens completely new opportunities to attain higher levels of development. The capacity of these technologies to reduce many traditional obstacles, especially those of time and distance, for the first time in history makes it possible to use the potential of these technologies for the benefit of millions of people in all corners of the world (WSIS 2003-2005).
While the internet and technological connectivity has improved certain groups of people’s living conditions, interconnectivity is still highly restrictive in Canada and particularly rural southwestern Ontario. Having full access to the global information infrastructure at one’s own pleasure is limited to groups of users whilst the need to know English in order to effectively use technologies like the internet/computer further widens the gap that contributes to the digital divide. Due to commerce being the driving force for the development of the internet, investors and other stakeholders will always seek a return on their money in the form of access to new markets (Main, 2003). As a result, these stakeholders and investors look for ways to develop a high-speed network that is designed to carry voice, data and video in the form of consumption. The relationship between foreign direct investments on the communication infrastructure only perpetuates this notion. The technological gap that needs to be filled with investments in communication infrastructure must be done so with the consideration of local needs, realities and complexities. The WSIS’s declarations of principles reflect the need to support connectivity, information and communication to those unaffected by the technological wave without jumping on the technological bandwagon without a purpose.

The Information Network and ICT innovations in the internet have brought connectivity to a whole new level with the ability to have a universal platform for publication without an editor or censorship. In Canada, the government set itself the goal of leading the internet revolution by making Canada the ‘most connected nation’ by launching several initiatives under the banner ‘Connecting Canadians’ (Industry Canada 1994). These initiatives were Canada Online, Smart Communities, Canadian Content Online, Electronic Commerce, Canadian Governments Online, and Canada Connected to the World. However, the development of the ‘information highway’ has not been progressing at the level as expected; According to the World Economic Forum’s measurement of technological readiness Canada ranks only 14th (Global Competitiveness Report 2011). The Information Highway Advisory Council, assembled in 1994, was responsible for setting the information and knowledge structure for Canada’s information highway (Industry Canada 1994). The council’s mandate was to ensure universal access at reasonable costs. However broadband communication networks were not made equally available to all parts of Canada, especially in vulnerable communities like the Northern provinces and rural regions. Canada had always been a frontrunner in broadband uptake; however by 2008 Canada’s rank fell
to the 10th spot in OECD rankings for tracking broadband adoption rates (Middleton 2010). In Ontario, the dichotomy between eastern and western regional broadband network developments can be the difference between social benefits and economic benefits in employment sectors such as human services, general manufacturing, forestry and auto parts. Open networks fosters competition and community capacity building through new services in education, health and government (Middleton 2008).

Community Access Program (CAP) launched by Industry Canada in 1995 was a program intended ‘to provide Canadian with affordable public access to the Internet and the skills they need to use it effectively.’ This program attempts to meet the needs of those that are not digitally connected through various access points located in schools, libraries and community centres. Having access to this program encouraged Canadians to be more connected in online activities in the new global knowledge-based economy by providing assistance and guidance to seek opportunities of growth in learning new skills in digital networks. However, where the program achieved to provide a starting a point to drive connectivity to digitally isolated populations; it failed to consider local needs and complexities. Consequently, the federal government’s funding for the Community Access Program ended on March 31st, 2012, leaving many communities to fund their own program for delivering access to online services and activities. There were 1,078 CAP sites across Ontario, 563 of which were public library and school sites that provided equitable internet access building digital literacy and skills development to more than 2.4 million people (Ontario Library Association 2012). The 2010 Internet Use Survey by Statistics Canada revealed that only 54% of households earning less than $30,000 had internet access. Cancellation of CAP means that disadvantaged groups will no longer be able to participate in the digital economy and network society. Such examples of Ontario’s plan for digital inclusion means that guaranteeing access to technology itself may not be enough, Ontario needs to consider how to integrate the propensity to use internet technological tools to be integrated into the workplace, home-life and government services.
Impact of ICT Use on Agri-business Sector in Canada

Information and communication technologies in agriculture have always mattered; Communication processes in agriculture involve the conceptualization and development of innovative applications to agricultural practices. ICTs have become a global tool used by individuals, farm organisations, nongovernmental and governmental organisations for personal and official activities to further grow their business practices towards adoption of new and modified businesses strategies. These push and pull factors that act as drivers for agri-business owners help drive development of communication networks that can have significant impact on production efficiency. It is becoming apparent that telecommunications and the internet are changing how farms function to produce products and services within a competitive business market (COMPAS 2005). Recognizing the importance of the power of technology and analyzing its potential can mean the difference between a successfully operating agri-business and one that can no longer sustain itself. There have been minimal statistical reports that refer exclusively to ICT use in the Canadian agri-business sector, however, what has been so far reported seem to indicate that there is evidence of farms and firms recognizing the importance of ICT access and utilization (COMPAS 2005). The Agriculture and Agri-Food Canada Online (AAFC Online) identifies itself as the gateway to the agriculture and agri-food sectors in Canada. AAFC Online has been used by various agri-business organisations 35,000 times daily while visits have grown 200% annually by 2001 (COMPAS 2005). Noteworthy examples of ICT based initiatives within the agri-business sector is the federally sponsored ICT program in North Bay and Timmins which aimed to develop a permanent infrastructure for rural business to access the internet.

The literature indicates several barriers that impede Canadian agri-business to adopt ICT-based practices, one of which is geography. Ontario’s rural geography makes it difficult for many rural communities to access a high-speed internet infrastructure (ITU 2003). According to the city of Ottawa’s surveyed reports on ICT use in agri-businesses (2005), availability is not the only reason that rural communities cannot access ICTs within the community because even if the technology is available, implementation expenses can be unaffordable for many agri-business owners and their families. The demographics of Canada’s population further discourages private sector infrastructure investment into rural broadband development due to lower population
densities that is scattered across the vast country while the majority of the population lives in urban centres. Moreover, out migration of youth populations residing in rural Ontario to more urban settings have further diminished the impact and influence of ICT development, especially since technologies are demand-driven in rural areas and supply-driven in urban areas (Ramirez 2001). The out migration of youth in rural Ontario has contributed to a greater age-dependency ratios where you have a larger number of elderly and younger persons compared to the number of persons of working age. Another major factor impeding ICT development is the resistance to change. Change connected to the introduction of ICTs in agricultural practices may be viewed negatively by those in the industry. ICTs may be considered more of a threat rather than an opportunity for rural, remote communities due to traditional agricultural practices that have anchored the rural communities for so long. Rural Wellington County communities tend to operate in the ‘old economy’, with low- to medium-skilled workers and few professional or technical positions being held (COMPAS 2005). Most producers are not yet large-scale users of electronic communication. Asking these communities to change their practices, especially built practices steeped on tradition found in agriculture, means changing the very foundation of businesses for many people. Therefore, any efforts to incorporate ICT development into a farming community cannot be viewed outside the social and cultural context of farming and agri-business. The appeal of the growth of the internet to improve communication may not have the same appeal for a farmer taking a trip to the local dealer to conduct their business.

Ontario’s agri-sector is a large industry boosted by rich agricultural lands that produce more than 200 agricultural commodities (agri-food asset map). In 2009, the sector contributed $22 billion in gross economic stimulus to Ontario while employing approximately 164,000 people. Impact of ICTs and digital media is offers its own unique challenges due to the local operations of small and micro agri-business that largely dominates agri-food businesses in Ontario. As a result, small business owners often must decide if ICT is right for them and secondly they must act as their own ICT specialists, implementing and operating the system through their own means (Graham, 2000; Jones, 2000; Kleindl, 2000).

As ICTs have become more and more pervasive, they are becoming more and more relevant to agricultural innovation systems (Aparajita 2011). Availability of telecommunication networks
can enable ICTs to reach rural Ontario through a diverse range of means seen in text, voice and applications between stakeholders and farmers. Opportunities for farmers to connect with agribusiness researchers and extension workers can be created with the help of investment in broadband ICT networks that can increase the speed, reliability and accuracy of information exchange among other uses (Aparajita 2011). More specifically, ICTs such as mobile phones can be key instruments to drive participatory communication for traditional agricultural-research processes as well as to deliver services and products to the cliental of rural agri-business owners. Aparajita (2011) explains that

ICTs are fundamental to the business models of the “infomediaries” and “brokers,” public and private—extension agents, consultants, companies contracting farmers, and others—emerging to broker advice, knowledge, collaboration, and interaction among groups and communities throughout the agricultural sector (Aparajita 2011).

Various types of information regarding market commodity pricing, weather, crop diseases, contacting government, technological advancements, and emergent customer bases can be valuable assets to attain through increased ICT access and use. Furthermore, cloud computing has shown as a major tool that can improve agricultural innovation systems through a model that can enable information sharing from a ‘shared pool of configurable computing resources such as storage networks and servers that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Aparajita 2011). Nonetheless, it is important to note that not all types of ICTs will yield productive results within rural areas for development. The technical capacity in infrastructure, connectivity, accessibility and affordability of the necessary resources as well as staffing capabilities in IT understanding are among the list of prerequisites that can produce effective services and products. Public-private partnerships can help build the prerequisites that can improve the current telecommunications infrastructure towards sustainable capacity building where ICTs can be used as tools to enhance knowledge creation, transformation and innovation.
Despite the prerequisites for the successful implementation of ICTs, industry leaders believe that the future is open when dealing with ICT development in the Canadian agri-business sector (ITU 2003). According to the federal government, the possibilities are endless when it comes to ICTs and agriculture, hence the phenomenal growth of ICTs cannot be undervalued. ICTs have the ability to streamline administrative and accounting tasks as well as to help organizations attract, inform and retain members of their organisation through a collective voice that can be mobilized through communicative feedback mechanisms. The application of ICTs like the internet, web portals and mobile phones in agriculture are not a new concept. What is important is to consider how ICTs can move forward in agriculture, and how ICTs are expected to have a crucial impact on the agri-business sector’s needs and improving their adoption to changing socioeconomic and environmental conditions, and what potential tools of ICTs can be used to do so.

**Defining Telehealth & the Role of ICTs and Broadband in Health**

There is no definition of consensus of what telehealth is or what its contents and boundaries are. In Canada, the National Initiative for Telehealth Framework of Guidelines (NIFTE) has one definition while the Draft International Convention on Telemedicine and Telehealth has another (Donahue, 2006). Industry Canada postulates that the new buzz word is ‘e-health.’ E-Health is a relatively new term that signifies anything related not only to internet-driven medicine but also computers or ICTs and medicine. The NIFTE defines telemedicine as “the field of telehealth employed by medical professionals to view and discuss diagnostic information” which is distinguished from ehealth which refers to the use of internet related tools for health prevention and treatment practices. Thus telemedicine can be understood as the use of medical and health-related information and telecommunications technologies and telehealth is the result of the exchange (Donahue, 2006). Some distinguish telemedicine from telehealth with the former restricted to health care delivery exclusively from physicians while the latter represents healthcare services provided by health professionals in general which includes physicians, nurses, and pharmacists among others. For the purposes of this thesis, telemedicine and telehealth will be used interchangeably and both terms will be considered synonymous. The World Health Organisation has adopted the following description for telemedicine:
“The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities” (World Health Organisation 2010).

Generally telehealth can be defined and summarized in 4 elements

1. It involves the use of various types of ICTs to deliver healthcare services
2. To deliver health care services and provide clinical support to patients at a distant site by overcoming geographical barriers, connecting users who are not in the same physical location
3. To educate providers, administrators, patients and their families to improve health outcomes
4. To accumulate data or conduct disease surveillance for public health or epidemiological reasons (randyamy.com)

In Canada, the term ‘telehealth’ is a broad umbrella concept that covers more than just what telemedicine (a term mostly utilized by Europe and the USA) encompasses. Telehealth will refer to the use of any technology whose objectives are to deliver any type of health care and health services over distances.

Some of the challenges that prevent the provision of accessible, cost-effective, high quality health care services to rural communities can be addressed through ICT mobilization to overcome geographical and accessibility barriers to healthcare services (World Health Organisation 2010). The World Health Organisation’s (WHO) Global Observatory for eHealth (GOe) examines the advantages and disadvantages of ICT’s contribution to health care and patients’ well being. The Observatory is responsible for providing reliable information and guidance on up to date practices, policies and standards of eHealth by determining current statuses of eHealth solutions at the regional, national and global level. During the periods of
2002 and 2009, the GOe published two individual global surveys, found in the *Global Observatory for eHealth*, in order to explore eight thematic areas in detail. This eHealth series was primarily meant for government ministries of health, information technology, telecommunications and eHealth related researchers, academics, nongovernmental organisations and donors. The results of the survey indicate that almost 70% of participating countries cited the need for more information regarding the necessary infrastructure and cost-effectiveness of telemedicine solutions. Developed countries like Canada are more compelled to pursue robust telecommunication infrastructure and technical expertise for telemedicine services; however the survey also shows that developing nations are realizing the promise of telehealth and telemedicine solutions, especially to rural and underserved communities that traditionally suffer from lack of access to health care and education. While the promise of telehealth is great, the field is only in its infancy and continual evaluation and can ensure maximum benefit.

Recent advancements and popularization of the internet has further accelerated the pace of ICT development and utilization by the general population. Moreover ICTs have been arguably one of the biggest drivers over the past decade that has rapidly created new possibilities for healthcare delivery. From the replacement of analogue forms of communication to digital methods of communication, the continual drop in cost of various types of ICTs have forged a progressive interest in a wide range of applications and services among healthcare providers. The scope of telemedicine and telehealth practices has expanded to web-based applications and multimedia approaches such as digital imagery, video, email, teleconsultations, and teleconferences via the internet. Telehealth can be classified into two basic types: 1) the timing of the information transmitted 2) interaction between the individuals involved (health professional-to-health professional or health professional-to-patient etc). Between these two modes of functioning you can have wide array of applications from remote patient monitoring, real time direct two way communication channels from health provider to patient to store-and-forward telehealth. Store-and-forward telemedicine involves the exchange of pre-recorded data between two or more individuals.

Telehealth policies and initiatives have been expanding in Canada for quite some time. The scope of these various projects and programs in place range from service delivery i.e. telecare,
and telepharmacy to professional support, public health education and promotion. Based on past
reports websites, most of these initiatives have been directed at expanding telehealth networks,
info structure development, integration of telehealth applications in the healthcare system and
health information management.

Assessing Broadband Infrastructures

For definitional purposes, broadband and the internet is synonymous in Canada. Industry Canada
recognizes the definition of broadband as 1.5 Mbps download speed as previously mentioned. It
further defines unserved and underserved Canadians as “those without Internet access or with
dial-up service only” and “those who may be able to access the Internet using a connection
with a speed less than 1.5 Mbps” respectively. Comparatively speaking, The United States
embraced a higher speed target of 4 Mbps for universal broadband in its National broadband
Plan (Hudson 2010). Table 2.0 of the appendix displays the universal broadband speed goals for
a few selected countries.

Within southern Ontario, broadband’s definition is one that is constantly shifting positions due to
the evolution of the technologies. For the purposes of this thesis, broadband will be referred to
services that allow such activities as VoIP (Voice over Internet Protocol) or P2P (person to
person) video networking and other applications that allow innovations within the technology
itself.

Canada primarily relies on facilities-based competition which is the result of the availability of
more than one type of infrastructure connecting homes. Typically, most facilities-based
competition has been between DSL and cable infrastructures where broadband entrants builds
their own facility (Gorp & Middleton 2010). Service-based competition occurs when entrants use
the facilities of the incumbent known as the Incumbent Local Exchange Carrier’s (ILEC) local
network; this is created through the process of unbundling where incumbents are required to
allow entrants/competitors to use its own existing infrastructure (Technical a). It is argued that
facilities-based competition is more desirable while researchers argue that service-based
competition deters facilities-based competition. The nature of facilities-based competition
removes heavy regulation requirements by the industry since each operator essentially controls its supply chain to the largest possible extent (Bourreau & Dogan, 2003). This is more conducive for long-term efficiency when compared to the limitations present if entrants are forced to rely on the incumbent’s facilities for service provision. Facilities-based competition gives consumers a variety of choices for broadband which can subsequently produce higher speeds, lower prices and innovative internet access services. Moreover, Bourreau & Dogan (2003) argues that when incumbents are faced with a threat of facilities-based competition, the incumbent can strategically delay entrants through the means of attractive terms of access to its facilities. Consequently, new entrants are faced with the decision to either build or buy an arrangement that allows the entrants to compete for services through the use of the Incumbent Local Exchange Carrier’s (ILEC) local network. The CRTC’s (Canadian Radio-television and Telecommunications Commission) goal to rely on market forces for broadband services means fostering facilities-based competition over service-based competition.

The Ontario provincial government has created an agenda to engage in the digital media and economy in Ontario by anticipating that a broadband enabled Ontario will produce economic and social benefits to its citizens, government and local businesses. This process of development, deployment and adoption of broadband lies in the cooperation of multiple stakeholders in both the public and private sector. Although, Canadians were the early adopters of broadband internet services, it was not until 2002 that most Canadian households began using the internet in comparison to previous years when dial-up internet access was the only option (Middleton & Ellison 2008). Canada has been an international broadband leader amongst G7 nations; however this status is being eroded as time is passing. According to StatsCanada’s CIUS data (Canadian Internet Usage Survey Data) on 2005, 61% of Canadian households had internet connections which many theorists say that growth in internet access is slowing (Middleton & Ellison 2008).

The National Broadband Plan stipulated by the US legislation, announced in March 2010, aim to provide universal service policies that can extend broadband deployment across the country. One of the major objectives of the plan include having every American have equal opportunities to affordable and accessible broadband services to at least 1 GB broadband services to different institutions such as schools, hospitals and government buildings (Hudson 2010). The plan
emphasizes that private investments alone cannot provide broadband services to rural populations. In contrast, the CRTC does not have any explicit broadband policies. Although the CRTC has designated $650 million for rural broadband development, they announced (February 2010) the review of its intentions of basic service definitions that was last updated in 1998 (Hudson 2010). The perfect scenario for Canadians would be one with ubiquitous broadband access with seamless connectivity however there are several factors impeding ubiquitous access: usability, affordability, value and accessibility.

**Usability**

Usability refers to the extent to which an internet network is relatively easy and accommodating to use. Questions that may arise due to usability issues can pertain to how convenient is the service location? Can the network be found in a quick manner? Are there any restrictions imposed on the network that prevents internet access? Are there a wide range of access devices that the user can connect to? Usability barriers found in skill level is one of the bigger deterrents of broadband adoption (Middleton & Bryne 2010). The literature says that skill-related physical barriers can be overcome with the appropriate utilization of programs that direct potential users to relatable broadband applications. This was especially true since a majority of nonusers have identified the importance of broadband driven for community socioeconomic development.

**Affordability**

The all important price point. According to numerous reports, the number one biggest barrier to broadband adoption is affordability especially since demand for broadband continues to be stifled by prices. Agricultural businesses are wary of investing into broadband because of the costs that may not be mitigated. Technical issues like broken computers and online virus infections represent significant barriers to broadband affordability. Overtime bundling issues can be expensive to maintain or underutilized, thereby leading to cancellation of broadband services. Billing issues between servers providers and end users can create disputes and major price differences between wired and fixed wireless or satellite coverage reinforces the digital divide further by forcing certain segment of the population to depend on dial-up telephone modems or
slow speed ADSL. Satellite and wireless broadband services are significantly more expensive than internet provision offered by DSL and cable providers. Prices of basic satellite broadband (maximum download speeds of 512 Kbps) using Xplornet costs $50 per month, plus additional charges for equipment, three-year contract fees, installation costs, and set-up fees can total upwards of $500 or more for the initial investment. CRTC claims that 91% of Canadians are covered by mobile broadband however pricings for mobile broadband is considerably higher than fixed services (Hudson 2010 p. 95).

**Accessibility**

Acquiring affordable rates to broadband services may not necessarily mean that the services being provided are accessible. The quality of service and its reliability is the main component that differs from usability. It is all too common to receive a slower speed of broadband connectivity than advertised; throttling is a process defined by the CRTC in which internet service providers “slow down the transfer of rates of traffic by delaying certain data packets at certain points in the network” (Middleton & Gorp 2010). Finding the network and determining whether the speed is constant and predictable can be time consuming for both health organisations and independent agricultural business owners. The desired speed may not be adequate for carrying out certain activities during certain time periods of the day and this outcome mitigates the goal of achieving originally set by Industry Canada in 1994 to connect every Canadian to participate in the digital economy.

**Value of Adoption and Acceptability**

There is no doubt that broadband network deployment can create many opportunities for homes, business and our healthcare systems. However connectivity and digital inclusion should be better pursued through alternative forms of infrastructure development. Note that this is different from the provision of ‘content’ found in the internet (i.e. community information, local agri-business hubs, access to government services etc). The support of a broadband infrastructure can drive the development of local networks that supports community and agricultural business interests and other avenues like peer to peer file sharing and networking among individuals and social
structures. Ultimately the push and pull factors associated with broadband adoption depends on the perception of how connectivity can be best utilized to enhance productivity and efficiency. For agricultural knowledge workers, this means that broadband technology can bring forth valuable sought after information pertaining to a variety of operations such as crop growth, crop market prices, livestock, acquiring land title, participating in government programs and data storage and exchange. The open access movement to information has allowed greater public-private partnerships thereby leading to more-sustainable services for rural populations.

Healthcare services has followed a similar route through the development of patient education programs, health promotion on wellness and prevention and the support of mental healthcare and early childhood development. Each of these different examples has utilized ICTs by connecting health services with consumers through various initiatives such as ehealth operations in Electronic Health Records or Picture Archiving and Communications Systems (PACS).

**Benefits of Broadband**

One of the greatest beneficiaries of an integrated broadband infrastructure is the industries themselves. This broadly labelled term refers to telecommunication services and manufacturing sectors, computer (hardware and software) manufacturers and service providers. Therefore investments into ICTs at the governmental, provincial, regional and communal levels can be a large factor for national productivity and economic and social development. These benefits have been conceptualized by Middleton and her work on household internet usage in Ontario. In figure 3.0 of the appendix, Middleton claims that the benefits of broadband are multi-layered. However, Katherine Middleton acknowledges that what is less clear is to what extents are these benefits are actually being realized at the societal, communal or individual levels. Even examining adoption levels for broadband can be difficult since the presence of a well developed broadband may not necessarily mean complete adoption of its use. According to Middleton “the challenge going forward is how to bridge the gap between the current realities of broadband usage and the societal goals for broadband to become an enabler of the information society and the digital economy (Middleton 2007).
As noted above, the stakeholders (industries, government, civil society actors etc) partnerships and development is key for a successful implementation of broadband to regions with very little services. The Broadband Cycle illustrated in figure 4.0 of the appendix describes the 2 stages to broadband development. Beginning with a promotion and planning stage, to a broadband deployment phase which leads to meeting the needs of broadband consumers. However, it is to be noted that simply developing Ontario’s broadband network may not instigate adoption or consumption. According to Middleton, adoption is a result of demand for broadband services where as the demand grows, the cycle repeats in order to increase capacity of broadband networks. Faster cable connections is not yet made common in Canada and the level of advertised internet speeds is rarely achieved by customers.

The 2005 telecommunication polices review panel of Canada acknowledge that the target for universal broadband around 2004 was not met and is now recommending the developing of reliable and affordable broadband connectivity to all regions. Internationally speaking, the WSIS recognizes that ‘access to information and sharing and creation of knowledge contributes significantly to strengthening economic, social and cultural development (L.S, Shade & Powel 2006).’ ICTs can act as drivers for innovation thereby enabling communities and individuals to improve livelihood. Katherine Middleton argues for incentivised programs that allow for innovation and investments into competitive broadband networks through two types of services: facilitation-based services and service-based competition (over two platforms, cable and DSL). Canada’s broadband market deals with facilitation-based competition which depends on wireless networks, fibre to the home and cable. Nonetheless, it is evidently clear that having a clear communicative network goes beyond measuring broadband penetration rates and network upgrades. The private sector alone cannot drive innovation, but with the help of policy development, it can lead to the development of higher capacity technologies that meets the bandwidth and connectivity needs of rural businesses and households. Table 3.0 of the appendix summarizes the state of the characteristics of broadband services in Canada.
Development of Communication for Social Change

Development communication is a term used to address the use of a variety of communication techniques and tools to establish solutions for insufficient systems, process or modes of production within a specific context. For several decades, global communication theories have presented various strategies targeted for social change based on rapidly changing environments through print, radio, television, satellite, and other traditional tools. However what is lost in translation is that genuine communication is a basic human need like food, shelter and clothing. To enter into effective communicative and transparent partnerships and relationships, to establish communities for improving livelihood, people must communicate. How individuals communicate with their surrounding network and communities have drastically evolved in impactful ways that can be positive or detrimental depending on how communication was conducted within different channels of information (Waisbord, n.d).

Fifty years ago, communication in the development sector consisted of a one-way flow of information characterized from sender to receiver through mass consumption of information (Waisbord, n.d). Daniel Lerner’s The Passing of Traditional Society: Modernizing the Middle East (1958) laid the foundation of communications within modernization theories. Daniel Lerner argued that the dissemination of Western mass media can help transform nations of the Middle East from ‘primitive’, traditional countries to modernistic practices. This was marked by Everett Rogers’ diffusion of innovation theory in the 1960s that recognized global diffusion of technical and social innovations infused by foreign Western values and expertise are essential to development. From a policy initiative perspective, modernization was the weapon to thwart the Cold War’s spread of Soviet Communism in Asia, Africa and the Middle East. Rogers segregates the community population according to their propensity to incorporate innovations and ultimately the time in which they adopt or reject them from ‘progressive’ to ‘laggard’ adopters (Rogers 2004). This view exhibits a linear process of centralized information dissemination through predefined changes among the community. Rogers wanted to use mass media communication channels to expose large numbers of people to messages of innovation in order to reach those not exposed to the original transmission for development (Rogers 2004).
Based on the work of Everett Rogers came Wilbur Schramm’s (1964) who proposed that coding and decoding are the two essential processes of effective communication. Schramm emphasized that communication is incomplete and useless unless the sender of information codes the information carefully so as to ensure that the recipient understands what the sender/speaker is trying to convey, hence, the importance of coding and decoding. However it is also important to note that feedback from recipient to sender is key; Schramm believed that communication is a two way circular process (see figure 1 of the appendix).

The modernization era and the diffusion model failed to deliver positive change in low income nations and as such these theories gave way to a shift within development communications from an economic preoccupation that emphasized transferring technology and norms from the ‘developed’ world to the ‘developing’ world to a broader more inclusive framework that recognizes the importance of social networks, opinion leaders and participatory approaches to establishing solutions. Many of these approaches have been associated with the work begun in the Latin South America development communication scene by Paulo Freire in the 1970s. As an educational theorist, Paulo Freire (1970) argued that education should be a dialogue in which the student and teacher learn from each other. Therefore the student is better able to understand the causes of his or her oppression and can then do something about it. This is what was identified as conscientization or conscious raising. Paul Freire insisted that people are the markers of their own culture and that change is only possible if people within the community are willing to embrace and work for the change. Indigenous media tools for development were a major concept for Freire (communication research trends). Similarly, Chambers identified the need to reverse the process of development so that local communities can control the process of change that can instigate socioeconomic and livelihood improvement (Chambers 1994).

The theories and practice of development communication continues to evolve today; from the mid-1970s, communications reflected wider shifts in global development to incorporate technical innovations in today’s information age.
Communication in the Network Society

Social movement theories are usually associated with influential scholars like Manuel Castells who focused on the role of communication networks for emphasizing political power-making in societies. According to Castells, power is defined as

“the relational capacity that enables a social actor to influence asymmetrically and the decisions of other social actor(s) in ways that favour the empowered actor’s will, interest and values” (Castells 2000a)

This definition of power was appropriated for networks and the network society where power is not something that resembles an attribute but rather a relationship. Castells claimed that communication networks are central for the mechanisms of power-making in any network and that the programming of single networks (programmers) and switchers (moving to different networks) are the fundamental sources of power. Network programmers and switchers are defined as the holders of power in the network society (Castells 2000a).

As the world is passing from the industrial age to the information age, new and upcoming information and communication technology is causing rapid changes in social organisation and its relationship to time. Communication technologies like broadband and the internet is decentralizing operations and focuses of control thereby increasing the effectiveness of networks. Castells says that “the main shift can be characterized as the shift from vertical bureaucracies to the horizontal corporation (Castells 2000a).” Therefore power now rests in networks where it is “constructed around multidimensional networks programmed in each domain of human activity to the interests and values of empowered actors (Castells 2000a).” Castells argues that the operations of networks involve including or excluding actors in the basis of their ability to contribute to the goals of the network. He categorizes power into four distinct sections: networking power, network power, networked power and network-making power (Castells 2000a).
Multimedia communications, more specifically digital media has the potential to reach a global audience. In the network society, the process of communication is enacted through global and local media networks defined as mass communication, mass self-communication and self communication (self generated and directed). Unfortunately Castells aggregates all of the new media between traditional communication and interpersonal communication by focusing heavily between network relations (cooperation and competition) and not relations within networks. In today’s networked economy the key factor in economic productivity is information, where the flow of capital is based upon access to information regarding stock markets, social trends, international politics and many more factors. Although this idea is not new, it is the individualized labour created by networks where Castells states that “the work process is globally integrated, but labour tends to locally fragmented (Castells 2000a).” Castells’ suggests that the information age is still largely a capitalistic age, however in his model there is a shift in power from the capitalists to the networks.

The diffusion of information packaged with a corporate agenda to a targeted audience is lost through digitization through global networks of communication. This produces a dialectical process with corporations expanding in communication networks while civil society building their own networks of mass self-communication which ultimately leads to empowerment. In this case, mass self-communication is defined through internet-based communication such as the use of email and social networking sites. Furthermore, the new world of mass self communication has created a culture of sharing messages from multiple senders-receivers; the versatility and diversity of this information through communication technology like broadband has influenced the networks of communication. This can be seen in the diffusion of information that can be amplified beyond anyone’s control (i.e. viral campaigns) despite the tension in control exerted by the traditional network power of mass media. Therefore, the use of mass self-communication in the internet has propelled technologically driven social movements to transform the ‘logic’ of networks. While technology is not responsible for change within a society, it embodies the capacity to change (Castells 2000a).
An Intelligent Community with Broadband (ICF)

The Intelligent Community Forum identifies itself as a think tank for social and economic development of the 21st century community. ICF seeks to share innovative practices of leading communities within the broadband economy that stimulate inclusive, sustainable renewal and growth. The ICF presents annual rewards to communities deemed as innovators in order to share and learn from the experiences and challenges to participate in a globalizing economy.

According to the Intelligent Community Forum, innovation can occur through a feedback loop where the ICF used specific indicators for broadband as a framework to create a “virtuous cycle” of positive change. Figure 6.0 of the appendix depicts this cycle where broadband connectivity [activity] can be seen to feed the development of a knowledge workforce while stimulating the foundation for digital inclusion. The ICF raises the level of importance for broadband as vital to economic growth as clean water and good roads. The knowledge workforce is defined as the labour force that creates economic value through the determination of acquiring, processing and using information to further developing the economy. Both digital inclusion and the knowledge workforce contribute to innovation while increasing demand for connectivity. Marketing and advocacy then is able to communicate possible advantages, possible improvements required for business growth which leads to a new vision of the community from within.

Community E-Development Framework

Based on what has been described as information ecologies and a communicative ecology, e-development at the communal level can occur based on the fundamental aspects of each of the ecologies described. Information ecology fills the role for technological adoption for knowledge organisation and mobilization while communicative ecologies contributes the various modes of communication and innovation that shifts communication power clusters to a dynamic lifecycle which incorporates varying levels of population groups found in both urban and rural centres. Garth Graham (2011) elaborates on the elements for capacity building at the community level for e-development through a “bottom-up” approach in 5 main elements – Self definition, learning process, organisational and institutional adaptation, relate and attract, and community governance. Each element plays an important role for driving e-development that calls for the
facilitation of public deliberations and private sector participation to deliver a more horizontal approach for governance rather than a vertical one. Figure 2.1 further describes each of the elements of the e-development framework.

![Conceptual Framework Diagram]

**Figure 2.1:** Capacity building at the community level for e-development.

Source: (Graham, Hanna, Knight 2011)

**Conceptual Framework**

The conceptual framework of this study revolves around the concepts of information, communication and innovation ecological approaches and their framework for the development of broadband in Wellington County. The framework is built on the foundation of previous literature on the development of communication for social change. This literature (examined at
the organizational level for this study) can be found at the base of Figure 2.2 which is comprised of works from Wilbur Schramm’s Model of Communication (1947) to Castells’ Network Society (1996) and Catharine Middleton’s (2011) work on fixed and wireless broadband networks in the Information Society. The base of this literature is positioned to support and influence the structure of the information ecology, communication ecology, and innovation ecology all based in the systems level. Similarly all three ecological approaches has been the basis for the four variables of interest for this study: usability, accessibility, value of adoption and value of acceptability at the individual level for Wellington County residents.

Figure 2.2: Conceptual Framework

Figures 2.2 illustrate how each ecology relates to not only each other but to the core research themed variables for Wellington County and its positive and negative experience with broadband technologies. Moving from the past literature, the diagram depicts how the literature transitions
into the ecologies and how the ecologies are important to formulate how each theme of the study operates with one another. Considering the process for technological and social development, the assumptions of this study which is based on self reporting of broadband use is utilized as an anchor to categorize the findings and analyze key aspects of what Wellington County residents share when it comes to the experience and frustrations of connectivity and broadband technologies. In addition to the literature and the work surrounding the circle, it is essential to consider the social factors that are in constant communication within and between one another.

Based on the work of Bonnie Nardi and Vicki Oday’s Information Ecology, Altheide’s Ecology of Communication and Innovation Ecology, this study conceptualizes the positive and negative impacts of broadband using these 3 works along with the four variables of interest: value of adoption, accessibility, usability and acceptability and finally the concepts that altered communication for social change from Evert Rogers’ diffusion of innovation and Manual Castell’s network society to Paulo Freire’s indigenous media tools and Wilbur Schramm’s model of communication. These previous concepts have been frame worked around the three ecologies in order to link the previous literature around communication to mobilize broadband connectivity as a vehicle to drive economic growth and social development.
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Author</th>
<th>Model or Approach</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947</td>
<td>Wilbur Shramm</td>
<td>Model of Communication</td>
<td>Coding and decoding of information and communication from a sender to a receiver identified as development</td>
</tr>
<tr>
<td>1962</td>
<td>Everett Rogers</td>
<td>Diffusion of Innovation</td>
<td>Communication of innovation through certain select channels over time from the innovators and early adopters to the laggards</td>
</tr>
<tr>
<td>1970</td>
<td>Paulo Freire</td>
<td>Indigenous Medial Tools</td>
<td>Dialogue between student and teacher and the process of communication as development and discourse as conscientization or conscious raising</td>
</tr>
<tr>
<td>1998</td>
<td>Bonnie Nardi and Vicki O’Day</td>
<td>Information Ecologies</td>
<td>Technology understood under a complex system of niches, keystone species, coevolution of agencies, and locality of those agencies</td>
</tr>
<tr>
<td>1994-1995</td>
<td>Altheide</td>
<td>Communication Ecologies</td>
<td>A communicative ecology of systems hosted by different agents connected in various mediated and unmediated forms of communication; Shifting away from single communication channels to clusters/lifecycles</td>
</tr>
<tr>
<td>1999-2012</td>
<td>Dougherty &amp; Dunne, Meyer, Schempeter, Scott, OECD Reports</td>
<td>Innovation Ecologies</td>
<td>Transformation from liner to systems approaches to complex innovation. Dynamic functionalities in Web 2.0 Technologies</td>
</tr>
</tbody>
</table>
Table 2.1 characterizes each literature from a chronological standpoint based on how each author’s work has been critical for the development of communication and information technologies as the world becomes integrated into the digital economy. The remaining portion of this chapter will further examine each of the three ecologies (information, communication and innovation) in greater detail.

**The Information Ecology**

Bonnie Nardi and Vicki O’Day introduce the concept of information ecologies, relating technology to its usage and adoption practices. According to their book, *Information Ecologies: Using Technology with Heart* (1998) technology can be better understood based on its social setting. This translates information ecologies into a ‘system of people, practices, values and technologies in a particular environment,’ which plays very much like a biological ecology that can be found in an organism’s environment (community) or system. The essential attribute that establishes the ecology metaphor is locality or local habitat where ‘individuals have an active role, a unique and valuable local perspective, and a say in what happens’ in regards to the use of technology; the local ecology may be a classroom, agricultural farm unit/enterprise, or family health team. A successful information ecology will account for the diversity amongst different ‘species’ – species of people, information resources and other technologies in order to better understand the socioeconomic and political contexts in which technology is invented, developed and used (Nardi & O’Day 1998). By examining the values of technology on a small scale, the evolution of an effective information ecology can facilitate an alternative method of allowing people to engage in discussions pertaining to technology and society while still capturing local differences (Nardi & O’Day 1998).

Developed countries have been the primary agencies for information ecologies, however, whether the ecology has been a cohesively sustainable one is another matter. Both Nardi and O’Day criticize two opposing discourses on technology that is ‘at the cusp of this new millennium’: a technological utopianism and a technological dystopia. The former, dubbed as technophilia, calls to accept technology without question and welcome all technological development as good and inevitable while the latter, technophobia, seeks to be unreceptive to
technology as a whole (Nardi & O’Day 1998). Nardi and O’Day’s call for a middle-ground view of technology would be disputed by few, rather the important assumption to recognize is of technology’s dominance and how users can question which technologies “we will choose and whether we will use them well.” The terminology of‘ecology’ is distinct from ‘community’ despite the many similarities that these two terms draw. Ecology suggests diversity in a manner that community does not, for example a community commonly implies homogeneity i.e. a religious community, a community of scholars etc whereas an information ecology is comprised of parts that are different and unpredictable (Nardi & O’Day 1998, p. 56). Nardi gives the example of the woodland ecology of California that has a diverse array of life from oak trees to scrub jays. Ecology also implies continual evolution with an emphasis for change in comparison to communities that are often thought of as timeless or slow to change i.e. a cultured village like an Irish or Bengali village or Tibetan monastery. The ways in which technological development can be facilitated in a sustainable manner is by defining one’s own local information ecology. This would involve the creation of ‘a local habitation and a name for the technologies we use.’ Thus, it is long overdue for users to be empowered through technology by recognizing how their own innovations, development processes and collaborative efforts shape the technologies being used. Nardi and O’Day provide a framework of “a system of people, practices, values, and technologies in a particular local environment” borrows heavily from activity theory and Nardi’s contribution to the theory to focus on greater understanding for unity of consciousness and activity rather than relying on a debilitating need to distinguish ‘applied’ from ‘pure’ science. The unit of analysis for the activity theory and the activity system serves as a starting point for understanding human interactions with technologies. This contains not only the properties considered objective to the natural sciences but also socially/culturally defined properties as well. As a result, information ecologies reflect a ‘bottom-up’ appreciation of technology and innovation as it is being developed and implemented into hospitals, farm enterprises, schools etc.
The Hallmarks of an Information Ecology

Complex Systems

Bonnie Nardi and Vicki O’Day postulates that information ecologies contain 5 main hallmarks. The first of which is that technologies are complex systems of interconnections and relationships. This means that change in an ecology is systemic – the whole system will feel the effects if one of the elements of the ecology is changed. Moreover, local changes can disappear without a trace if said changes are not consistent with the rest of the system. Such is the conflict between local interests and overarching system that may not be congruent with the sum of its parts. For example in an intensive care unit, the relationship and work structure of doctors and nurses is both extended and dependent by the technologies that they use for treatment and care.

Niches

The second hallmark, diversity, acknowledges the variety of roles or ‘niches’ that the ecology must fill in order to allow continual survival and perhaps chaotic change. A monoculture typically known for growing a single crop or species are generally susceptible to the transfer of disease based on its weakness to the pathogen in question. Similarly such a frail, brittle ecology usually results in sensational results in the short term until it completely fails in the long term. Jacques Ellul, the late French sociologist, asserts a sweeping view of technology in his book *The Technological Society* (1954) by highlighting the importance of how technological efficiency drives out every other human value. Mechanical efficiency may be important, however, undermining the value of how intertwined technologies are to the social structures can be detrimental to the sustainability of the technology itself.

Coevolution

The third hallmark for an information ecology is coevolution (Nardi & O’Day 1998). Information ecologies evolve as new ideas and innovations arise in them. Internet development has been changing and people within the information ecologies learn, adapt and create such
technologies to meet the needs of the ecology in its local context. Note that evolution implies a past, present and future. In agriculture this may mean using an online cattle record system that can diversify certain farms functionalities while others may be hampered by adopting such practices.

**Keystone Species & Locality**

Each information ecology needs a keystone species – the fourth hallmark. Such species are designated as skilled people “whose presence is crucial to the survival of the ecology itself [and] whose presence is necessary to support the effective use of technology” (Nardi & O’Day 1998 p. 53). The final hallmark to an information ecology is locality, where the participants establish the identity and place of technology of an information ecology.

In the article “Ecological Dimensions of Information Literacy,” Jela Steinerová (2010) proposes a new perspective for information ecologies based on its relationship to information literacy and conceptual innovations in information science. The concept of Information literacy concerns the competencies to use ICTs to retrieve and disseminate information. It is the ability to identify, locate, evaluate and effectively utilize information in order to actively engage and participate in the increasingly complex information society (Steinerová 2010). It is a term that has received academic attention from the 1970s and can be particularly associated as a core concept in library sciences, academic librarianship and information scientists found in information management and communication. As seen in figure 5.0 of the appendix, information literacy, human information behaviour and information horizon all lead to information ecology and eventually to science 2.0. The term science 2.0 can be related to the technologies and practices that have been brought forward by Web 2.0. The focus of discussion around Web 2.0 technologies is that they provide a certain level of online user interaction that was not previously possible from Web 1.0 technologies. Websites and social media has become much more interactive, dynamic and interconnected producing online communities thereby allowing greater information sharing and features or functionalities on the Web. However it is important to note that Web 2.0 do not refer to any specific versions of the web but rather a series of technological improvements. Tim O’Reillyph (2005) describes his idea of the differences of between Web 1.0 and Web 2.0 in table
4.0 of the appendix. Science 2.0 follows a similar approach to technological improvements but embodied in the scientific method for interdisciplinary research, publications and the review process. Moving from Science 1.0 to 2.0 is controversial and not precisely defined however it is emerging into an open science movement where there is increased collaboration between scientists through the use of wikis, blogs and video journals. This is highlighted by Jela SteinSteinova’s conceptual framework that drives several factors towards Science 2.0.

It is argued that this type of framework can be utilized in a broadband context that ultimately leads to a ‘2.0’ advancement in agri-food, health and other industries based on the recent progress of broadband ICTs for socioeconomic growth. However, the positive effects cannot be realized as a result of a sporadic environment of broadband provision in Wellington County and others parts of Ontario and Canada as a whole. Jela SteinSteinova attempts to incorporate information literacy in the context of information ecologies by examining the relationships between the interconnections of human and their information environment. SteinSteinova identifies “information behaviours as activities in the information environment [and] information behaviour relies on information horizon and is manifested by information styles and relevance assessment” (SteinSteinova 2010).

The concept of an information ecology is just not a metaphor but a functional unit of technological adoption and as such the notion holds value in today’s society that is very much dealing with a hierarchical structure and association of knowledge organisations that fail to support rural populations that are willing and able to use such technologies. Figure 6.0 of the appendix depicts a model that links the external and intern environments that are present based on the information sources and information processes and their technologies. According to Jela SteinSteinova, the left side of the diagram involves the intellectual processes of information management while the right side examines information technologies, information styles and relevance assessments.

The concept of information ecologies can also be found in various other works. Williams (2005) examined information ecologies by the notion that information is not always purposefully sought. As a result, Williams adopted such concepts such as “uncertainty reduction” and “gaps”
to study and explain information-related behaviour and the ecology surrounding how information is encountered, monitored and evaluated. Williams also shifts the focus from information technological systems to users within the context that involved various kinds of biological and social circumstances and constraints. Information ecologies also have different interpretations. In environmental psychology, information ecologies have been used as a framework to study text or speech produced by people when discussing their information practices.

**The Communicative Ecology**

The communicative ecology model has been derived from the discourse between the social dimensions of communications technology and the dynamic interrelationships of people that use such technologies in both the physical and digital environments. This concept has emerged from Altheide’s *Ecology of Communication* (1994-95) which was influenced by MuLuhan’s (1962) work on media ecology and how the media structure’s affects the typical communicative content found in the media structure. As a result, the communicative ecology consists of a host of different agents connected in various mediated and unmediated forms of communication that can be considered at both an individual and community level within the complex media environment. However, it is important not to narrow the scope of the analysis to just broadcast media and telecommunications media but also broadband based ICTs including social media, peer to peer modes of communication as well as other social networking applications and face-to-face interactions. The communicative ecology is a model that shifts attention away from single communication devices such as email or mobile telephone towards whole system interactions by examining communication frameworks within the context of population changes and lifecycles, networks or clusters and power relations. Altheide asserts that the ecology of communication is a concept that can be used to link information technologies and their various formats with political, social and cultural phenomena from the past, present and even future. Furthermore, Altheide argues that the construct of communication is fluid and that the ecology of communication can be used to attempt to model how researchers examine how technology may or may not be integrated into already existing communication patterns rather than technology being independent of the context that they are used. For example if a new communication technology does not complement the existing communication patterns, it risks rejection.
Communication ecology has 3 layers: the technological layer, a social layer and a discursive layer. The technological layer is described as the devices and connecting media that enable communication and interaction while the social layer consists of the various people and their organisation around a social structure (Foth & Hearn, 2007). The discursive layer refers to the content found within the process of communication, this may include “ideas or themes that constitute the known social universe that the ecology operates in (Foth & Hearn, 2007).” Like biological ecologies, communicative ecologies have lifecycles defined within periods of growth or decline based on the ever changing landscape of communication networks.

More recently, the communicative ecology framework was utilized by various contributors to human communications research. More specifically, "Comparing the Communication Ecologies of Geo-ethnic Communities: How People Stay on Top of Their Community" by Wilkin et al. (2007) incorporates a communicative ecology approach to their study in order to develop a communications map that connects researchers and practitioners to a wide range of ethnically diverse populations. The goal was to identify advantages for studying communication ecologies and stressing the importance of people using more than one communication options and different media outlets to various degrees to accomplish particular goals in understanding, orientation, play and health.

Allison (2007) presents a unique perspective on a communicative ecology by using the 3 layer model to describe individual social groupings centered on geographic and virtual space; this includes both face-to-face and electronically mediated communications. Using action research to document findings, the study identifies a new form of community called "the primary attention group" which was used to negotiate through the 3 subsystems of relationships in order to examine individual social groupings. Allison’s findings suggest that the loss of congruency and limitations of community group sizes contribute to a restriction of the number of interpersonal relationships that a community can sustain. Allison asserts this due to the fact that during and after the Industrial Revolution, villages grew and more and more people began to live in cities, however the size of a traditional community did not. “The number of people born into a congruent community where everyone knew everyone else intimately rapidly declined. Thus a core defining element of traditional community changed (Allison 2007).” Allison coined the
term ‘primary attention groups’ to signify that although communities were once tied to geography, primary attention groups are located in a combination of physical and virtual space. This has been corroborated by many other scholars that have examined the development of a globally connected electronic environment with the coming of the Information Age (Kurzweil, 2005; United Nations Development Programme, 2001, as examples).

Communicative ecologies can also be found in Shepard et al. (2007) paper on the ecologies of domestic ICTs. The concept of communicative ecologies is extended to the material and spatial aspects of domestic ecologies of communication. This means that a setting like a home in either a rural or urban environment acts as a communication hub that is situated in a dense network of local, global and international communication networks. Therefore how domestic technologies and other particular technologies are accommodated very much depend upon many variables in the ‘host’ environment.

**Innovation Ecologies**

**Systems Approach to Technological Innovation**

Innovation can be defined as any new knowledge that is introduced into and utilized in an economic or social process (OECD 1999). Innovation in agricultural practices has shifted from an approach seen in the transfer of technology to a more bottom-up, inclusive and participatory way of thinking, learning and innovating. Similarly healthcare in Canada is undergoing a radical shift from the old medical model that dictates the physician or any other healthcare provider to assume an authoritarian role in relation to the patient. As a result, the patient is seen as a passive and dependent individual that is looking for advice and/or guidance. The shift towards a more social ecological model for healthcare focuses on a two-way model of patient-clinician interaction; just as there is a transition from Web 1.0 to Web 2.0 technologies, the same is true moving from Health 1.0 to Health 2.0. Health 2.0 involves a wider system where all constituents become an active and responsible partner in the healthcare pathway (Van, Engelen, Berben & Schoonhoven 2010). Innovation in new technological tools in online and mobile platforms has
assisted patients, clinicians and agricultural knowledge workers in a variety of formats and applications.

Innovation systems thinking has challenged the ways in which society disseminates information by shifting from a linear approach to a framework that explores the complex relationships amongst differing agencies, social and economic institutions and endogenously determined technological and institutional opportunities in innovation and development. Recent empirical studies have documented the change from the unidirectional transfer of technology to a more complex, process-based systems approach.

Studies of innovation for the purposes of this paper can be dated back from Adam Smith (1776) who examined the influence of innovation as new production in techniques and new divisions in labor for output and for society. Following up on these ideas was Ricardo (1821) who discussed orthodox (neoclassical) and heterodox economic perspectives on innovation and technological change in agriculture. Based on Ricardo’s book on *The Principles of Politician Economy and Taxation*, Ricardo considered a number of challenges of agricultural production, most notably the importance of technology providing opportunities in production possibilities. Furthermore, the author distinguished between 2 types of technologies: one which “increases the productivity powers of the land” or that which “obtains its produce with less labor” (Ricardo 1982 p. 54). As other scholars have noted, “Ricardo’s analysis gave rise to further interest in the social and economic effects of technological change by such classical political economists as List (1841), Mill ([1848] 1965), and Marx ([1894] 1990).”

The work of Schumpeter then went on to differentiate technological change by segregating between invention, innovation, and diffusion. He defined innovation as any addition of an already existing body of knowledge while increasing the production function and decreasing the associated cost curves. Moving to advanced theories such as the agricultural knowledge and information systems (AKIS) perspective highlights the linkages found between research, education, and extensions for fostering technological change and generating knowledge. The AKIS conceptualized the diffusion of innovation based on a systems perspective where information is presented in a pattern superimposed on data which influences the interpretation
and transmission of the aforementioned data. As such, the systems approach to diffusion of innovation signifies that knowledge consists of meaningful experience and such knowledge must be encoded or transformed into information if it is to be transmitted (Pant & Odame 2009). Biggs and Clay (1981) and Biggs (1989) introduce concepts that describe the relationships between innovation and institutional learning and change. Clay and Biggs argues for agricultural innovation systems that is characterized by the participation of a range of actors and multiple points of interpretations or practices in different contexts contributing to innovation.

When considering farming systems for technological innovations, the 2 major paths of evolution in the literature involves the system scale, performance criteria and target beneficiaries. The systems scale, performance criteria thinking originally focused on productivity as an indicator for the system where studies have shown that a sustainable system is one that is economically viable, socially and politically acceptable, and technologically adaptable. The second farming systems, target beneficiaries, evolved based on the social processes for technological innovation. The current farming systems argues for a hard and soft systems approach that goes beyond the biophysical components of a farm like livestock feeds or crop production (Pant 2012) (Pant & Odame 2009).

Institutional change is a large factor for innovation; the notion for institutional theories depicts a modern society as one made up of autonomous and purposive individuals and organized actors (Meyer 2010). There are numerous ways in which to describe and approach institutions, most notably some of the reflections on institutional change and theory has strongly been influenced by structuration theory (Scott 2003). Social scientists have been rediscovering the importance of institutions for social, political and economic life (Scott 2003). By the turn of the last century, instructional theorists differentiated agent-based and naturalistic accounts of viewing institutions. Agent-based endorses a regulative view of institutions while naturalistic accounts argue more favorably for normative and cultural-cognitive aspects of institutions (Scott 2003). Agent-based understanding deems more attention for individual agents to work individually or collectively to play a large role for defining the power struggle in institutional processes (DiMaggio 1988). Over time, Naturalists saw norms being passed from person to person and group to group at a
more macro level. Meaning, a naturalistic process involves the efforts of many who participate in order to advance their own interests.

Scott (2003) calls for an approach that characterizes three elements to ‘the pillars of institutions’: the Regulative Element, Normative Element, and Cultural-Cognitive Element. The regulative element is emphasized by economists and political/social scientists that favor rule-setting, monitoring and sanctioning activities while the normative element stresses norms and roles and their prescriptive expectations for social order (usually favored by social psychologists and sociologists). Behavior is seen to be morally governed through internal social obligations. The final element, cultural-cognitive, is associated with organizational sociologists that emphasize attention towards a shared conception that make up social reality where meaning is made. To describe how the 3 elements of institutions move from place to place, various carriers were distinguished – symbolic systems, relational systems, routines and artifacts. Scott (2003) argues that carriers are not neutral transport vehicles but rather they strongly influence the elements that are transmitted across and within institutions. In summary, Institutional Theories and the 3 pillars of institutions has helped shape define the role that institutions play for societal development by characterizing the movement of people in the modern world and the flow of people from one area to another. However questions still remain regarding which carrier is associated with which institutional element, how do the different carriers affect the way the different institutional elements are received and interpreted and what is the role of the information intermediaries.

Innovation has been a key vehicle for enhancing access to information and trade. The elements of disruptive innovations have come up throughout this study. Christensen’s seminal work on “The Innovator’s Dilemma” (1997) highlights disruptive innovation using an S-curve of a technology life-cycle and the concept of value networks. He argued that disruptive technology operates in a different value network (see Figure 2.3).
The innovative technology appeals to low-end, price-sensitive consumers, however, after maturation disruptive innovations begin to challenge the traditional performance markets and existing products. Incumbent organizations and entities tend to ignore early signals of a technological shift since they are too consumed with the current demand pattern of their leading consumer. Ultimately they dedicate all their innovation for improving performance when a disrupting technology begins to overtake the market while an incumbent focuses on overachieving rather than addressing productivity and efficiency. Table 2.2 is a framework of innovation from first generation to fourth generation. Moving from a linear conception of innovation focuses on top-down processes of diffusion to fourth generation grounded in a knowledge-based networked economy (Stone et. al, 2009).
Table 2.2: Examples of evolution of innovation metrics by generation.

<table>
<thead>
<tr>
<th>First Generation</th>
<th>Second Generation</th>
<th>Third Generation</th>
<th>Fourth Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• R&amp;D expenditures</td>
<td>• Patents</td>
<td>• Innovation surveys</td>
<td>• Knowledge</td>
</tr>
<tr>
<td>• S&amp;T personnel</td>
<td>• Publications</td>
<td>• Indexing</td>
<td>• Intangibles</td>
</tr>
<tr>
<td>• Capital</td>
<td>• Products</td>
<td>• Benchmarking</td>
<td>• Networks</td>
</tr>
<tr>
<td>• Tech intensity</td>
<td>• Quality change</td>
<td>innovation capacity</td>
<td>• Demand</td>
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<td></td>
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<td>• Clusters</td>
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<td>techniques</td>
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<td></td>
<td></td>
<td>• Risk/return</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• System dynamics</td>
</tr>
</tbody>
</table>


Previous framework utilized to examine broadband adoption for innovation includes the Technology Acceptance Model (TAM) of Davis (1986) and the Technology Readiness Index (TRI) of Parasuraman (2000). TRI links the attitudes, perceptions, perceived usefulness and ease of use of broadband enabled devices using 4 factors (see figure 2.4):

1. optimist (how positively viewed a technology is)
2. innovativeness (technological pioneers and thoughtfulness)
3. discomfort (perceiving the lack of control over technology)
4. insecurity (distrust in technology)

Parasuraman (2000) argues that optimism and innovativeness are drivers of technological readiness while discomfort and insecurity are inhibitors. TRI proved to be a useful theoretical model for understanding users’ acceptance of technology and the rationale behind such decision.
making. The Technology Acceptance Model (TAM) measures the adoption of technology based on perceived usefulness and perceived ease of use in order to determine an individual’s intentions to use a system (see figure 3 below) (Gerrard, Cunningham & Devlin, 2006).

**Figure 2.4: Technology Acceptance Model (TAM)**
**Source:** (Gerrard, Cunningham & Devlin, 2006)

Although this study did not utilize TRI or TAM as a form of measurement of broadband adoption, these frameworks for the innovation ecology helped formulate how a communication and information ecology can interact with the many components of an innovation ecology. Lastly, innovation literature has suggested that there are three dynamics of emergence to enable ongoing strategizing (Dougherty & Dunne, 2011 p.1218). The first dynamic of emergence, combining current/future capabilities with business opportunities, allows the development of new possibilities involving the adoption of evolving technologies and markets (Dougherty & Dunne, 2011 p.1218). The second dynamic involves the amplification of strategic action in real time in order to focus on process of innovation rather than its content. Since nonlinear systems can be difficult to predict and control, one can set improvised directional boundaries within self-organized solutions on local actions and outcomes (Dougherty & Dunne, 2011 p.1218). The final dynamic, recombination and stabilization, is about the long-term commitment for complex innovation that is required over many years for improving performance and achieving continuity to allow new possibilities to emerge.
Summary

The idea of information and communication ecologies has a valid framework as an initial perspective to overcome the barriers from achieving ubiquitous access and connectivity across all levels of government and users. However the problems are more inherent then just what the literature describes as a “digital divide.” This is made even more apparent from the lack of an appropriate definition of what broadband really is. Accepting a definition of 1.5Mbps speed being considered as “broadband” is not only primitive but it is also foolish and unproductive if Canada is to achieve its goal as a more connected nation by 2015. Innovation in the information age is constantly changing and evolving, as a result adhering to a restrictive form of definition for broadband, especially one considered low as 1.5Mbps, is a bad design that highlights the shortcomings of incumbents who have skimped on the infrastructure in order to reduce costs for providing broadband services.

Using an “ecology” as a metaphor for analyzing communication and the utilization of broadband based ICTs provides a number of unique possibilities to better understand how social activities surrounding connectivity in Wellington County is organised and its implication for higher order at the macro level and its influence at the micro level. Even though the analysis involving an ecology will help define boundaries of an ecology, its coherence within that boundary and its relative stability, there are certain limitations in which the literature fails to take into account. Among these shortcomings is the lack of substantive discussions around the discourse of technology’s role for impacting society as whole and societal differences in which technology must work within. This means a greater attention must be forth for stronger interrelationships amongst the social, economic and political contexts in which technology is innovated, developed or compromised. As broad and redundant as this may seem, examining the role of technology and connectivity at a systems level will help explain how to sustain technological microcosms that thrive within societal differences. Although Bonnie Nardi and Vicki O’Day’s work on the impacts of technology emphasizes the differences found in an ecology, the concept fails to address key factors that compromise connectivity. This can largely be attributed to a failure of the literature to document technological and connectivity impact changes that have created the situation Canada finds itself in. Lastly, the idea of building a vision for broadband technology to
be tools that blend education, entertainment and consumption all under one soup seems contradictory to the argument of “let’s examine the local level” impact of connectivity and broadband technologies.

The large focus of attention generated for a central agency i.e. researchers arguing for individuals asserting their own agency rather than having technology determine their values and practices, provides no basis for distinction or boundaries between people, values, practices and the technologies themselves. Both the communicative ecology and the information ecology thinking has struggled to grasp people as separate “agencies” without distinguishing people from the other parts of the technology working in an ecology. The same can be said for Castell’s network theory that describes the inner network structure. These problems stem from the fact that the market functions of the internet is based on connecting people mainly for profit making purposes rather than a socioeconomic or livelihood development process. This is not to undermine the importance of the private sector business and its role for the interplay between the uptake of technology and the economy. Both expected and unexpected outcomes of new technology, such as broadband, must be examined in context. The literature’s discussion presented here suggest that although user-generated approaches may contribute to pockets of connectivity in the short term, this will unlikely sustain the long term propensity to rely on an infrastructure required for a robust platform designed for a digitally engaged population.

The studies presented have given the case that the economy and public interest will have to play a larger role that can contribute to develop an infrastructure that enables connectivity. However, the emphasis is misplaced through a supply-driven perspective rather than a demand-driven perspective. A demand-driven perspective for technological rationality is examined at the micro-level, bottom-up approach. Examining the impact of technology from a demand-driven framework will also give the advantage of providing a broader picture of ICT applications that represent the labour of pilot projects and newly implemented projects. Thus the concepts of ‘information’ and ‘citizen support’ are essential for connectivity to be achieved in terms of the 4 variables discussed: affordability, usability, value and accessibility.

Garth Graham (2011) conceptualizes the interplay between top-down policy structures described previously and the grassroots, community-level initiatives for a networked economy very well.
The author calls for a community-level capacity building for e-development. The literature describes broadband as something that intensifies and redefines local knowledge and innovative practices however this cannot be fostered if the Canadian government is resting on the assumption that technology in itself is the job. Garth Graham summarizes the central point being argued here – the need for a greater intellectual curiosity for broadband in all levels of public and private sectors in order to emphasize the nature of broadband equity for rural socioeconomic development.

The following chapter discusses the methodology that was employed in order to obtain the data that was used for analysis.
CHAPTER 3: Methodology

Introduction

This chapter describes the approach undertaken for the research process. To address the questions posed in Chapter one, the methodology of the research is identified and described based on each data collection tool, how the process was carried out and its analysis. The research design was generated to explore people’s perception of ICTs and broadband, how they see themselves within a networked digital society and the way they work and overcome challenges to participating in the digital economy. The chapter begins with the epistemology of the study followed by the context under which this study was selected and conducted. Following the context of the study is the research design which discusses in depth the data collection tools that were utilized on the field. This chapter concludes with the analytical tools used as well as the limitations that were encountered.

Epistemological and Methodological Considerations

The epistemological approach of this study was one based on a post-positivist framework where emphasis was placed on multiplicity and complexity rather than differentiating the importance of objective or subjective values over one another. This type of approach allows the researcher to be interpretative through meaning (knowledge) and experience by seeing the participants in a relational manner not bound by reason (Ryan 2006). Research methods mirrored a learning role to further explore the impacts of communication for development through ICTs and how broadband accessibility supports social and economic benefits while managing social change and empowering rural environments. The issues to broadband accessibility, affordability, value and usability which was critical to the research being conducted was approached with the consideration of examining broadband challenges based on current research practices and knowledge overview of the environment (Ryan 2006).

The data collection tools adopted for this study aimed to connect the researcher and participants by conducting research among the people rather than conducting research on them (WolCott
1990). As a result, the research questions were designed to strive in engaging with the social construction of a narrative with the participants rather than evoking responses that would be otherwise prepared to standard questions that are ‘manufactured.’

Approaching the study through post-positivistic lens, the research questions do not assume the role to solve the problems that they are set out to investigate. Moreover, these questions may incite a problem setting or indicate causes to the problem rather than facilitating problem-solving thinking with the participants. The key tool of post-positivist research emphasizes the concepts of discourse which concerns the balance of power and the values found within a narrative. The concept of post-positivism has been increasingly been associated with contemporary empirical research activity (Phillips 1990, Schumacher & Gortner 1992, Ford-Gilboe et al. 1995). Like positivism, post-positivism share the belief of the importance for rational justification through scientific verification however the difference lies in the acceptance for theories, knowledge, background and values of researcher and participants that can influence what is being observed. Thus, pursuing objectivity is just as important as recognizing the possible effects from biases.

Karl Popper (1980) describes positivism by differentiating between “scientific theories” and “myth,” where he defined scientific theories as predictions that can be empirically falsified i.e. shown to be incorrect. This type of approach has led scientific discovery and innovation through data that can either support the currently accepted theories or falsify such theories – no scientific theory can be proven to be true or correct. A prime example is Einstein’s scientific Theory of Relativity. The theory has been put to the test – Eddington’s eclipse observation in 1919 confirmed the theories’ predictions that contrasted Newtonian psychics that were commonly accepted at that time. In contrast, Sigmund Freud’s development of psychoanalysis to deal with the unconscious mind can never be disproven, according to positivism, due to the nature of the theory to use ad hoc hypothesis to explain contradictions. Such is the core of positivism which is commonly labelled as Falsification Principle where the underlying idea is that experience can show theories to be incorrect, but can never prove them right (Kuhn 1970, Hanson 1958).

This study’s post-positivist framework presents a less severe perspective on its epistemological approach. Instead of only dealing with the observed and measurable knowledge of broadband
impact on society, which can only be either verified or falsified, the post-positivistic approach assumes the underlying principle of critical naturalism for ICTs – the idea that the digital world and network society is dependent upon human perceptions and therefore to study such an environment, the researcher must learn to adapt to it (Cook, Campbell & Day 1979). With the use of triangulation to recognize the need to measure phenomena in a variety of methods, the qualitative and quantitative domain of the study was bridged under a commonality to understand the impact of broadband for the region of Wellington County (Cook, Campbell & Day 1979).

The implication of adapting a post-positivistic epistemeology for this study means that the role of the researcher will not be wholly detached from inquiry. Personal processes and involvement will be considered an element of the research through human inquiry. The use of in depth interviews, documentation analysis and observations reflects an interpretative type of research design that was largely conducted for analytical induction rather than deduction. By adopting inductive reasoning, the study was able to examine specific pieces of information in order to derive to a general principle or common idea. As a result, the study strived to move from specific observations of participant perspectives of individuals, organizations and institutions to broader generalizations and theories that pertain to the patterns and measures that were explored for regularities or irregularities. Framing this study within a post-positivist worldview highlights the importance of the socio-cultural context in which social structures (individuals, organizations and institutions) learn to communicate, network and innovate based on their norms and interactions. Differences of worldviews among study participants in agriculture or health of broadband influence and perceptions have been viewed as multi-faceted characteristics that can be understood through the triangulation of multiple measures of observations. Therefore this study approached objectivity by conducting research in a manner that was contained within the context of a broader community of past researchers and practitioners that have been contributed knowledge and values to the investigation and access of broadband networks, demand, usage, supply and policy in Canada.
Context of the Fieldwork: Case Study of Wellington County

The census division of Wellington County is an area located in Southwestern Ontario. There are seven municipalities and a separate single-tier municipality: Centre Wellington, Erin, City of Guelph, Guelph/Eramosa, Mapleton, Minto, Puslinch, and Wellington North. The County of Wellington residents is comprised of a diverse cultural population; the 2011 Statistics Canada Consensus Data has shown that the population of this area is approximately 208,360 with a population density of 78.3 /km² and mean age of 39.5 (Statistics Canada 2011 Consensus). The 14 urban centres can be seen below where Wellington’s residents are evenly divided between the north, centre and south (Country of Wellington Credit Review, 2011)

![Wellington County Map]

**Figure 3.1: Wellington County**

Source: (Country of Wellington Credit Review, 2011)
Wellington County has experienced considerable demographic changes in the area with the majority of growth occurring between 2006 and 2012 (Wellington County Economic Development Strategic Plan, 2012). Although growth rates for over the last decade have been comparatively slower at the provincial level, Wellington County is at a position to accommodate the growing population with an expected growth of 27,400 additional residents by 2031 (Wellington County Economic Development Strategic Plan, 2012). The Wellington County Official Plan (2012) projects the future of the county based on household population and planning for growth-related facilities. The forecast also anticipates that 82% of the population growth will occur in urban centres. However the guiding growth for the county has been mainly directed for urban area intensification and redevelopment and to encourage more efficient use of land through increased urban densities.

Opportunities for growth for rural Wellington County are based on industries in agriculture, forestry and aggregate operations (Wellington County Official Plan, 2012). Rural System policies intended to ensure employment and economic opportunities is operated based on the abilities to provide larger lots, larger buffers for compatibility, and proximity to rural resources. Supporting trends for more home based businesses will be used based on the applicable policies of this plan. Other things being considered would include sales avenues for products produced on the farm, small scale industries and other rural enterprises. Through this plan, Farm Land protection for prime agricultural areas will be identified in order to protect conflicting development (Wellington County Official Plan, 2012). Despite such planning, Wellington County has been experiencing a growing but shifting population where the total population aged 45 years and older has increased from 41.4% to 44.5% from 2006-2012.
Figure 3.2: Wellington County Population Pyramid 2011
Source: Statistics Canada 2011 Consensus

This can be compared across Kitchener-Waterloo-Barrie’s regions who has experienced a 40.6% increase in the population aged 45 years and older (Wellington County Economic Development Strategic Plan, 2012). The aging population over 65 also accounts for a higher share of the population with Mapleton as the youngest population (30.4 years) and Puslinch as the oldest (44.2 years). This can be attributed to a number of different factors including the region’s workforce, future business attraction efforts and healthcare infrastructure (Wellington County Economic Development Strategic Plan, 2012). With the outmigration of youth from rural areas, many older generations find themselves in and out of the workforce while some are struggling to keep up with the ever expanding global economy. According to the health status report prepared by the Wellington-Dufferin-Guelph Public Health, figure 4 projects Wellington County population for 2016.

The labour force for the area has experienced a growth of 12% that has been greater than the province of Ontario at 9%. However, the County of Wellington Credit Review (2011) indicates that a significant portion of the population has lived in the area for several generations. In fact, over 60% of the population is third generation Canadians and where less than 1% of Wellington residents are non-permanent residents. The competitive advantages that Wellington County has
are numerous. Its proximity to urban areas like Waterloo, Hamilton and Toronto makes the area accessible while complimenting rural-urban economic activities. Educational institutions as well as natural amenities such as Rockwood Conservation Area’s unique geological history make the area a great attraction for tourists and those wanting to relocate or study aboard.

In August 2009, one member from each of the seven municipalities of Wellington County, the County and the Wellington Waterloo Community Futures Development Corporation (WWCFDC) created the Terms of Reference to establish an economic development Group for Wellington. The goal for this group is to build a working relationship with municipal and regional bodies by providing funding to conduct projects thereby creating a strong local workforce. Table 6.0 in the appendix indicates the labour force size for each sector for each of Wellington’s municipalities (Country of Wellington Credit Review, 2011). The separated municipality of Guelph is significant for Agri-business, biotechnology and environmental activities however based on a regional perspective the top 5 industries within the labour force include agriculture and resources, manufacturing, retail trade, educational services and healthcare (Wellington-Dufferin-Guelph Public Health, 2012). For Canada overall, the demographic growth for its provinces and territories is predicted to come from the visible minority groups where one in five Canadians will be part of a visible group by 2017 (Wellington-Dufferin-Guelph Public Health, 2012; Statistics Canada, 2005). Wellington County has a low experience with the immigrant population with Mapleton having the highest recent immigrants (3.5%). Recent immigrants in Mapleton have been identified as low-German speaking Mennonites and Puslinch as the highest rate of immigrants (16%) (Wellington-Dufferin-Guelph Public Health, 2012).

Having access to high speed internet is critical in today’s economy where using modern tools for communication and operations is important for social and economic development. The internet has become an indispensible part of every aspect of our lives from increased intelligence for all types of devices to the opportunities of innovation that it provides. With broadband information and communication technology, Wellington County can participate in the global economy while still maintaining a local purpose. Unlike the past, today’s quality and quantity are not the only benchmarks for growth and development. Visibility in the market is an essential component for
people to recognize each other in order to experience local and global success. Wellington County still has a number of challenges before equal broadband coverage is available for all of its residents. Such barriers include the need for rural broadband expansion, assessing the local capital commitments of municipalities based on requests by business and community partners as well as building the capacity to sustain broadband coverage to a level based on bandwidth needs of the population (Wellington County Economic Development Strategic Plan, 2012).

Plans to build rural broadband infrastructure for Wellington County was announced in 2009 as part of Rural Connections Broadband Program run by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). The plan launched in 2007 with currently 54 rural broadband projects allocated in $31.4 million in investment funds with the help of the telecommunications sector providing up to two thirds of the cost of each municipal project. By March 31, 2012, approximately half a million rural residents and businesses have had access to internet services (OMAFRA, Rural Connections). See figure 9.0 of the appendix for more information. Since the announcement of the program, $3 million have been allocated for the broadband infrastructure; Figure 10.0 of the appendix indicates broadband coverage before the project while figure 11.0 depicts the impact of the project (Wellington County Economic Development Strategic Plan, 2012).

Despite the project’s design to build 18 towers with high speed wireless capabilities by Xplorenet, Wellington County continues to struggle with broadband coverage. To add to the problems was funding being restricted for areas that previously had 75% coverage, resulting in areas like Erin left with access to only some of its residents. Recent launch of Xplorenet’s 4G satellites has been expected to improve internet signal strength by preventing degradation or eliminate blockages. Even with such claims, it is very likely that access and availability issues still continues to persist for Wellington County residents. This study aims to identify the positive impact of a robust broadband access that is available and accessible and some of the negative impacts associated with the challenges and constraints that Wellington County residents experience as a result of the lack of a ubiquitous broadband infrastructure.
Even with greater investment for underserved areas satellite communications can often cost more than competing technologies. Companies like Everus Communications, which started in mount Forest as High-Speed FX won the $1 million bid to initiate a wireless high speed broadband infrastructure but has had difficulties maintaining its contracted work for counties of Grey, Wellington and Dufferin. Consequently, Everus Communications going out of business allowed Barett Xplore Inc (operating under the brand name Xplorenet) to purchase some of Everus’ equipment and customer base in order to invest $2 million and receive $1 million in funding from OMAFRA to complete the work of building the broadband infrastructure. Today, rural Wellington County continues to struggle with an effective broadband strategy of infrastructure and it is this study’s objective to characterize the uses of broadband and how Wellington County can move forward in order achieve greater integration of the internet within its areas. It is the idea that Wellington County has experienced a limited but concentrated effort to build broadband availability for its residents that makes this case study an ideal location to further increase the knowledge surrounding the influence of high-speed connectivity and its pervasiveness across all sectors and cultures in Wellington County and beyond. To summarize this point, table 3.1 characterizes the scope of broadband initiatives from 2007 that was directed for Wellington County.
**Table 3.1: Broadband Initiatives for Wellington County, Ontario**

<table>
<thead>
<tr>
<th>Year</th>
<th>Goal</th>
<th>Investment</th>
<th>Launch of Rural Connections Broadband program (Objective)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Bring broadband internet access to rural and remote areas currently underserved areas: 18 projects marked the first wave of broadband infrastructure undertaken jointly by rural municipalities and the province. Wellington County being one of 14 Ontario municipalities utilizing $1 million in funding (via Rural Connections Broadband Program)</td>
<td>Telecommunications sector responsible for 2/3 of each municipal project infrastructure costs contributing $2 for every $1 invested by the province. Totaling $31.4-million investments for 54 rural broadband projects</td>
<td>Bring high-speed web access to under-serviced rural areas by partnering with private firms in order to develop infrastructure including a series of towers that sends wireless internet signal to receivers at people’s homes.</td>
</tr>
<tr>
<td>2009</td>
<td>Completion of Broadband Canada: Connecting Rural Canadians. A total of 18 project “funded in 5 provinces and 2 territories, bringing broadband access to a total of 218,000 previously unserved and underserved households</td>
<td>7 companies approved for funding for Ontario:  - Barrett Xplore Inc.  - Bell Aliant Regional Communications, Limited Partnership  - Chatham Internet Access  - Chippawa of the Saugeen First Nation, known as Saugeen First Nation  - CORE Broadband Inc.  - Huron Telecommunications Co-operative Limited  - True 802 Wireless, Inc</td>
<td>As part of Canada’s Economic Action Plan and the 2009 Budget to develop a strategy to extend broadband coverage ($225 million)</td>
</tr>
<tr>
<td>2010</td>
<td>Speeds. Minimum download speed of 1.5 megabits per second, wireless connectivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round 1 May 9, 2010</td>
<td>Round 2 between July 6 and 15, 2010</td>
<td>Round 3 November 6, 2010</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>Investments: $2 million from telecom sector and $1 million from OMAFRA</td>
<td>Goal: Launch of Xplorenet’s 4G satellites to build 18 towers with high speed wireless capabilities</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>- Deployment of towers, 4G WiMAX network and two next-generation 4G satellites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>New partners including SWEA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Research Design**

The time period that was allocated for this study was approximately 3 months starting in October and ending in December 2012. Any remaining respondents unable to participate during the scheduled time period for data collection were moved to throughout the months of January through May of 2013. A double case-study approach was employed where most of the data were obtained from sub-cases within each case study. The first case study was categorized under agri-
food farm and firms that are situated in Wellington County while the second case study was comprised of local family health teams across Wellington County. The case study design was considered appropriate for the objectives of this study due to its exploratory and explanatory characteristics and its nature to study complex phenomena through a case-by-case analysis. Although such a design does not traditionally allow for generalizations, the use of each case study can provide meaningful information that identifies key elements of the impacts of broadband technologies for rural development within the context of Wellington County. The purpose was to use multiple subcases for each of the case studies in order to gather information about the effects of broadband based on 4 key variables: usability, affordability, availability and accessibility.

The qualitative case study approach is one that builds exploration within the context of various data sources. Creswell and Clark (2007) defines a qualitative case study research design as one where the researcher explores a bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information. Robert Stake (1995) and Robert Yin (2003, 2006) discuss case study research by arguing the importance of “subjective human creation of meaning” without discrediting the notion of objectivity. A case study design is best utilized when the objective of a study is to answer “how or “why” questions (Yin 2003) - based on Chapter one of this thesis, the premise of this study is to have a greater understanding of how broadband technologies influences rural Wellington County and in what ways. Robert Yin also stresses the importance for selecting the appropriate contextual conditions so that the behaviors of those involved in the study are relevant to the phenomenon of interest. This is especially important because of the unclear boundaries between the context and the case in question. Subsequently, generating different information based on the subcases from a double case study design can provide useful insights on broadband and socioeconomic development that can aid relevant stakeholders, practitioners and researchers in the area of study. By understanding the anchor which holds the context of individual and organizational experiences and perceptions to connectivity, this study was able to analyze how rural farmers and family health teams of Wellington County experience broadband technologies and their decision making processes that are developed and delivered within the bounded context.
Mike and Huberman (1994) argue the importance for articulating the unit of analysis for case study research as “a phenomenon of some sort occurring in a bounded context [whereby the case is] in effect, your unit of analysis” (p. 25). Thus the unit of analysis for the double case study is reported to be the experience/perceptions of broadband technologies and the rationale (decision-making process), strengths, weaknesses, and effectiveness of broadband connectivity for socioeconomic development, human interaction and their propensity to communicate. The many multiple layers of analysis for a case study research was formulated as a double bounded case – the first bounded case is designated under agri-food industries while the second is for rural telehealth and broadband based health. Both bounded cases contribute to the larger body of research that was aimed towards the understanding and discussion of factors influencing connectivity and broadband in rural southern Ontario.

Cultural and social indicators were used as a proxy for analysis which includes the knowledge about broadband technologies, its causes or impacts, perceived norms for using broadband in the context of Wellington County, personal attitudes towards broadband connectivity and community support for broadband integration. The involvement of the researcher in the study was reflected towards a community-based ethos for understanding and analysis. In addition to the four study variables identified previously, several key indicators were used as identifiers of each case study. These identifiers helped create inclusion criteria for participants with the study. One of which is the site’s location and proximity to a city centre like Guelph, the geographic diversity surrounding the site such as high or low environmental barriers that prevent access to local hospitals, roads and municipalities, and the magnitude of activity of the participant (whether they are considered to be a microenterprise of 10 or less employees or small-medium emprise).

The selection of research sites was based on non-probability purposive sampling that initialized from Sites of the Ontario Telemedicine Network (OTN) for the health case study and the OMAFRA agri-award winners for agricultural farm families or firms. The identification and location of respondents list for farmers in Wellington County was also obtained through the Ontario CSA (Community Supported Agriculture) Directory and the Guelph-Wellington Local
Food (GWLF). To obtain key informant individuals from health organizations, the Waterloo-Wellington Local Health Integration Network (LHIN) provided a comprehensive listing of all Family Health Teams located within the County of Wellington. Non-probability purposive sampling was then conducted on this listing. A similar process was followed with key informants in agricultural practices within Wellington County. In order to obtain variation within the sample size several criteria were chosen based on an iterative nature where each preceding stage was integrated into the next stage. This was intended to direct the study to be more reflexive rather than repetitive - which will be a significant factor for obtaining a comprehensive and analytical understanding of each stage of the research process.

**What is considered rural?**

Examining the impact and influence of rural broadband in Wellington County requires defining ‘rural’ due to the variation of definition that can be found being used by industry leaders, agricultural practitioners and health specialists. The current definition of rural, according to Statistics Canada, is based on the geographic distribution of the population size and population density. The definition is comprised of small towns, villages and other populated areas with a population of less than 1,000 and a population density less than 400 per square kilometre.

Specifically defined geographical units are designated under country subdivisions based on 4 levels: the top tiered divisions are labelled as provincial or territorial, the second-level belongs to consensus divisions (CD) which are classified as provincially legislated areas such as counties or their equivalents; CDs are then further divided into census subdivisions (CSD) which is a general term for municipalities. Dissemination areas (DA) consist of the smallest geographical units, with a population of 400 to 700 persons. Based on the location of this study, Wellington County is identified as a consensus division (CD) with smaller CSDs such as Guelph or Arthur.

Urban areas can be defined as areas with a population of at least 1000 and no fewer than 400 persons per square kilometre. The Ontario Ministry of Agriculture, Food and Rural Affairs identify urban areas as the following cities: London, Ottawa, Hamilton, Windsor, the Greater
Toronto Area, and the Regions of Niagara and Waterloo. Any areas outside these cities are considered rural southern Ontario. Populations less than 100,000 are also considered rural.

**Data Collection Methods**

This study relied on a number of sources and techniques to obtain the data that was analyzed. Data acquisition consisted of in-depth interviews of practitioners working in agri-food businesses and program directors or managers for Wellington County Family Health Teams, key-informant interviews of leaders and decision-makers that have brought their insights to the context of understanding program, project or institutional goals, and finally document content analysis prior and during data collection. Secondary approaches to data collection included field observation and a qualitative survey administered for participants that were unable to attend an interview session. Part of the ongoing process of data collection also involved attending as an observant of formal and informal planned events addressing various broadband strategies and processes from a variety of perspective stakeholders.

To obtain an understanding the nature of broadband, the research and data collection was conducted based on 2 different groups of stakeholders: individual farm families/firms and community health organizations of the Waterloo/Wellington LHIN (Local Health Integrated Networks). The figure below illustrates how this study’s data collection plan was formulated.
Development of Interview Guidelines (In-depth and key informants)

The interview with people who had broad knowledge in rural agri-food businesses and rural healthcare Family Health Teams were conducted in order to obtain more detailed information regarding the perceptions of broadband use and its impact on the recipient or end-users. The interviews were flexible and part of the process was to submit the interview questions in advance with the understanding that the questions will serve as a thematic guide for the rest of the interview. The questions for the in-depth interviews were derived from the evaluation of the literature’s documentation of broadband impacts; they were designed to meet the research needs for southwestern Ontario’s ever reaching goal to build an effective and ubiquitous access to broadband technologies. The research questions were pre-tested for reliability (consistency of the
measurement procedure) and validity (measurement of what it is intended to measure) through the communication of farm organizations that have agreed to provide feedback on the research questions being proposed. Moreover, testing the questions for validity was a continual process throughout the data collection phase where questions were continuously refined based on participant-researcher communications. Questions that were asked to the participant were used to build information about their experiences on the provision and utilization on broadband based on their surrounding region and their circumstances. The resulting expectation was to build a narrative that evokes the community and stakeholders to gather stories and various points of view of broadband in order to create a greater understanding of such ICTs. Interview schedules that emerged at each stage of data collection were consistently tested, refined and retested at each stage of the data collection process.

Key-informant interviews were similar to the in-depth interviews – the only differences consisted of participants that were decision makers of an organization, project or program. These interviews were conducted to gather information about current and past programs, prospective programs, and personnel and professional insight into the different aspects of broadband provision and utilization within their respective surroundings.

Most of the interviews conducted were between half hour to an hour in length. Open-ended questions were used to gain an in-depth understanding of the participant’s perspective of broadband while evoking an open and naturally organic interpretation process. Preceding each interview, the objective and research efforts were summarized to each participant in order to attain suggestions to improve the approach of the research. Furthermore, the thoughts and ideas suggested by participants throughout the interviews served as a referent that guided the interpretations of the data that has emerged.
Content Analysis

To further understand the development, implantation and utilization of a broadband strategy and why such technologies are adopted by some and ignored by others, documents were explored as well as physical space and virtual space. Material that were obtained and analyzed included past reports, surveys, project logic document, funding proposals, community invitations to participate, and broadband-ICT related evaluations from institutions, organizations, individuals and programs. More specifically documents such as the Canadian Internet Usage Survey data was gathered to have a greater understanding of the context of broadband within Wellington County and its infrastructure that is currently in place.

The review of these documents was based on the understanding that the data presented was within the context of discussing broadband issues related to the specific functionalities of interest. Canadian government documents such as those mentioned to be CIUS data, research reports produced by the Waterloo-Wellington LHIN and associated Family Health Teams was considered to be secondary sources whose policies and procedures were in place to be reviewed at a broad level linking broadband and other issues of recognized importance.

Observations

Attending various formal and nonformal planned events for broadband development provided an opportunity to observe and reflect how different social groups involved with integrating ICT development into the community identify the barriers to their goals and how they may strategically mitigate such challenges. A basic inventory was observed and recorded based on the recognized needs of the community and the stakeholders involved. Observations was also made on the telemedicine sites of various Family Health Teams in order to understand some of the applications that dependent on a broadband infrastructure and the curriculum and interactions between program staff workers and the users.
Analysis

After the completion of gathering data for each case study, the information was coded in order to identify emerging themes and patterns related to the variables being examined and to the search for an accurate and transparent picture of the data. This was done by categorizing and structuring the data based on each case study boundaries.

Patton (1990) argued that the first stage for data analysis is to describe rather than interpret. Building on this idea, this study began its analysis with a description of the context of broadband in Wellington County and various organisations’ experience with broadband in order summarize the basic questions that may have been unanswered from the outset. This allowed the development of past experiences and perceptions of broadband to formulate a baseline that acts like a middle-step between raw case study data and research findings.

The next stages of data analysis consisted of open coding to uncover, identify and develop key concepts from the data; after which in the later stages axial coding was employed to relate certain categories and dimensions to each of the central themes pertaining to broadband – affordability, accessibility, value and usability. Social relationships as well as regulators like market conditions and resource allocation was analyzed in terms of their similarities and differences so that it may illuminate how these factors influence the study’s unit of analysis: the experiences/perceptions of broadband and its rationale, strengths, weaknesses, and effectiveness of connectivity for socioeconomic development, human interaction and their propensity to communicate. The organization of the data was done through the creation of nodes and assigning attributes to the corresponding nodes and various documents. While some of the initial categorization was shaped by pre-established study questions, analysis was inductively conducted in order to remain open to inducing new meanings from the data that was attained and to create a narrative based on recurring themes and new ideas presented by the participants. The representation of data consisted of concepts, metaphors, and narratives that were grouped into similar units of meaning based on the unit of analysis. Certain techniques of analysis were employed such as enumeration (quantifying common words in reports and interviews), creation of a hierarchical categorical system, using typologies to relate separate dimensions found in the data and the creation of matrices to depict the data in a manner that describes relationships. A SWOT analysis (i.e.
strengths, weaknesses, opportunities and threats) was conducted in order to analyze the data that was obtained through field work (see figure 3.3). It is important to note that SWOT analysis was not conducted with respondents of the study but rather after the data was obtained (found in the Discussion Chapter).

Limitations

The drawbacks for using in-depth or key informant interviews include the size of the sample. Due to the small sample size, the results cannot be generalized. Hence external validity is usually very low for this type of data collection method. Learning and generalizing from case study research may be controversial for the justification of drawing conclusions about similar cases due to the irregularities found with other cases. Moreover, an individual interviewer takes into account situational and individual factors making it difficult to infer conclusions. Documentation of broadband access and utilization can be tricky; field notes during interviews often contain too much confidential information for wider circulation, thus much has to be taken into trust for the reporting stages. Furthermore, many may feel obligated to report higher or lower than expected use of broadband connectivity within the core functions of the organization or individuals of interest.

The contacting process of study participants was met with a few significant challenges. Email invitations were sent to potential participants of the study however a lack of response from a few participants meant transferring the invitation process to the phone line. Any respondents that did not acknowledge via email were able to communicate via phone. The potential reasons for this occurrence is estimated to be attributed to an email address that may have been invalid/expired, the email may have been sent to the junk folder, the receivers’ concern or lack of trust of the email’s content, receivers’ concerns for the time commitment required to participate, or receivers may have not recognized the sender of the information.

Time and resource constraints prevented the study from contacting potential participants that were located away from the investigators area of stay. Limitations in the secondary data sources
may not always be clear exactly how the data was collected, who was involved and what may have been omitted from publication.

**Summary**

Based on the research methodology, this study has followed a qualitative, exploratory case-study design supported by the principles of a post-positivist framework. Using key-informant and in-depth interviews, observations and content analysis, the study has acquired data regarding broadband use in select regions of Wellington County and its subsequent analysis. Chapter four discusses the findings that were obtained based on the data collection tools that were utilized in the field.
CHAPTER 4: Findings

Introduction

This chapter presents the findings of the study based on the results obtained from interviews, surveys and document analysis. The findings are separated into three distinct sections based on the use of broadband in Wellington County by agri-food businesses and health organizations. The findings are presented in relation to the four main themes being explored in terms of the use of internet enabled devices: value of adoption and acceptability, usability and accessibility. These four core themes were refined using predetermined categories that examine the use of the internet from the perspectives of Wellington County residents.

Wellington County Agri-Food Farm Businesses

Value of Adoption and Acceptability

The majority of successful adoption practices of broadband enabled technology in this study for Wellington County farm organizations can be found not only for business purposes but also for the home environment. Having a high speed internet connection has a dual purpose especially for farms whose homes are tied to their work environment. Moreover it is argued that the influence of the home environment is a strong motivator for pursuing high speed connectivity. For the farms involved in this study, a majority of the sample size have claimed to use internet-enabled devices for their children, entertainment purposes and educational means. For those that are not inclined to use such technologies, citing privacy reasons and the exposure of inappropriate content to children, these farm organizations tend to forgo using broadband for business purposes as well. Generally many of these small business farms did not want to deal with parental control mechanisms and such in order to restrict access to certain technology. Regardless of a farm organization’s stance towards broadband connectivity, it is interesting to note that all participants in the study cited that broadband-enabled technologies will be important moving forward not only economically as a means to enhance farm productivity but socially for building relationships and forming networks.
The literature for consumer adoption of broadband indicate that content is one of the key drivers that allow wide-scale usage of broadband services and applications. So called “killer apps” is considered to be so influential that “the idea that without content, network infrastructure is of little value” can be seen being applied to broadband systems. The data gathered from this study show similar behavior; access to content creation and communication found in online financial transactions, email/Skype correspondence with consumers and social purposes of internet are just a few mentioned platform of content that has been continuously been valued as a great asset of broadband. Judging from the interviews conducted, content availability such as weather patterns and competitive market prices is integral for many rural farms operating in Wellington County.

Adoption generally leads to greater usage. One Wellington County farmer recounts the use of internet for their children more so than for business purposes while others cite both for business related usage and for their children’s entertainment and education. Based on the majority of interviews conducted and surveys, the results show that where broadband is used, there is an influence of youth within the farm. The age range of the children in the farm can be from a young stage to the adolescent stage. The involvement of youth within the farm was shown to be consistent with most of the interviews conducted. One farmer with poultry recounted:

“We use the internet not only for business purposes but also for our children. Rather than having our children depend on the school for the internet, we provide internet at home and it [the internet] also serves as a valuable asset to our business. To us, using the internet is more than for communication purposes, connectivity and gaining businesses advantages; it is about providing our children with the appropriate tools for their future.”

As a result of these types of discussions, the internet has been continuously distinguished as a key component for support and development of youth. Consequently farmers running their business past their retirement age have been less enthusiastic to be subscribers of internet connectivity as compared to their children that have gone to establish their own families and become more reliant on the internet for business and personal purposes. Many of these cases were evident for farmers whose children live nearby or on adjacent properties/farms. However a
few farmers admitted that their children’s use of internet-enabled devices for their farms has influenced them to become “limited adopters” of the internet. As such, many farmers opt to use broadband within the context of a few basic applications. Deviating from these applications would not be worth the trouble according to these farmers. The appeal of using the internet for business purposes gains considerable traction depending on the learning curve perceived by those adopting the technology.

Using connectivity for relatively low bandwidth intensive applications for communication and information gathering has been an important source of utility for those subscribing to the internet. Moving towards greater bandwidth intensive activities such as the use of video feeds or online transactions has been found more common for those well integrated with broadband and internet enabled devices from computers and laptops to smart phones. These users have been found to be situated in more populated towns surrounding Fergus, Arthur, or Mount Forest comparatively speaking. Based on the connectivity that is available, these types of applications have been limited to those that have the bandwidth capabilities to utilize their high speed internet to gather information in a short period of time. The literature has shown that the ability to use the internet is described as tacit knowledge which is diffused by social interactions. Acquiring the appropriate information and expertise to optimally utilize broadband to its fullest potential may not be necessary to experience enjoyment and certain value of the internet. Similarly, the diffusion of tacit knowledge by social interaction implies that socioeconomic factors such as income and education may not necessarily explain the digital divide between urban and rural areas when comparing internet pricings and availability of networks. All participants of this study, subscribers and nonsubscribers, have expressed the current need for more ISPs in the area that can provide internet coverage whether that may be wireless – fixed or cellular – is not an issue however many farmers’ first wish is to have cable installation for gaining internet access.

Family members have been found to be a strong influence over whether a farmer decides to use broadband recreationally or for his or her business. For the most part, farmers responded to questions regarding broadband acceptability in a positive light despite those that do not have an internet connection. Reasons for non-use for the minority of farm businesses that identified themselves as nonusers for this study has considerable variation including no perceived need,
lack of the required material goods (computer, laptop etc), security issues, and cost. Although these businesses have expressed that they have no reason to adopt broadband within the farm or the home they realize the importance and need for high speed internet for future generations. They have acknowledged that society’s socioeconomic development may depend on connectivity for support. Even though these businesses are hesitant towards accepting new technology into their home or business, long term speaking, these businesses have realized that the new service economy depends on the exchange of information at ones fingertips 24 hours a day, 7 days a week (SITE). A farmer that grows a variety of fruits and vegetables for the farmer’s market remarks:

“Although broadband is not a major focus for my farm, I realize the importance of broadband for new growers to develop a stable business around a network of people and organizations. Engaging with the internet seems to help ease the transition for establishing a farm business for the long term.”

The sharing of knowledge, resources and expertise through an online platform is part of an important developmental process that broadband is able to provide. There has been a strong consensus that broadband based technologies have been able to strengthen local, and geographically distant communities by connecting businesses with their consumer base while providing access to services such as online banking and equipment purchase transactions to name a few. The data obtained from these distinct farm businesses of Wellington County tell an important story that the acceptability of broadband as a whole is consistently positive regardless of whether a business chooses to adopt into the technology or not. Farm families with a long standing farm history that goes back several generations have found to express their reliance on the internet with their kids and the newest generation.

For one milk producer, using the internet is a lot like having the luxuries of cable television; information gathering is the biggest utility for this particular farmer. When asked about speed or cross platform use, he indicated that he is not familiar with what speeds is considered to be defined as broadband. Due to the lack of awareness of what is considered broadband many of these small agri-food businesses rely on the internet provider to accept whichever speed is
available on the package deal being offered. Those that are relying on the internet for greater use have shown to have their download speeds around 3Mbps when their ISP advertised 5Mbps. Farms that utilize a fixed wireless connection from neighboring farms has been quite common amongst the participants of this study:

“If our neighbor quit then we will lose our internet as well. There are no nearby towers that we can use.”

Generational differences can be seen for younger farm organizations however some of the oldest farm businesses that participated in the interviews have been well integrated into broadband connectivity and taking advantage of its utilities from using individualized webpages to market sharing and selling.

**Usability**

The intent to use broadband technologies stems from many different factors. The social interactions that broadband technologies allow have given many Wellington County farmers the opportunity to network and communicate with their consumers and other farmers in a manner that has not been commonly developed. The difference between rural and urban broadband diffusion have been routinely delegated to differences in geographic factors, demographics and socioeconomic determinants of farmers. However what are commonly misplaced are the social motivations that are related to the usability of broadband technologies.

Usability of broadband technologies for farmers in Wellington County has been referred to many different aspects. Regardless of the size of the operation, there is a component for broadband. One cattle and dairy farmer recounts the importance of using the internet to monitor competitive market prices for cattle including daily, weekly, stock and cow bred reports that ultimately influence fluctuations in prices. Using Beef Improvement Opportunities, the farmer can examine current trends in cattle sales while simultaneously inputting data regarding the farm’s up to date cattle records. By integrating information gathering under one source, this cattle farmer is then able to remain competitive with other cattle business on an international scale while taking into
account the local market climate for cattle. Therefore, the application of the internet is critical in instances like these that allow farmers to be aware of the value of their crop production while having a tool to predict future trends and changes in the market. Using the internet for information gathering has not been just limited to gathering market data, other uses such as weather information from Environment Canada has been important for seeding activities as well as planning harvest scheduling, and irrigation. When asked about cross platform use between different devices, many farmers indicated the importance of downloading vital business produce information right to the smartphone in real time when a farm employee or farm owner is out on the field. Other farms that have been integrated with the technology have utilized a GPS navigational unit with the combine which involves the use of an advanced innovation in automatic movement and computerized detection system for better maneuverability and pinpoint tracking.

Making online transactions has also been a large application for having an internet connection. One farmer responsible for operating a floral greenhouse talked about how the internet has been a huge sales opportunity:

“In terms of impact, the internet has been critical for our customers that like to order our flowers through our online website. Since our business revolves around vegetables and flowers, we heavily depend on social media websites like Facebook, Twitter, and Youtube to generate interest of our business and to attract international clients.”

However, the use of the internet has not just been limited to the sales of a business. One farmer notes how his sheep milk farm was able to purchase large scale farm equipment at a significantly discounted price compared to a local farm equipment dealer from Guelph. The transaction of items over the internet is nothing new and most farms that indicated their use of the internet has been involved with purchasing or selling items over the internet in some fashion. Moving from production to distribution, many small farm business operations are using an online newsletter for their regular customers that may require updates of the produce that is being sold on the farm. However such use of the internet has been limited to well established agri-food businesses,
especially those working in a CSA (Community-Supported Agriculture). An urban farm business located in Guelph moves beyond the use of online newsletters and uses video formatted Webinars as a training tool for urban families located in Guelph to grow their own fruits and vegetables in their own backyard. Taking advantage of the networking capabilities of the internet can vary from one farm to another, however by in large, all farmers utilizing a fixed wireless connection for the internet is getting their worth through social media and its marketing aspect. Higher, bandwidth extensive types of applications like video feeds tend to be less applicable for the farmers that were interviewed. Due to network signal strength issues on a 3G platform and the lack of trust of ISP technicians, most farmers do not engage with taking risk and applying to news ways of using the internet to further their business. Reducing costs to promote and expand production sales into their local market has been the most common utilization of the internet for Wellington County farmers.

The utilization of broadband has been self evident through numerous occasions that have transformed business alliances and community networks. For example, using broadband connectivity to deliver farm equipment, one farmer explains how broadband enabled him to order and attain cheaper machinery goods as compared to local farm factories or store outlets. He explains that purchasing livestock handling equipment has allowed him the purchasing power to invest in higher grade equipment from well reviewed manufacturers including John Deer, International, and Massey Ferguson. The farmer goes on to claim that the purchase of such equipment via an internet transaction has allowed him to save more money as a result of the price differences which can be as high as $400-$500. Such utilization of technology is a strong indication of where broadband technology is leading and its potential outcome for growth and development for not only farm-food enterprises but for community organizations, the government and other social actors with a rural network.

The use of the internet has an important social component as well. Communicating with family friends abroad via email and other applications including Skype helps many farmers connect with people that would have been otherwise only possible through phone, mail or travel. Many of these realized benefits are not new as there have been numerous studies and the vast literature detail the benefits of broadband socially. This study does not contradict this trend, as many
families emphasized the role of broadband for themselves, their place in the community, and the
distribution of their network within their neighborhood. Broadband technology has challenged
the distribution of social organization by enabling social innovation at the local and larger levels
by disentangling the interactions between farmers, their customers and their local council
members within the community. One farmer recounts:

“Our broadband subscription is important not only for our business but for our
children’s development. Before we had high speed internet our child would
have to go to the Mount Forest library to get access. This was not only a
hassle for us but it limited our children’s potential to develop their computer
skills and other skills. I feel very bad for some of our neighbors with no
internet who still rely on the library for getting access to the internet.”

Many farm businesses are frustrated that providers tend to flock to more populated areas to
provide better internet services and some are asking who should be responsible for these
providers to provide a similar infrastructure to rural areas. One solution a farmer says is to have
the urban population that is receiving a better internet infrastructure to offset or mitigate some of
the costs that providers have to incur coming to rural areas. Depending on municipal services for
the internet such as the library is not enough. Moving beyond the entertainment factors like
movies and games, preventing equal education opportunities for rural kids that are
“disconnected” can be significantly harmful for rural development in Wellington County.

Differences in agri-food farm business significantly differ in terms of operation based on its
location. One business located in Elora will operate differently than a similar type of business in
Mount Forest or Palmerston. A nursery in Elora discussed their plans to use the internet to find
certain information about particular plants while a nursery located in Mount Forest have a
different strategy of using trusted secondary shipment suppliers as source of information
regarding seasonable market plants. The allocation of resources varies from business to business
however most of the small business that were interviewed acknowledged that the level of internet
activity that is conducted needs to be higher. They attribute as low as 10% of sales coming online
based activities. However despite such low expectations of the internet’s ability to influence
business development, farms have expressed that they are also aware of the many indirect measures or indicators of economic growth that the internet can facilitate through market exposure, information gathering and the conservation of time through the ease of communication. Farmer businesses that are strong advocates of high speed broadband argue that it is not the radical transformation that the internet provides for urban households and business but the use of the internet as a tool and aid for important actions and strategies focused in have a competitive edge through task-oriented activities like finance, education, and service provision. The internet’s critical presence in these essential decision making processes helps rural businesses experience growth in the agricultural sector. The decision for allocation resources for broadband is not purely one concerning the markets or because of a socioeconomic factor. Instead it is the aspect of achieving a long term goal of being part of the “information society.’ One farmer alludes to this idea by saying that

“The proliferation of personal computers, tablets, smart phones and other types of devices connected to the internet makes conducting business without them almost a handicap to the business itself. Investing in these technologies is like investing in hydro, an important necessity to life.”

Overall, the usage patterns of broadband for Wellington County farm organizations and businesses vary depending on the type of businesses being conducted. The table below describes some of the commonly and rarely mentioned applications of ICTs encountered.
### Table 4.1: Use of Internet Enabled ICTs

<table>
<thead>
<tr>
<th>Frequently Mentioned</th>
<th>Occasionally Mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreational (Entertainment, family, friends, community)</td>
<td>Bandwidth intensive applications video feeds</td>
</tr>
<tr>
<td></td>
<td>(Uploaded)</td>
</tr>
<tr>
<td>Assessment/monitoring of crop production</td>
<td>Smart machines to run self diagnostics</td>
</tr>
<tr>
<td>Monitoring of market and commodity information</td>
<td>Online banking</td>
</tr>
<tr>
<td>Communication/connecting to agri-farm coop website</td>
<td>Getting health or medical information</td>
</tr>
<tr>
<td>Tracking production</td>
<td>Online educational seminars</td>
</tr>
<tr>
<td>Storage of data or inventory (Cloud Computing)</td>
<td>Video centric web usage (downloaded)</td>
</tr>
<tr>
<td>Gathering weather information</td>
<td></td>
</tr>
<tr>
<td>Social media (marketing and promotion)</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** (Interview respondents, 2012-2013)

Those more integrated with technology have found greater opportunities to invest their business to collect, manage, store, retrieve and distribute the knowledge obtained from an online platform. Success was found in efficiency and cost-cutting measures like online banking where the user no longer needs to travel to the local bank or make mailing transaction in order to conduct macro or micro finance activities for their business. Ultimately broadband has acted as drivers of economic and productivity growth even if by 10%, which some farms indicated. One local farm business owner talks about how the internet has helped his business promote cross-border e-commerce by conducting business with industrial seed suppliers from the USA that helps their business procure seeds in bulk without having to rely on Canadian suppliers which may be more expensive.
For those managing a website, webpage design can be a barrier. Without the help of a software technician or someone familiar with designing a website many smaller farm businesses feel that it is not worth their time to invest into developing a website. Acquiring outside help even from technologically proficient neighbours has had a large impact on those farms that do have a website for their business. For those that do have their own website, the internet acts as its own “advertising company.” With ads and support opportunities, many of these websites allow business to order products online thereby avoiding a middleman or sales associates in the process. Moreover, these businesses can get the newest stock exchange courses because of the stock exchange in the Internet always maintaining the most current one. You also have the ability to tell the computer to buy shares when the course is down. Maintenance can be a key issue, especially when it comes to viruses and infected computers. Data corruption is a big fear for many businesses as they depend on their data to be safe and secure.

**Accessibility**

The accessibility of broadband based technology has been a source of debate for both users of the technology and the providers. Accessibility is defined as the ease of use of the applications, small and large, that can be found through the use of high speed internet. Accessibility of advanced communication tools to citizens, small businesses and community organizations can be considered as a key ingredient to the “Information and Network Society” that Manual Castells discussed. The availability of an advanced electronic communications infrastructure like broadband has been consistently seen as an important contributor for rural socioeconomic development based on its usability, adoption and acceptability of the technology associated with internet connectivity. Unfortunately for Wellington County residents an internet connection has not been equally accessible for all.

Almost all of the small farm businesses interviewed for this study have access to a computer. Even when not having an internet connection, the importance of a computer has been well established as a tool that most small business’ success depends on the use of the computer to do basic operational skills like budgeting, accounting and customer service. However using the
internet for sales, marketing and even budgeting and accounting to name a few can require
greater time and investment on the internet. These types of opportunities and investments have
not been equally shared amongst agri-food business owners in Wellington County. As one
farmer said that without having neighbors with internet access, many of these types of activities
would not have been even possible. The lack of ISPs has been a large detriment to the
serviceability of internet in the area. Almost all participants have acknowledged the fact they
have no information or possibility of switching internet providers. They are forced to remain
with their contracted provider or face the possibility of having no internet.

“We do not have any other options, in terms of internet providers, nor can we
can we effectively rely on our internet connectivity to interact with our
customers in a consistent basis,” acknowledges one farmer.”

She expressed her disappointment in with their ISP to provide a fast, reliable internet speed that
is capable of carrying the demands required to operate their business effectively. She is a farmer
that has claimed to be lucky to have access to the internet because of her neighboring farm who
has installed a tower on top of their silo thereby allowing a signal to be moved to her home for
internet connectivity. Most problematic, according to this farmer, is that the frustrations being
experienced is largely an infrastructure issue with inadequate support for rural families to receive
connectivity in a stable basis. The owners share their frustrations by citing the lack of tower
development and fibre optic cable installations in their area. Fibre being built into the home is
only a pipe dream compared to the current situation where many farms have to rely on only 1
particular provider and hope that the provider will provision competitive prices according to the
market. Unfortunately the opposite occurs as one firmly succinctly put it, “This creates internet
poverty for those living in rural areas like us.”

If the lack of connectivity options wasn’t a problem enough, the signal strength varies from time
to time with long periods of delays that have been reported to be at least twice per week for
several farm businesses. A dairy farmer who has invested on having high speed internet relies on
it for critical sales opportunities with international clients and when the internet goes down, it
can be extremely frustrating to meet the needs of their business on a day to day basis. Small
business like floral shops and greenhouses in Wellington County heavily rely on a loyal customer base. When that customer base cannot be communicated with in a timely manner, there is a substantial amount of business that ultimately gets lost. The impact of such a problem was especially profound for a small business out in Elora that grows a wide variety of perennial flowers and plants. With the use of their website, they are able to attract clients all over the world. One particular German client was interested in purchasing a select number of flowers in bulk in preparation for a wedding scheduled in Canada. Unfortunately for this particular business, the unreliability of their internet access prevented effective communication in order to complete the large purchasing order in the timely manner that was required. Consequently this small farm business failed to fundamentally operate thereby further limiting their profit margins, something that could have been easily prevented with a reliable and fast high speed internet connection.

Another issue related to signal strength is having access to conducting online banking. For many businesses, this means a variety of services such as transferring funds, view bank account details, and paying bills. However for many small business farms that has attempted to conduct online banking, they run into the problem of time. Since many of these internet line connections are throttled at certain points of the day, the speed at which these business can complete their online banking are significantly slower than what the banks expect. As a result the internal security system of a banking institution’s website will automatically kick the user out of the system if it deems that the user is taking too long to complete the task at hand. Canadian Banks have been declaring how secure their system are and this unfortunate reality is a real concern for small businesses with slower internet speeds that must complete their online banking within a certain amount of time before they are removed from the system. Once a user is removed, he or she has to start from the beginning. Operating a small farm business and conducting online banking can be almost inaccessible as a result of this constant battle with time so that one can complete all that is required before getting booted from the system.

Using fixed and mobile devices also make a large difference in accessibility with the technologies themselves. The farmers associated with this study have ranged from youth farmers in their late 20s to farm families near retirement. For those reaching retirement, using mobile
devices like smart phones can be especially a daunting task to the eyes. With a strong LD light screen many older farmers site how these screens prevent long term usage. Not only are some of the text not visible or readable as a result of a small screen, but the button layouts on a tablet or even a keyboard of a laptop can be tricky to maneuver through. An individual with low vision, cataracts and low physical acuity will have a difficult time managing computers and other types of devices connected to the internet. One farmer reasoned that he does not carry a smartphone with him because of the likelihood of it falling out of his pocket when he is out work on the field. Instead he displays a heavily protected and durable cell phone that can withstand quite a bit of damage. To him, he perceived smart phones as delicate pieces of technologies that are not worth its investment especially when it can be sensitive to work. Furthermore, the screens of smart phones are too sensitive to operate. These issues associated with the lack of accessibility to technology in the information age further inhibits any ricks taking endeavours that many Wellington County small businesses in agriculture-foods have little luxury in part taking. With unreliable network connectivity, business owners find themselves actively avoiding broadband for their businesses. As one business owner states:

“I prefer to use my telephone to contact with my suppliers or equipment sellers in order to solidify a deal. My problem is that with the speed of my connection that I am getting [1.5mbps download], it is not worth my time using emailing correspondence. Even getting response from an email for me is not immediate whereas with a phone I can be talking immediately with the person of interest. My Internet line is already expensive…paying $70 per month for a wireless network where I don’t even download documents or upload any material to the internet. I do not know of any options of other providers, but for now I cannot be bothered to look for another provider when I know my options are limited.”
Adoption and Acceptability

The value of information and communication technologies for rural healthcare and telehealth more specifically has been well documented. The amount of considerable international and national discussion around the potential of ICTs to contribute major impacts to health and well being has been seen as important tools that drive information flows between a healthcare worker and the patient. Through evidence-based knowledge these tools attempts to be participatory and encouraging of patient empowerment. However the value of ICTs for healthcare has not been extensively accepted as tools that can bring empowerment to patients and healthcare workers through the applications and services that they enable. The existing public-private solutions have been temporary patchworks that often do not meet the criteria for sustaining telemedicine for healthcare in Wellington County.

A diverse range of organizations from the Waterloo Wellington LHIN to local community health centers situated in rural areas between Arthur and Fergus have indicated issues such as privacy and security as some of the largest barriers preventing ubiquitous access to health-related broadband technologies across all health facilities simultaneously. More troubling is that Wellington County has experienced varying levels of value of broadband adoption and its acceptability for providing healthcare. A program manager responsible for overseeing a community wellness program indicates that:

“Connectivity isn’t necessarily the barrier to the implementation of these technologies. There are a couple of structural issues that play a role including the infrastructure in general, the absence of communication protocols and standardization that facilitate the exchange of data across multiple health information systems. You find that everybody is doing their own thing and there is no surge or critical mass to uptake any particular technology in order to expand implementation of a service like that across a wide area.”
Consequently, the liabilities associated with privacy legislation in the Health Information Act have created hesitancy amongst healthcare workers to use technology over an internet connection involving the transfer of sensitive private health information. Wellington County spends approximately 3%-7% of its operational budget to health/ambulance. Within the community context, the province of Ontario has been gradually shifting its focus on funding and investing for health services towards community based care from hospital based acute services to preventative, community care. Despite such a shift in focus, one physician recounts his disappoint in telemedicine as the “ugly duckling or the stepchild in the sense that telemedicine is still considered as a secondary layer of healthcare.” With such a perception, program implementation has suffered from not having a coordinated approach from government investment to community integration. The ehealth mandate currently in place goes towards trying to resolve issues pertaining to the use of certain standardized tools that ease the transition for providers for changing over their health information services to ones that support a provincial data exchange platform.

Healthcare providers are always looking for ways to dedicate limited resources in an effective manner such that the benefit acquired by users and providers of the technology improves the quality of care. The expectation is largely dependent upon benefits that are derived from the technology itself rather than the services or applications that it provides. Large-scale operations for health-related ICTs in Canada have often involved electronic health records (EHR), remote diagnostics via telemedicine, upgrades in hospital information systems, and information sharing and distribution among patients, workers and other actors in a network. One such example being utilized by the Waterloo Wellington LHIN is Clinical Connect. A Family Health Team manager working from Guelph describes this program as a portal that acts as a secure online database for the transfer of patient medical information (Electronic Health Records) between healthcare workers from various institutions from Community Care Access Centers (CCACs) to hospitals. Clinical Connect is available across Ontario and is expanding to southwestern Ontario to 71 hospitals and 4 CCACs, serving 3.6 million Ontarians. The Waterloo Wellington LHIN states that “care providers can look up information about their patients online, review their treatment plan, medications, test results, and more.” During the time of this study, this program has been in its initial stages serving 8 Family Health Teams including Cambridge Memorial Hospital,
Groves Memorial Community Hospital, Guelph General Hospital, Louise Marshall Hospital, Palmerston and District Hospital, and St. Mary’s General Hospital). Smaller programs like Trellis Mental Health have yet to utilize such program when working with patients in any of the previously mentioned healthcare facilities. Opinion regarding Clinical Connect among various stakeholders from different institutions across Wellington County has varied significantly. Most notably, when asked about the uses of Clinical Connect, one stakeholder from Elora has expressed that the level of detailed information that is shared has not been meeting the requirements of the physicians, nurses and other healthcare workers that are sharing the information. Specifically looking into the discharge information of any particular patient from one institution to another is not explicitly discussed. While another program manager has praised the system for being instrumental for delivering patient treatment plan information for patients who are referred to different specialists. However other web-based programs like Point Click Care and out-patient programs such as Oscar have been more open-source applications that have been extensively utilized for healthcare workers to communicate for Family Health Teams. The use of financial transaction was also briefly noted using AcPac.

Although the field of telemedicine can be considered still in its infancy for Canadians (WHO telemedicine), the use of ICTs to increase access and care of health services have been well documented (WHO telemedicine). The discussion regarding the adoption of electronic information systems and many healthcare providers including physicians have argued how information technology adaptation has dramatically increased the time dedicated for patient support. However physicians have also expressed concerns about the reliability and safety issues related to such systems being utilized. The physicians interviewed for this study have expressed their concerns that a hospital’s adoption of new information systems has been routinely questions by the users of the system due to negative experiences with the system and security issues pertaining to patient confidentiality. The amount of time consumed with the use of electronic systems and record-keeping was also a concern despite contrary claims to usage. Maintenance requirements of telemedicine remote monitoring equipment requires greater investment while local culture systems prevent the transfer of knowledge from different contexts i.e. doctor to patient. Nurses and the administration have also claimed that time taken up for documentation and record-keeping was time consuming. It is important to note that this claim was expressed
anecdotally by a physician based on his experiences with his Family Health Team. However, the majority of interviewees have acknowledged the importance of user-oriented systems that ultimately results in the improved quality of integration and adaptation for the technology itself.

The experiences documented in this research have been by healthcare providers and program directors. As such, the perspective of the patients and their view on adaptation of health-related ICTs were not obtained. The goal was to qualitatively assess the level of adaptation of healthcare ICTs amongst Wellington County Health Organization. One key idea that has consistently emerged as a result of the interviews was the idea of patient confidentiality and security. As one member put it “connectivity isn’t necessarily the barrier to the implementation of these technologies.” This individual goes on to identify several structural issues that play a large role including security, communication protocol and general standardization. In the absence of such factors, many health organization located in various regions across Wellington County shy away from broadband based ICTs that integrate differently operating organizations due to the lack of surge or critical mass of uptake of any particular technology or service. The liabilities associated with the maintenance and privacy legislation often create logistical barriers that almost all community based health organization cannot afford to risk. Each health organization is content with their capacity to operate without pursuing incremental or radical innovation in order to improve the system in place. Consequently this prevents investment into an electronic infrastructure that facilitates cross system communication at the organizational and systems level. When speaking with Health Centers in Fergus, Elora, Arthur and areas north of Drayton, it is apparent that each facility has their own patient chart meta data. So each clinician, physician and health worker working in the organization have to manage their patient’s record summaries. However if patients are to move from one facility to another, the new healthcare workers would be responsible for obtaining the appropriate information related to their discipline while not having access to secondary information that is within another institution or facility. A perfect example that a particular physician covered was regarding the Ontario Drug Benefit Plan. It is important that physicians treating patients have a paper-based master chart that identifies the correct patient. The problems lies in that if an individual is not part of the Ontario Drug Benefit Plan and he or she pays for their own drugs then some of the drug plans may or may not appear in their drug plans. The system may work for individuals over 65 since they are covered under
the plan however for those that may not be covered, this often critical information may not be transferred to the healthcare worker. This relates back to the lack of information transferability from one facility to another in Wellington County, which can alleviate some of the problems associated with this situation.

Most respondents have agreed that a user-centered approach to the usage of telemedicine or broadband based technologies for healthcare would be more sustainable for the future in terms of service delivery and impact. However such approaches have not been widely adopted in the health informatics domain for Wellington County according to many of key informants interviewed. As a result, a user-oriented development cycle of healthcare ICT systems have been limited because of the emerging field that is relatively still in its infancy. Focus tends to be more for the information and delivery management rather than on human or end-user aspects. Many of the interviewees of this study agree to these ideas, stating that:

“Running a system like MediTech for one organization will not necessarily be the same for another organization that runs Mechasa. Technology that has enabled healthcare service service delivery via the internet is 20 years old now, and the health sector has always been an early adopter of technology so it’s not a matter of the availability of the infrastructure or the lack of investment in technology, its more along the lines of the adoption and coordination of its implementation and that has been true of technology projects in the health sector time and time again.”

Despite many physician, healthcare workers and clinicians declaring that the technology is not the problem, it is the adoption and acceptability of it, some of them in other regions of the county made claims to the contrary, showing systems like MediTech have not been as effective or satisfactory. Problems like nursing order entries may be missing from doctor order entries or vice versa. Poor resolution of may limit the efficacy of remote diagnosis while internet congestion can lead to delayed image quality. Moreover, almost all of patient charting has been paper-based rather than electronic for a variety of major institutions across Wellington County such as Groves Memorial Community Hospital. Here, one key informant describes the emergency room:
“As a patient that enters the emergency room, healthcare works and nurses still have to physically go down to health records and find the appropriate chart and bring it to the physician in the emergency [in order] to be able to understand what your medical history is in this facility.”

Ontario’s approach to healthcare delivery region-by-region has been very cautionary. After approximately 10 years, Ontario’s passing of legislation for 14 Local Health Integrated Networks (LHINs) in 2006 has had the mandate to plan, fund integrate and coordinate healthcare services for efficient care in their respective regions. A key component of the system is to produce an Integrated Health Service Plan (IHSP) that is consistent with the strategic plans of the Ministry of Health and Long Term Care (MOHLTC). The duties of the LHINs include overseeing the distribution of public funds for selected health services in a designated area including hospitals, community care access centres, community support service organizations, community mental health and addiction agencies, community health centres, and long term care facilities. The existing local bodies and entities – such as hospital boards, home care agencies, and long term care boards have the responsibility to provision the services while the LINs finance and coordinate these services, but do not operate them. As a result 60%, which translates to approximately $21 billion, of Ontario’s health care budget that is acquired from provincial tax revenues are dispensed by regional health authorities (CPSA). The Ontario Telemedicine Network is a ministry initiative that is funded by the ministry of health. However, based on the select sample of interviews conducted, not all health organizations have partnerships with the OTN or have any form of treatment strategies related to the internet. This is not surprising since partnering with the OTN depends on the proposal and the direct objective of the leadership of the particular organization.

The final component most commonly encountered when discussing adoption and acceptability of telemedicine or the utilization of internet connectivity and ICTs for health was the idea of adoption amongst health consumers. Keeping in mind that this study was solely conducted amongst key informant providers and not the patients themselves, nevertheless most key informants expressed how education, income and age are important predictors of adoption and
acceptability of utilizing telemedicine services outside the status quo. This is especially not surprising as many studies have indicated how certain predispositions like alcohol or drug addictions and other socioeconomic factors such as income and education may play a role in the adoptability of individuals to use technology. The geriatric population to utilize telemedicine can be different than the youth population due to generational differences in technology availability. Similarly the large Mennonite population located cross Wellington County can be a challenge to introduce technology to more conservative cultures that discourage the use of certain modern technologies. A physician working from Groves Memorial Community Hospital in Fergus indicates that almost 25% of patients that he receives from north of Wellington County such as Mount Forest, do not even have their own health cards. Some of this population are Mennonites not willing to pick up their health card regardless if it is free to them. Ultimately, they end up paying for their healthcare.

Not having equal opportunities between urban and rural settings has had its impact in Wellington County where rural towns in Arthur are markedly different than towns like Fergus where a larger population of employed professionals live, according to one key informant. That being said, most key informants acknowledged that even the higher income and education population across Wellington County do not have equal access to technology. This was especially evident for one physician who works and resides on Rockwood. This individual invested more than $5000 of his own finances to build a tower in his backyard in order to get access to a fixed wireless connection to his recently purchased home. With such high investments, the end result was connection speeds at 5mbps download and 1mbps upload.

**Usability**

The Use of ICTs can be dedicated to a variety of applications, most notably `guiding treatment decisions, reducing medical errors and improving patient outcomes, as well as facilitating the management of patients more quickly and effectively (Eccher et al. 2009, Greenberg et al. 2006, Voeffray et al. 2006).
Based on the information gathered, the use of broadband enabled devices for healthcare has seen a variety of applications and changes. One of the more common applications sited were the services of the Ontario Telemedicine Network (OTN). The OTN identifies itself as an independent, non-profit organization that is funded by the Ontario Government. The network is responsible for the delivery of health-related and information using telecommunications technologies using systems like two-way teleconferencing systems and tele-diagnostic instruments for patient examination cameras, otoscopes, and digital stethoscopes. By partnering with CCACs, other community health based organizations and more than 1200 sites, the OTN is able to provide videoconference consultation with specialists from their line of network to provide clinical care and professional education among healthcare providers and patients. The OTN was a result of the merger of three award-winning, provincially-funded telemedicine networks: CareConnect (Eastern Ontario), NORTH Network (Central & Northern Ontario) and VideoCare (Southwestern Ontario). While the first pilot projects for telemedicine were initially launched around 1999, image quality did not vastly improve until 2006 where telemedicine really began to garner more attention.

As seen by the OTN, the applications and services that can be provided through broadband enabled devices are numerous. Participants from this study cited that those utilizing broadband connectivity for telemedicine types of services would largely involve delivering patient support for mental health and addiction, rehabilitation services and oncology. It was in the interest of many of these health organizations Like Trellis Mental Health and Development Services that has services all across Wellington County in Arthur, Mount Forest, Drayton and among other areas to utilize OTN’s database of specialists in order to connect these specialists with those living in rural areas in need of a particular specialist. One common application that was discussed with key informants was the use of telepsychiatry. Using OTN videoconferencing units, different community facilities would conduct OTN sessions in real time using psychiatric specialists from Toronto. Other applications similar to Electronic Health Records like Clinical Connect have been in the early stages of implementation. With eHealth Ontario being the main lead for Electronic Health Records (EHRs), key informants discussed a mixture of EHRs and paper based management of patient records based on the location of the organization.
Surprisingly, many of the bigger institutions are still paper based such as Groves’ Hospital located in Fergus as previously discussed.

Rural programs across Wellington County have been finding creative ways to implement a broadband strategy within their service delivery. One Family Health Team has implemented a program called ASH (Addiction Supportive Housing). The goal is to use subsidized housing in order to support stable living in a new environment using education, work and other activities. Family health team members would normally have to travel from one area to another to visit their clients and traveling from an area like Mount Forest to another has not been financially feasible. The ASH program allows single to double units of housing that can be occupied with those using the services of the program. One of the objectives is to use telemedicine units comprised of videoconferencing units within the ASH program for healthcare workers to communicate with their clientele that may be located in a housing unit from another town or location. However, the real problems lies in the actual usage of the system itself and the lack of a dedicated support system that can facilitate an easier transition into using the technology that is available.

Part of the objectives of this study was to identify some of the usability requirements for telemedicine and other broadband based technology types of services and to examine any usability issues that may have developed over time. This may include a host of service delivery including like teleconsultation, teletriage, telepharmacy, telecare, professional support and education, clinical support, health prevention and promotion. By today’s standards, healthcare has experienced a moderate degree of ICT integration; however the concept of the “teledoctor” is a relatively new one. Regardless of the novelty of such a concept, the applications of connecting a physician like a psychiatrist to a patient that is unable to travel to a healthcare facility with the appropriate specialist has been documented to be impactful. In some ways, the case study in Wellington County validates this point according to a program director. The result being that broadband connectivity serves as an open interactive platform that enables healthcare consumers to receive healthcare in a timely and efficient manner. Moreover, many physicians that practice medicine in and around the GTA can leverage their extensive networks with community care partners in the area of study that are suffering from specialized and skilled human resources
needed for the patients being served. As a result, this dynamic partnership between urban town centre practices and rural Counties like Wellington creates a multitude of real-time usable possibilities and applications for resource sharing while simultaneously offsetting the time and financial investments associated with health treatments in rural areas.

The interviews that were conducted for this study have found that most healthcare workers and physicians have a better sense of strategic planning that involves working with the technology such as remote telepsychiatry and teleconferencing with patients otherwise unable to receive services in a manner that improves the health outcomes of those using the technology and receiving the services. Similarly, the program directors and coordinators that are associated with working with broadband-enabled devices and other technologies have indicated that training and education with a nurse, more specifically a telemedicine nurse, plays a key role for enhancing the comfort of using a teleconferencing unit. A physician respondent of the study points out:

“I would send a patient to St. Joe’s geriatric or psychiatric departments, however other times when this is not possible, I would have to contact specialists from other institutions. Having our family health team hire two full-time OTN (Ontario Telemedicine Network) Nurses significantly helped overcome the challenges associated with setting up and using the OTN equipment. These nurses also help with delivering the program services so that patients are more comfortable dealing with receiving care. Having a full time OTN nurse as the expertise is critical whether this type of program succeed or fails. I would not even think about doing this if we didn’t have these nurses to facilitate the telemedicine services.”

As indicated by this physician, the use of OTN nurses has been fundamental for the success of the telemedicine program for his Family Health Team. To further illustrate the importance of dedicated staff familiar with newer technology, the same type of response was obtained from another respondent who is a program manager for a healthcare facility located near Guelph. This individual expresses his frustrations:
“We own our own properties. However we also have to travel to various individual’s homes. As a nonprofit organization and without much increase in governmental help in many years, it can be difficult to keep up with the standard of living [referring to the patients to remain in the facility]. And so our IT is pretty rudimentary. We are trying to get shifted over to put a few more dollars into IT infrastructure because usually we need to have our VP into our rural locations.”

This extends to a variety of different examples; one notable example is the use of a dermatologist to examine skin rashes. A Family Health Team from Palmerstone can contact the appropriate dermatologist from Toronto, and use real time pictures of the patient’s skin rash in order to treat it using instructions sent as video feeds using OTN teleconferencing equipment. An OTN nurse helps put the entire process together from gathering picture charts of the skin rash to setting up the teleconferencing unit in order to connect the dermatologist to the doctor.

**Accessibility**

The successful establishment local integration and accessibility of telemedicine and broadband enabled health services carries numerous complexities’. Among the technological readiness of the local population and the cooperative organizational culture, there are several key aspects that allude to how sustainable such practices can be. Using information technologies for delivering patient care requires not only the appropriate IT resources for hardware and software but also the appropriate skilled workforce that can help facilitate the delivery of healthcare according to each personal case. Understanding the tangible benefits of utilizing telemedicine services for healthcare can provide great mileage for improving the accessibility of the technologies itself.

One of the major themes that have emerged from the interviews of several program directors for telemedicine is that physician acceptance and user skills help integrate such services into the hospital and the greater community. While implementing standardized information systems may have to hurdle legal barriers, system software engineers have to take into account how a physician will operate around the technology being developed. As a result, the level of
integration and by extension accessibility largely depends on the skills of those facilitating the services rather and the adoption perceptions of the recipient or users of the technology. Developing a shared vision between organizations should be an iterative process that must include parent organizations, management, health consumers and the public. However the systems design, with an emphasis on a systems life cycle based on the provider may not be as productive as an architecture that responds to patient changes and needs directly. Moving from program/project planning to the deployment and operations involves taking into account the technical and social risks associated with telemedicine types of healthcare. These risks, mentioned in the next few sections, are projected based on operational costs, licensure of the equipment and other legalities which impede the accessibility of such services to the local population. One key respondent noted that:

“The Family Health Team in Guelph moved ahead with a tele-home monitoring system that brought monitoring devices into senior’s homes. However, Memorial Hospital wanted to use a different model then Guelph whereby the technology behind remote monitoring would be sent to senior’s homes along with a healthcare provider that may not necessarily be a nurse. The healthcare provider would carry the remote monitoring device from one patient’s home to another therefore requiring less equipment for each senior patient. The model failed to be implemented because of funding and human capital issues. Consequently seniors were left without access to such technology.”

Improving accessibility would mean improving not only the level of integration of broadband based healthcare to locally oriented rural communities but also a way to harmonize network standards and interoperability without suffering to meet the local needs of a rural community. Understanding accessibility issues was segregated into 3 main areas: a) the technology/infrastructure, b) the people involved, and c) the process. The goal for all of the health organizations in Wellington County that have committed to a broadband network for providing various healthcare needs have the direct goal to connect the technology to those that are providing and receiving the services and the process which includes the clinical,
administration, legal and health strategies. For example a key informant indicated that Mount Forest’s Health Centre has just recently undergone fibre optic installations through the facility. They are currently running on a PACs system for x-ray images which is digital based rather than film-based x-rays. The digital-based x-rays are then able to be transported or wired out to specialists who can then interpret the patient x-rays. This is drastically different then using film-based x-rays that normally have to make healthcare workers make physical contact with the actual film. As a result of the installed fibre, the PACs system for the x-ray department for Mount Forest and Palmerston was operational only recently.

Comparatively speaking, an area like Fergus, the PACs system has been up and running for nearly 7 years. Even more surprising is that according to a respondent, there’s hardly any hospitals left in Ontario that do not currently employ the PACs system for using digital imagery instead of film. Consequently, it has been challenge for the wider community and the surrounding area of northern Wellington County to work in an integrated and efficient manner because of the lack of high-speed data transfer and a coordinated governing response to such a deficit.

The implementation strategy is one that is unique for each health organization situated in Wellington County despite their affiliation with the Ontario Telemedicine Network and eHealth Ontario. Organizations based in Fergus for example, will be at a different stage of developing a telemedicine program when comparing to organizations based in urbanized areas like Guelph. Since each organization is in a unique situation, the implementation strategy adopted has varied. While an organization such as Trellis has experienced growth in their telemedicine program for the Francophone population, other organizations have not been so fortunate. Some organizations have even acquired the necessary equipment for telemedicine types of services, however, the lack of human resources have prevented any use of the technology. Based on field observations many of the equipment lay dormant in storage.

The project logic models that were examined during this study show that the short term outcomes involves activities like a media launch, the hiring of nurses, and the establishment of a virtual team. Moving towards an intermediate plan involves the clinical utilization of
telemedicine increases (service delivery, collaboration, and networks) and the development of new care models. The long term outcomes are for the daily use of telemedicine services for Waterloo Wellington residents and increased access to multilingual language services. Trellis Mental Health Services has especially tailored its telemedicine to the Francophone populations near and around Guelph however other organizations have been struggling to integrate ethnic minority cultures with their telemedicine program that is offered through the OTN. Strong leadership as well as the presence of nurses is important, however, technical issues in IT resources and implementation complications have consistently lacked a standardization and interoperability of telemedicine services across Wellington County. The lack of IT specialists can have a large impact especially for smaller organizations that do not have an IT department. Programs like Clinical Connect aims to further enhance connectivity between physicians however inadequacies in the system may lead to decrease in workflow and productivity which in turn contribute to clinicians’ resistance to adopt these systems.

Physicians from different sizes and types of practices have had differing opinions on telemedicine and other technological practices for healthcare like EHRs. Respondents have agreed that larger medical practices such as those found in St. Joseph’s Health Centre located in Guelph or even Groves Memorial Community Hospital tend to involve more extensive support for EHRs and have higher adoption rates amongst physicians to use the available applications than those from smaller more rural practices and medical clinics situated around rural Wellington County. Such circumstances have been expressed by a variety of worker skill positions from OTN health nurses to those operating mental health clinics. According to program staff members of rural health clinics north of Guelph, the lack of understanding amongst users of the technology has been as equally frustrating as those providing the services. OTN nurses generally expressed concern over what is to be understood as the technological and administrative hurtles that must be crossed before telemedicine can be integrated into any community based program. The top down paternalistic model that dictates certain behavior has been in a transition towards community based care services that are more directed towards public health prevention and promotion and less on emergency usage. This moves healthcare towards a discussion based practice whereby patients are designated as health consumers who can discuss treatment matters in a discursive manner rather than playing as a secondary role of a recipient of services.
Summary

Findings from the summary suggests that the goals and aspirations that broadband enables can come from a variety of processes and sources. For Wellington County residents, this means that the implementing strategy for creating an environment for high-speed data transfer is still in continuous flux with many of the key power players still not committed towards achieving ubiquitous access. As evidence from the findings indicates, physicians have only begun to be introduced to the telemedicine technologies during the time this study was being conducted. The issue of usage has come through many different forms from allowing greater productivity growth for Wellington agri-businesses to better communication health services amongst family health teams otherwise unable to effectively bring in the expertise required. Where the value of broadband and its many different applications diverge is the idea of pricing and the motivation behind which resources are emphasized over another. Lacking physical as well as human resources has pushed many key respondents of this study away from effectively managing and utilizing a broadband connection. Inadequate core capacities to sustain such technologies have been wide prevalent across both the health and agri-food sectors.

The value of adoption and acceptability has been significantly expressed amongst those working in agri-food. Their ability to understand the worth of being connected to the global market has been seen in all regions of the county. In contrast, the value of adoption and acceptability has not been as pervasive since many healthcare providers have alluded to the novel concept of telemedicine for much the area. Despite the lack of acceptability, the level of innovation found in the usage and accessibility of telemedicine related technology has experienced a great deal of innovation. While both sectors praise one another for managing and innovating within the online worlds, in hindsight both sectors requires a much greater degree of implementation strategies that is relevant to the mobile needs of rural Wellington County residents. The findings also indicate how essential livelihood capacities depend on the limitedly available technological infrastructure that the county provides. The stage of “Effective use” of technology has not been reached as a consequence of restricted access – which has been defined by end users through aspects such as speed, bandwidth capacity, availability of services and investment risk taking.
The next chapter discusses the key findings of the data obtained regarding broadband use for Wellington County. The Discussion Chapter begins with a look at the data from a systems, organization and individual perspective and moves into a SWOT analysis (i.e. strengths, weaknesses, opportunities and threats) based on the 3 ecological frameworks that were discussed in the Literature Review and Conceptual Framework Chapter.
CHAPTER 5: Discussion

Introduction

Chapter five combines the research findings to the literature review and conceptual framework by identifying the commonalities and gaps found in the Findings Chapter. The Discussion Chapter is divided into three sections. The first section explains the findings from a systems level perspective that is dependent upon the supply-side and demand-side drivers of broadband. The next section of the Discussion Chapter examines broadband at the organizational and individual levels respectively. The next section discusses the role of innovation, communication and innovation ecologies at the systems level and to investigate whether these ecologies have been present throughout the study area. The goal is to examine the results based on this framework and to introduce the SWOT (strengths, weaknesses, opportunities and threats) analysis across the systems, organizational and individual levels for broadband. The next section examines the strengths and weakness associated with resource management in terms of organization structure, governance and how the agricultural and health sector has managed change without disrupting the status quo. Within this area of the findings, this chapter discusses important factors in supply and demand chains as well public perception of broadband and what it really has to offer for socioeconomic growth and productivity. The final section of this chapter considers the barriers and threats that prevent ubiquitous access and use of the internet but also how overcoming these challenges can bring meaningful opportunities to businesses and health organizations.

Broadband as a Strategy for Development and Innovation

From the onset of this study, it became quickly apparent how strong of an impact broadband connectivity has been for both agri-food farm businesses as well as health organizations across Wellington County. Respondents from both sectors of this study have stated their many different uses of broadband. Surprisingly those that have indicated very little use of broadband as compared to their day to day operations have acknowledged the importance of broadband and how it has influenced the interaction of business organizations between themselves and their consumers. This has been especially true for the minority of farm businesses that were
interviewed for this study who have indicated that they have no use of having an internet connection for their business. Key informants representing a wide array of health organizations across Wellington County have been indicating a use for broadband in one form or another.

Many of the mainstream discourse of “what works” in digital inclusion have overlooked the social dimensions and technological factors of broadband adoption and effective utilization. Hence a pragmatic approach to Wellington County’s broadband inclusion for both sectors has been important in order to involve individualistic criteria for broadband adoption along with indicators set by internet service providers, researchers, practitioners, consumers and policy makers. As a result the Discussion Chapter considers broadband adoption for its utilities based from a system, organizational and individual’s level for both sectors of this study.

Systems Level

Supply-Side Drivers of Broadband

From a systems level there are many contributing factors that have been examined from the findings of this study. When discussing broadband adoption, its acceptability, usability and acceptability, the ecology of information, communication and innovation is considered as support. This would include such components as institutions, organizations and even informal groups, and individuals that serve to facilitate users into broadband.

The supply side system for both sectors have been found to be almost parallel in nature while the demand side for broadband diffusion is markedly different between the two sectors. Many consumer studies have examined telecommunication services based on price elasticities and evaluating the digital divide based on geographical, economic or demographic consumer characteristics (Glass & Stefanova, 2010) (Savage and Waldman 2009; Rappoport et al. 2001, 2002; Flamm and Chaudhuri 2007). However examining the users’ perspective on the availability of existing networks and market competition have been an important factor for understanding and assessing content availability and what type of networks that service providers will need to offer for today’s standards and future standards. Those from both sectors perceiving
the internet as an important tool for development have also illustrated a lack of inadequate speeds and bandwidth capabilities of the network that they are currently using. For many small farm businesses sharing network infrastructure with other farms has been a key indicator for broadband adoption, which can be seen in the Findings Chapter. Having fixed or mobile devices for business related activities has had no bearing on broadband adoption for the small sample size, however having wireless mobile devices for connectivity has been an important tool for not only cross platform use within the health sector but also for agri-businesses that rely on obtaining information in the most effective and streamlined version as possible. This means that having mobile devices while working on the field can be a significant for farmers compared to those not utilizing such technologies and relying on slower processes to obtain information. Such examples is an indication of the need for the assistance of private sector costs for broadband deployment and provision based on long-term loans, and fiscal incentives that many of the respondents of this study has suggested. Several Wellington County rural communities feel that there are not enough financial incentives for internet service providers to offer their services to the rural areas.

Most health organizations have the added advantage of partnering with the OTN or other networks in order to service their community while farm businesses usually find themselves helpless (unless they operate with neighbour farms that receive connectivity) when it comes to the availability of a valid and effective internet provider that can offer the capacity of internet services that is required by businesses to operate at a high level. It is unsurprising that broadband connectivity has been met with considerable challenges across Wellington County when the process of liberalization and privatization has affected so many industries in so many sectors across Canada. Many key informants primarily focus on the market’s value chain and financing infrastructures by entrusting entirely on the free market while public decision-makers is limited to regulation designed to enhance competition and engage citizen interest through future investment and promoting innovation.

Both sectors between health organizations and farm business have come to the consensus that high costs for fibre broadband lines and the necessary investments required to carry out broadband deployment can take a long period of time. The uncertainty of the timing and
recovery of investments have left many weary of having hopes for a better internet infrastructure. The level of privatization and sharing of private ownership in the electronic communications industry and equal level competition have been something that has been repeatedly requested by respondents participating in the digital economy. Studies show that using a composite index of a weighted share of the market share and spectrum ownership for new entrants in the telephone and mobile markets is something that must be considered in order to reduce the variability that is seen today from the internet provision found in rural Wellington County (Manganelli, 2011). Public-private partnerships such as the Ontario Ministry of Agriculture, Food and Rural Affairs’ initiatives with Everus Communications and subsequently Xplorenet must be further planned in a more equal manner with providers that reduces private owners’ costs of deployment while ensuring that the broadband being provided adheres to the requirements of the end users without bottlenecking and/or throttling the connection speeds during high traffic times.

Demand-Side Drivers of Broadband

From the demand side, the perceived value of broadband can be identified as based on a number of different cross-sector factors including the demographic, certain socioeconomic factors, prices of broadband access services, and users’ capabilities. Public services are especially dependent upon the internet to provide healthcare services and their development. As a result the demand for high-volume content (low and high bandwidth intensive applications) must be met with the demand for a better flat-rate internet access that does not cause users to incur extra costs financially and/or to the network based on its usage patterns. The differences that diverge between these two sectors are when each sector has a different set of stimulation patterns that invoke adoption and use of the internet. For health organizations, the problem lies in the paternalistic use of broadband that very much instills a top-down one-way communication of thinking not allowing effective communication to occur that Wilbur Schramm has talked about in his Model of Communication. This is especially the case for many of the health promotion departments that were spoken to. Using broadband enabled technology and social media such as Facebook, Twitter and Youtube has been a vehicle to get their message of healthy living and enabling people to increase control over their health determinants. However such dissemination of information has ultimately resulted in very little absorption of information of the target
population of many public health promotion campaigns such as the youth. In fact, one key informant has urged the need to say that the health field in general knows very little on how to use and manage the internet and social media effectively.

Contrary to the demand-side for broadband in health organizations, many farm businesses have some indication of how broadband can be utilized for growth and development of their businesses. Those effectively managing broadband with an online presence through Facebook or Twitter were content while others more ingrained with connectivity by relying on a better network connections utilize the internet much more with daily updates to their social media presence as well as a website to further connect with their consumers. A study conducted by Waseda University summarizes the uptake of broadband based technology on supply and demand side factors in figure 8.0 of the appendix. Based on the results, the study has shown that the effectiveness of broadband relies on a complex combination of ICT capacity-building along with a framework that encourages competition with many providers based on existing and new network development, market competition and human and social capital.

The ecology of information and communication comes into play with the network communication between users and providers with the understanding of digital inclusion based on meaningful broadband adoption and support coming from a variety of social actors. Meaningful broadband adoption and its framework is nothing new; Eubanks (2011) has discussed low-income working women and their desire to develop their own capacities to garner computer internet skills so that they are included in the digital economy. Such an example is an indication of the range of variation that can be found in the demand-side for broadband. Similarly Dailey et al. (2010) examined the role of intermediary institutions, such as libraries, neighborhood organizations, and other community anchor institutions to integrate broadband into the public. Without an effective strategy to supply and support broadband, the steps necessary for adoption and usage will be severely limited (Gangadharan & Byrum, 2012). Based on a bi-sectoral approach, policies and community driven broadband support at the systems level can be found in table 5.1.
**Table 5.1: Supply and Demand-Side Drivers of Broadband**

<table>
<thead>
<tr>
<th></th>
<th>Demand Side</th>
<th>Supply Side</th>
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</thead>
<tbody>
<tr>
<td><strong>Goals and Objectives</strong></td>
<td>Technical and marketable skills for growth and development. Public demands for specific services</td>
<td>Operator’s commitment to maintain and update network service provision. Administrative simplification</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>Consumer subsidies (computer hardware and software) for digital inclusion</td>
<td>Physical (private) and social access (public) to technology and mapping</td>
</tr>
<tr>
<td><strong>Networking and Partnerships</strong></td>
<td>Incentives for business demands and productivity</td>
<td>Government strategies for public-private partnerships and fiscal incentives</td>
</tr>
<tr>
<td><strong>Programming</strong></td>
<td>User capabilities and content/applications</td>
<td>Federal/provincial agenda to improve existing and new networks and market competition</td>
</tr>
<tr>
<td><strong>Funding</strong></td>
<td>Demand aggregation based on pricing</td>
<td>Long term loans and financial incentivized programs</td>
</tr>
</tbody>
</table>

*Source: (Interview Respondents, 2012-2013)*

**Organizational Level**

The ecology of support – from information, communication and innovation depends on a complex organization of multiple layers and of alterative networked layers within one another. Components of organization for broadband include the last mile to eventually connect all users to the internet, internet service providers to receive and send internet-bound data, high speed fibre backbones or middle-mile pipes to connect computers to networks in order to deliver traffic to content providers and the source and creators of the internet content itself. Each layer of
organization for broadband is important for not only broadband adoption and effective utilization but also to align local administrators to focus their efforts on a capacity building structure that is better situated to introduce new ideas, tools and approaches to technology every day. Through the interaction of community organizations the Broadband Readiness Index measures the preparedness of a community institution or program to adopt and utilize broadband in a community-centred process.

Partnerships between organizations found in the health sector are quite common for solidifying stakeholder relationships and bringing expertise, creativity, human resources and financial capital for broadband. Local officials executing broadband deployment based on providers and local demand can be a challenge if there is a lack of competition among providers and there is a disconnect between goals and objectives of local broadband based initiatives and Industry Canada’s goal of building the last mile to connect all Canadian end users to high-speed internet. Failures of sustaining programs like the Community Access Program (CAP) are just one example of how discrepancies between organizational programming and the local community can lead to flawed designed program. Businesses struggling to keep up with finances have had difficulties with integrating how they involve their network capacity that is available in productive but efficient operations.
Table 5.2: Organizational Level Summary

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Management</td>
<td>Strengthening network security, consumer protection</td>
</tr>
<tr>
<td>Innovation</td>
<td>Disruptive Innovation: Enhancing access and trade</td>
</tr>
<tr>
<td>Efficiency</td>
<td>ICT-related efforts and programmes fully integrated into national and regional development strategies</td>
</tr>
<tr>
<td>Networks</td>
<td>Emphasis on standardization and demand-driven standards for broadband</td>
</tr>
<tr>
<td>Multipurpose</td>
<td>Sharing of resources and capacity that is culturally sensitive</td>
</tr>
</tbody>
</table>

Source: (Interview Respondents, 2013-2014)

Table 5.2 is an indication of how broadened strategies at the organizational level are critical for sustaining efforts to integrate broadband into the community. Knowledge management has been an important organizational factor for broadband use for many of the key respondents of this study. Managing the use of information and communication technology based on the risks associated with them has deterred businesses wishing to not participate in the digital economy. Moreover, privacy and security issues have critically influenced how mobile health services, such as video conferencing consultation, with a clinician are conducted. The sessions not only need to be secure from non-authorized viewing but also requires the correct operation of the technology from support staff during consultation to the technology staff responsible for trouble shooting and managing equipment during technical difficulties. The process is a lengthy one beginning with a rural community telehealth site where a patient’s x-rays is scanned and captured to an electronic file which is sent to a physician practicing from their location which
can be as close as Guelph or as far as a site in Toronto. This file along with the appropriate medical notes is then sent from a radiologist who reviews the x-ray files and confirms or determines a diagnosis. The notes with the accompanying files are returned to the patient in the rural telehealth site without ever having to meet with the radiologist. Thus compromising the confidentiality of medical data and image disclosure harms the integrity of the overall system. To prevent security intrusions, telemedicine services must conduct a Privacy Impact Assessment (PIA) as part of Canada’s section 3 of the Privacy Act which aims to identify potential privacy risks of such programs.

Such a case is directly occurring with telemedicine serving as a disruptor of face-to-face delivery of healthcare when telemedicine brings opportunities to give patients better access to timely, relevant and in some cases, improved results of treatment and diagnosis by key experts otherwise unable to practice their craft because of geographical, financial and human resource constraints. The identification of a specific disruptor of innovation was not found within agri-food businesses. This can be attributed to the limitations of the study itself or the lack of broadband penetration across many of the agri-food businesses that were interviewed. Although many of these businesses have felt that broadband is becoming a disruptor for traditional farming, many businesses are still struggling to adapt to broadband as a disruptor because of the constraints related to its availability and effective use.

Efficiency, networks and multipurpose strategies, the final 3 components of Table 2.0 (Organizational Level), summarize the lack of interoperability between technologies for both sectors of this study. The health sector shares similar frustrations with technological systems from different institutions not compatible with one another while agri-food businesses are forced to use different formats of technology from data base storage to online banking and consumer transactions. Integrating all layers of consumer care and business productivity with regional development strategies like those found with Rural Connections program means that broadband sustainability can be driven from a locally drawn perspective rather than using provincial program management and goals as a proxy for achieving ICT cooperation through various mechanisms. Creating “digital opportunities” and undertaking existing networked infrastructures to bridge the digital divide would involve the sharing of knowledge and resources, something
that is not occurring effectively in a regional or local manner across Wellington County. Building broadband capacity that is culturally sensitive for some target populations encountered including the francophone and Mennonite populations of Wellington County including many others needs to reflect the preservation of culture and content while encouraging in digital inclusion.

**Individual Level**

At the individual level, making full use of the opportunities offered by ICTs and broadband in an enabling environment requires flexibility of broadband technology based on end user requirements and needs. Besides previously discussed factors for determining broadband acceptance and use which include demographic and socioeconomic factors – the non-market interactions also strongly influence digital inclusion at the individual level. For example social interactions among networked partnerships and businesses and spatial proximity for belonging in a group, coop, CSA (Community Supported Agriculture) etc where internet usage is widespread is a good gauge for integration of broadband by an individual. The literature supports the idea that merely belonging to a certain group greatly affects broadband access decisions. The quality of service providers (i.e. level of help received from technicians) has a substantial marginal affect on the broadband digital divide found between urban and rural areas in Wellington County. Usage can be analyzed based on the perspective of intensity that was described. For many Wellington County businesses, e-banking, e-commerce and e-information has been common. Table 5.3 describes the experience of broadband connectivity for Wellington County based on its surrounding environment and the challenges that goes along with the environment.
Table 5.3: Individual Level Summary

<table>
<thead>
<tr>
<th>Enabling environment</th>
<th>Challenges and constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discomfort: Risk</strong></td>
<td><strong>Adapt security, confidentiality, and privacy</strong></td>
</tr>
<tr>
<td><strong>Perceived Need/usefulness (Value, Optimism)</strong></td>
<td><strong>Competition, productivity, growth and ease of use of treatment plans</strong></td>
</tr>
<tr>
<td><strong>Capital (Human, social)</strong></td>
<td><strong>Shared resources</strong></td>
</tr>
<tr>
<td><strong>Discomfort: Accessibility</strong></td>
<td><strong>Meeting speed and bandwidth requirements of applications</strong></td>
</tr>
<tr>
<td><strong>Usability (ease of use)</strong></td>
<td><strong>Greater educational opportunities</strong></td>
</tr>
<tr>
<td><strong>Human Interaction</strong></td>
<td><strong>Greater networked communication locally, nationally and internationally</strong></td>
</tr>
<tr>
<td><strong>Innovation and disruptive innovation</strong></td>
<td><strong>Challenging status quo</strong></td>
</tr>
</tbody>
</table>

Source: (Interview Respondents, 2013-2014)

Systems approach to information, communication and innovation ecologies

The literature around information, communication and innovation ecologies that has evolved over the years has been significant for examining and in an effort understanding how the study findings have come to fruition. At the systems level, the three ecological approaches suggest that most of the findings have been largely related to a linear bubble within any one particular ecology or a combination of the ecologies. At the bare minimum, the utilization of broadband
within the context of these ecologies is conducted at a superficial level where adoption and practice by the end users is not relevant to the value of the application of the technology itself. However when all three ecologies are effectively integrated within one another where individual actors and social agencies work locally for each ecology, knowledge and resources can be dispersed across many different entities allowing interdependent organizations to pursue specifically individual plans that are sustainable for the ecologies as a whole.

In Wellington County’s current state, based on the evidential findings of this study, the supply of knowledge has been resolute with only a select few avenues of access to network connectivity for broadband enabled ICT usage. Moreover, the evidence suggests that there is a general consensus over the value of broadband and its implication for progress economically and socially. As a result, knowledge has been focused to a level that is reasonably well established to well defined problems. These well defined problems have been consistently present throughout the data as respondents share their frustrations over their broadband experience as a consumer in terms of network coverage options, speed, pricings and bandwidth capabilities.

Conversely the demand for knowledge has been found to be widely fragmented based on the results of the study. Each ecological framework contains its own overarching understanding of how technological progress and integration can be implemented. With a fragmented decision making process across different levels found among policymakers, stakeholders, and local actors along the chain (program managers, researchers, practitioners etc), information gaps can be found where short-term issues deflect the attention away from longer-term development. There are little opportunities for innovation to emerge through the complex dynamics of each ecology interacting with one another. This dynamic of each ecological approach acting as complimentary organizing principles requires the transformation of knowledge into action that enables the local keystone species (component of an information ecology) to integrate with the technological, social and discursive layers of a communicative ecology and to move from linear to systems approaches of an innovation ecology.

The use of broadband enabled technologies found throughout Wellington County is an indication that there are opportunities to foster the growth of locally integrated broadband in each region
simply by the fragmented demand that is evident across the health and agri-food sector. Moving away from simple linear information ecologies that have been postulated by the works of Everett Rogers and Wilbur Schramm will require a fundamental shift in engaging with evolving technologies and digital markets. The lack of a trial and error approach to technological adoption of broadband where technologies are utilized in different contextual applications like greater bandwidth intensive activities has been largely missing between the interplay of all three ecologies in an effort to build new business models for economic growth and programs for health provision that are efficient and effective. Embracing risky behaviour is not something that should generally be attached to the adoption of broadband and yet the evidence from this study show that new entrants to broadband are hesitant to embrace broadband connectivity in the long term because of the risk associated in having an unreliable network capacity, financial costs and the required expertise. Thus the value of an innovation ecology is effectively marginalized because of the findings that have continued to draw similar responses in large numbers criticising the lack of meaningful utilization of the important aspects of the information and communicative ecologies that can support knowledge capacity to innovate using broadband capabilities. The marginalization of the innovation ecology creates a mismanaged system whose errors cycles back to further the disarmament and fragmentation of knowledge of the information and communication ecologies in order to produce disruption in a seemingly never ending manner.

Breaking the cycle of ineffective information ecology and communication ecology obstructing an innovation ecology which only further hampers the communication and information ecologies requires taking ownership of locally delivered internet access. The locally delivered provision of broadband can be optimised if it’s driven by regional needs for broadband from family health teams to nonprofits and independent small businesses. Achieving action to well identified goals over time requires directing and redirecting action in response to the changing environment. However how can such transformation take place if each ecology is composed of disparate, competing agents? Therefore the production and distribution of locally developed insights helps enable users/Wellington County residents to focus on collaboration and innovation in a holistic system level that not only incorporates information and communicative ecologies but also welcomes innovation that can potentially disrupt commonly accepted practices.
In order to grasp the implications of Wellington County’s experience with broadband connectivity a SWOT analysis (i.e. strengths, weaknesses, opportunities and threats) were put together in an iterative manner. This was done by basing the SWOT analysis on the summaries of the findings presented at the systems, organizational and individual levels. Each level provided an opportunity to take the 4 variables of interest (usability, accessibility, value of adoption and acceptability) and use them to highlight certain consideration by defining, extending and refining certain elements of the situation analysis.
### Table 5.4: SWOT Analysis

<table>
<thead>
<tr>
<th></th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systems Level</strong></td>
<td>• Resource management for expanding production and program planning</td>
<td>• Reliability of network capacity of broadband infrastructure</td>
</tr>
<tr>
<td></td>
<td>• Strong positive digital literacy of understanding wireless connectivity to enable true mobility</td>
<td></td>
</tr>
<tr>
<td><strong>Organizational Level</strong></td>
<td>• Locally built partnerships that produce dependency on a shared broadband connection</td>
<td>• Lack of technical support and less then successful public-private funded infrastructure deployment programs</td>
</tr>
<tr>
<td><strong>Individual Level</strong></td>
<td>• Increasing number of users engaging in info-communication technology like data transfer, cloud services, online banking and digitally-based programs</td>
<td>• Lack of risk taking of any new particular broadband enabled technology or innovative applications not currently in the market</td>
</tr>
<tr>
<td></td>
<td>• Changing age structure of Wellington County influencing the adoption of broadband</td>
<td>• New entrants underestimate the level of expertise required to effectively manage broadband capacity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systems Level</strong></td>
<td>• Competition regulation and/or regulation of provision for rural areas</td>
<td>• Regional differences in broadband coverage impedes infrastructure development</td>
</tr>
<tr>
<td></td>
<td>• Greater investment opportunities for innovation with broadband connectivity</td>
<td></td>
</tr>
<tr>
<td><strong>Organizational Level</strong></td>
<td>• Greater tracking of information and information gathering and communication between agencies</td>
<td>• Appropriateness of language – i.e. for Francophone and Mennonite populations</td>
</tr>
<tr>
<td><strong>Individual Level</strong></td>
<td>• Translating practical skills in health provision and agri-food to overall broadband-enabled IT skills.</td>
<td>• Legal factors and regulations regarding privacy and data protection</td>
</tr>
<tr>
<td></td>
<td>• Intelligent information management with open access and open data</td>
<td>• Hardware/software malfunctions, virus attacks.</td>
</tr>
<tr>
<td></td>
<td>• Digital presence for growth and distribution of content</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Interview Respondents, 2013-2014)
In order to grasp the implications of Wellington County’s experience with broadband connectivity a SWOT analysis (i.e. strengths, weaknesses, opportunities and threats) were put together in an iterative manner (see table 5.4). This was done by basing the SWOT analysis on the summaries of the findings presented at the systems, organizational and individual levels. Each level provided an opportunity to take the 4 variables of interest (usability, accessibility, value of adoption and acceptability) and use them to highlight certain consideration by defining, extending and refining certain elements of the situation analysis.

From the standpoint of an information and communication ecology, the divergent needs of the two systems is shown to have strengths that has allowed the organization of the two systems to enable users to navigate through those needs by transforming digital literacy (i.e. knowledge of broadband use and its capabilities). With Wellington County respondents of the study, much of the data has revealed a certain level of interaction between these two ecologies which has allowed resource sharing and a general consensus of understanding of how impactful having a digital presence can be for a business and telehealth types of services to rural populations. The lack of opportunities for understanding innovation ecologies however is preventing the required integration of broadband into the community for long-term permanent participation in the digital economy. As such the dynamic interplay between the ecologies is not persistent throughout the strengths or opportunities found in the SWOT analysis. At the organizational level the strengths have largely fallen under networks that allow nonadopters of broadband to start becoming users while those outside these typical networks to remain outside. At the individual level, the innovation ecology suffers the most as the lack of risk taking ability and new entrants underestimating the expertise required to manage broadband ultimately falls under the shoulders of the individual. Because of the unwarranted blame forced upon users at the individual level, weaknesses and threats at the organization level remain unresolved therefore fostering the continual fragmentation of the information, communication and innovation ecologies from one another. Operating in a vacuum under each ecology has pervaded the threat of regional differences in broadband coverage impeding infrastructure development and deployment at the systems level. Meanwhile opportunities for growth at the organizational and individual level remain largely similar to the weaknesses: the lack of the uptake of innovative broadband
applications and its use being attributed to a inhibiting environment that can be considered to be volatile.

In the final component of the Discussion Chapter, the SWOT analysis is further discussed in depth. More specifically, the SWOT analysis is segregated into external and internal factors in resource management and allocation of capital, organizational structure in governance and the change process. In order to get a better grasp, both the external and internal factors associated with the SWOT analysis has been written from the context of the healthcare provision and agri-food farm businesses.

**Wellington County Agri-Food Farm Businesses**

**Internal Factors Associated with Strengths and Weaknesses**

**Resource Management and Allocation of Capital**

The Use of broadband technologies has been well documented to support the interests of the users based on one’s available assets and perceived needs. This usually results in a culture that is built with the assumption that social and economic revitalization requires with what already exists. However the results of this study indicate that the value placed by farm enterprise for broadband depend not only the available services that are being provided by the private sector but also how a farmer sees potential avenues for economical value.

The gap between the social analysis of broadband technologies and its relationship with socio-economic systems and policy contexts has been largely underdeveloped. Understanding the economical importance for broadband is a key factor for closing the digital divide between urban and rural connectivity. As a service world economy driven by tight profit margins, the importance for identifying key motivating factors that further promotes the economical viability of a business to utilize a broadband connection cannot be underestimated.
Another gap that is preventing many business owners from further investing their resources into broadband technologies is the reality of implementation risks associated with acquiring a contract from a provider. Besides the expertise and maintenance requirements for the digital technologies, sector-specific applications and organizational challenges of implementing a routine method of operating a business using broadband connectivity can be challenging. Hence smaller businesses across Wellington County are less likely to take risks with online strategies and applications. Cost reduction tools and subsidized programs that have been cancelled like DTAP (Digital Transformation Assistance Program) has further prevented smaller businesses to consolidate and synthesize material knowledge and ensure their broad dissemination based on how information can be applied to their specific situations. See table 5.5 for a summary of resource management and approach that were encountered throughout the study.

Table 5.5: Resource Management Approach

<table>
<thead>
<tr>
<th>Actors</th>
<th>Equipment</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal support</td>
<td>Laptop, computers (PCs), cross platform tablets, smart phone etc</td>
<td>Disruptive innovation</td>
</tr>
<tr>
<td>Private sector</td>
<td>Technical support</td>
<td>Technology generation and transfer</td>
</tr>
<tr>
<td>Investing in people: promotion of broadband based skills and applications (business leaders and coops)</td>
<td>Maintenance, durability and virus protection</td>
<td>Communication, translation</td>
</tr>
<tr>
<td>Research organization/university/extension services</td>
<td>Tower development</td>
<td>Existence of competitors</td>
</tr>
<tr>
<td></td>
<td>Fibre installations</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Interview Respondents, 2013-2014)
Organizational Structure and Governance

The current state of Wellington County has certainly broadened the desperation of an intervention that can potentially support the development of internet infrastructure investments in general. Despite having access to the internet, every small business indicated the need for a “digital agenda” (coined by one business owner), for expanding broadband coverage and extending high speed internet to the widest number of Wellington County residents as possible. Improving existing networks as well as creating a strategy for e-inclusion is a step that residents feel necessarily if rural areas will experience the level of connectivity that urban hotspots like Guelph enjoys. The debate that these rural farmers have put forward is one that not only holds economic value but also one where public support has shown the strong social implications of the internet to prevent youth outmigration from rural areas. One dairy farmer acknowledges the fact that his sons studied abroad and never returned to Wellington County as a result of pursuing other income-generating opportunities that can be found more in an urban setting. The current view, according to the snowballed sample size, is that public intervention is evolving such that the costs associated with constructed fibre optic broadband lines must meet the perceived propensity of the markets that can ensure that these investments are made. These types of decisions, responsible by key stakeholders of the community, must be carried out based on both demand side and supply side factors. For demand side factors, there is a significant willingness for consumers to adapt to broadband networks. These demands also mean that many businesses are willing to pay for an upgrade to their broadband connectivity because of the realization of the opportunities of growth and productivity that high speed internet can bring. More and more agri-food businesses are recognizing that broadband networks are as critical as the basic telephone lines were on the 20th century. Having a strong impact on economic growth and development, many small businesses are frustrated with the lack of Wellington County municipalities’ accountability to ensure that high speed internet is given equal access for everyone.

On the supply side, some of the issues perceived by small businesses have been expressed as the lack of profitability and recovery of investments coupled with the industry’s traditional business model surrounding broadband provisions by incumbent providers. Despite this, small businesses argue that there is a business case to be had for providing broadband to rural Wellington County.
Moreover many businesses believe that once there is a strong infrastructure for broadband, the services that can be provided can be profitable, however even if it is not profitable, the costs should be recouped by the municipality and those receiving a stronger network signal living in urban settings.

**Change Process**

Many farm business models operate on a budget that depends on a loyal customer base and word of mouth networking. Some of the smaller businesses have their local Farmer’s Market where they sell their produce while other middle sized agri-food businesses have partnerships with other companies that purchase their produce in bulk. Based on these operations, the internet becomes vital for communicating with their various partnerships. However many businesses, especially smaller scales ones, do not have the luxury to take risks and experiment with internet connection lines that may or may not provide what a business requires in order to operate.

Having access to broadband connectivity with cheaper rates can be found few and far between. Even with rural providers in Wellington County like Zing Networks, Firely and Bluwest, they are only available sporadically throughout the region and most business owners are not familiar when presented with a list of providers for Wellington County (see table 5.6).
### Table 5.6: Broadband Coverage

<table>
<thead>
<tr>
<th>Company</th>
<th>Packaging/Pricing Examples</th>
<th>Installations and bandwidth limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluwest Wireless</td>
<td>5Mbps/1Mbps $69.95 6Mbps/1Mbps $149.95</td>
<td>n/a</td>
</tr>
<tr>
<td>Eh!Tel Networks Inc.</td>
<td>Business DSL: Upper limit of 5Mbps $124.99</td>
<td>n/a</td>
</tr>
<tr>
<td>Firefly Networks</td>
<td>$49.95-$79.95 –no speed indicated Tower - $200-$800</td>
<td>n/a</td>
</tr>
<tr>
<td>Xplorenet (Hummingbird)</td>
<td>$94.99 packaging</td>
<td>n/a</td>
</tr>
<tr>
<td>Megawire Inc.</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>TD Tech Solutions (Netflash Internet Solutions)</td>
<td>$49.95 – 6Mbps/0.8Mbps- $89.95 - 15Mbps/10Mbps</td>
<td>400GB monthly usage Installation - $100 (2 year contract), $200 (1 year contract)</td>
</tr>
<tr>
<td>Packetworks</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Terago</td>
<td>1.5Mbps-5 (&gt;20)Mbps</td>
<td>Unlimited Monthly Transfers</td>
</tr>
<tr>
<td>Zing Networks Inc. (Vianet Internet Solutions)</td>
<td>3Mbps - $149.95</td>
<td>Installations $299.95</td>
</tr>
</tbody>
</table>

*Download/Upload

The information from table 5.5 was gathered using public information. However for many of these companies, obtaining price packages can be time consuming and even confusing, especially for those not familiar with surfing through webpages and advertisements. Moreover some of these companies have purposely omitted critical information like monthly bandwidth usage, installation costs and a range of internet speeds you are getting rather than just the upper limit. It can be startling to compare the companies’ claimed speeds with the MEDI Speed Test Data that was captured by Ookla, who operates the website www.speedtest.net., between the period from July 2011-June 2012 for Wellington County and see the differences in actual speeds
measured (see table 5.7). The data obtained from Ookla is based on the aforementioned speed test website where users choose on a volunteer basis to upload and share the speed tests results being currently experienced. This information is sent to the Ookla’s servers where the information is compiled. Despite the lack of generalizability of this information to the entire area of Wellington and the accuracy of the information that is self reported, the speed test data serves as an indication of the available broadband speeds as a sample for select regions of Wellington County.

\textit{Table 5.7: Ookla Speed Test Data}

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>CITY</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ID</td>
<td>Arthur</td>
<td>1.6143</td>
<td>0.6628</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Elora</td>
<td>4.8866</td>
<td>0.9651</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Erin</td>
<td>3.7440</td>
<td>1.2113</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>Fergus</td>
<td>4.1686</td>
<td>0.7453</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Harriston</td>
<td>11.9586</td>
<td>4.6889</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>Palmerston</td>
<td>12.7656</td>
<td>5.3704</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>Mount Forest</td>
<td>18.7068</td>
<td>10.9747</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>Guelph</td>
<td>12.2275</td>
<td>2.8816</td>
</tr>
</tbody>
</table>

(Ookla Speed Test Data July 2011- June 2012)

For some companies like Firefly Networks, their map network coverage can be seen from the figure below.
As a result the lack of awareness and availability of broadband around certain regions have further delayed the transition to an information network utilizing a fibre technology as opposed to fixed wireless connectivity which many of the farm businesses rely on. According to many small businesses, the possibility of using new infrastructure such as optical fibre is highly unlikely as most view that this type of transition can only occur if there is greater municipal support that incentivizes providers to upgrade their systems.

**External Factors Associated with Opportunities and Threats**

The applications of using the internet as a tool has been largely dependent on the type of internet connection, its usage and whether there is any cross platform use. The positive impacts that are bringing opportunities can be summarized as the capacity to communicate. However, ICTs and broadband goes beyond just communication. With the social change process evolving into a
networked society where small businesses develop international and national customers, the change in business operational behavior has been instrumental for the internet itself. However examining the other side of the coin, there are several barriers impeding the growth and development of broadband from the users that adapt to such technologies. The information overload can make many businesses overwhelmed. One farmer had a difficult time differentiating between the optimal growth patterns for his crop produce compared to those in other parts of the world with similar crops. Cooperation between the public and private sector has played a pivotal role for radically generating knowledge using the internet and increasing the accessibility of knowledge and information. However such development can be seen as lost opportunity because of the current climate of unequal access to broadband connectivity and how this prohibits effective use and application of the internet.

Table 5.8 summarizes where opportunity for broadband can help mitigate some of the challenges that prevent effective access. A cost-benefit analysis can further facilitate a greater sense of community or business ownership of broadband initiatives and to move forward for addressing some of the concerns over the question of how to enhance the broadband technology that is already here. Ultimately many businesses feel that by not having a dependable infrastructure of the internet in Rural Wellington County, it is difficult to overcome some of the other hurdles such as decisions to employ full time employees or dedicate greater time and resources for using broadband as a long term contributor to the business.
Table 5.8: Opportunities and Challenges to Broadband

<table>
<thead>
<tr>
<th>Access to Opportunities</th>
<th>Challenges of Integration &amp; Enabling Environment</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition in local loop and incumbent telecoms</td>
<td>Ability of users</td>
<td>Usage index download vs. upload</td>
</tr>
<tr>
<td>Competition in ISP market</td>
<td>Local significance – CSAs and locally shared towers</td>
<td>Reliability of network</td>
</tr>
<tr>
<td>Price for fixed wireless vs. using fibre vs. dial up</td>
<td>Municipal support</td>
<td>Capacity of ISP</td>
</tr>
<tr>
<td>Distance learning opportunities</td>
<td>Appropriateness of language – i.e. for Francophone and Mennonite populations</td>
<td>Partnerships with other institutions, universities, researchers etc</td>
</tr>
<tr>
<td>Availability of existing neighboring networks</td>
<td>Training and education</td>
<td>Greater business efficiencies</td>
</tr>
<tr>
<td>Technology maintenance and upgrades</td>
<td>Technical support</td>
<td>Innovation in business practices</td>
</tr>
<tr>
<td></td>
<td>Appropriate equipment and maintenance</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Interview Respondents, 2013-2014)
Wellington County Health Organizations

Internal Factors Associated with Strengths and Weaknesses:

Resource Management and Allocation of Capital

The emergence of Local Health Integrated Networks have given regional health authorities an arm’s length body to effectively manage the hospital sector within each associated region thereby constituting a devolution of power. For many years, Ontario has focused on hospital care and few on community-based care. From the 1990s, Ontario wrestled with the challenges of facing large deficits associated with increased health expenditures. As a result, an area like Wellington County has suffered from a lack of emphasis of integration of acute health services such as mental health. Such areas sought for solutions that were developed and integrated into a healthcare system that combines the efforts of hospitals, doctors, healthcare prevention and promotion programs and other community based healthcare services that can be easily transferred between providers rather than relying on costly institutional services. Ontario’s Local Health System Integration Act of 2006 that established 14 local health integrated networks, the Waterloo/Wellington LHIN being one of them, were designed to create a foundation for a variety of engagement avenues including the use of advisory groups, the funding of selected health services and community care access centers and long term care facilities. Existing local bodies and entities like the Guelph General however remain intact and keep their responsibilities for their services. The ultimate mandate of the Waterloo/Wellington LHIN is to finance and coordinate healthcare related services, not operate them. However based on the reporting of respondents, accountability, integration and performance measurements were among the key aspects that have not been operating at the level that is to be expected by Ontarians including those living in Wellington County. Making integration decisions under the authority of local networks needs to be the highlighting factor for LHINs under their specific jurisdictions.

Key informants highlighted several identifying factors that constituted some of the short comings of community health organizations across Wellington County. The three summarized ideas have been routinely expressed amongst a variety of skill positioned individuals that were interviewed
for this study. This would include the lack of communication from program to program, the idea of people not getting access to the required services and the lack of programs adoption. As a result of healthcare workers operating in different sizes and types of practices and brought forth different perceptions and norms towards the use of healthcare services electronically and over an internet line.

**Organizational Structure and Governance**

The governing structure for telemedicine seen across Wellington County has been deemed by many respondents to the research questions as in a transition state. Several change management mechanisms and key success factors have been identified throughout the interviews and survey questions that were asked. Anecdotal evidence was given based on various implementation strategies of telehealth and telemedicine systems. A variety of service needs were identified by several healthcare workers from urban environments such as Guelph to more rural areas found north of Arthur. These services include mental health services, diabetes, sexual health, pediatrics, perinatal HIV counseling, rehabilitation, chronic pain management and oncology. Each service is unique to any given health care facility across Wellington County due to the level of operations that are being currently carried out. For example, a Family Health Team in Fergus may refer a patient to Grove’s Memorial Hospital for a cardiologist.

In 2009, the WWLHIN eHealth Lead created a Telemedicine Advancement Committee in order to develop clinical telemedicine via the OTN. The Nursing Secretariat’s 9000 Nurses initiative provided the necessary funding in order to bring forth a business case for investing into telemedicine nursing within the WWLHIN. There were 8 RN FTE’s (Registered Nurse, Full Time Employees) and 4 RN FTE’s were responsible for integrating virtual telemedicine for the WWLHIN while the leading organization for this type of program was designated to St. Joseph’s Health Centre Guelph (SJHCG). The target population for this program Waterloo Wellington residents however specialty physicians outside the jurisdiction was also assessed in terms the use of telemedicine. Based on the program logic model the activities of the program include the use and assessment of nursing interests within clinical protocols and how it can support the telemedicine work that is being conducted by these nurses. The long term goal is to increase
telemedicine types of services in daily various settings while increasing access to multilingual language services to Waterloo Wellington residents. The outputs that are being considered in order to achieve the long term goals involve a nonspecified telemedicine implementation toolkit, an evaluation plan and final project closeout report. Short term goals that were outlined are the hiring of the appropriate nursing staff and to provide necessary education for nurses to become experts in telemedicine. A virtual team is to be established in order to have far reaching effects to communities while still maintaining initial areas of service delivery. These effects are predicted to lead to the intermediate goals of producing new models of care through telemedicine, an increased number of organizations utilizing telemedicine services, have wait times reduced and maintain cooperation between patients and clinicians that are using telemedicine and to ensure that communication is adequate. The stakeholders involved is the SJHCG which plays as the program lead organization while TAC evaluates the program with the help of a Telemedicine Program coordinator that develops and conducts the evaluation and telemedicine program nurses that collects and provides the data.

**Change Process**

One of the main effects of telemedicine is to transform distant communication technologies within the context of clinical care by having the capacity to modify personal face-to-face communication. The implication of such a radical change has been the source of constant debate amongst healthcare workers and those receiving treatment. The common component being raised is one regarding the integration and humanized mediated channels of communication that can occur as effectively as a face-to-face discussion. Of course depending on the type of treatment, the success of a telemedicine program will vary based on the level of acceptability of such a program by the end user. Nevertheless, the implications that telemedicine and other broadband based healthcare ICTs carry can share both positive and negative impacts. The most common aspects of broadband-enabled devices for healthcare that have been expressed to be most positive would include such abilities to transcend geographical boundaries and temporal boundaries.

Despite overcoming such challenges, what has limited the success of certain programs, according to the healthcare workers that were spoken to, was the ability, attitudes and comfort levels of
those using telemedicine services. The change process from one of rejection to acceptance has been a gradual one. Grove’s Memorial hospital has been currently working on a project with Sick Kids Hospital and the success of the Electronic Child Health Network (ECHM) success rate has not been meeting expectations. The ECHN is a network where physicians can share their child patient’s health records based on each patient’s referral to certain specialists.

Change process from one model to another that was discussed with key informants also involved the need for remote monitoring of patients identified as tele-home monitoring systems. Such individuals with no internet connectivity prevented the use of tele-home monitoring mechanisms which includes such applications as smearing blood sugar levels and its association to weight shifts. These indicators are especially important for monitoring COPD since large amounts of water gain can create lots of different health issues. As a consequence of the lack of the monitoring systems, these senior patients ultimately end up in the doctor’s office or worse in emergency situations.

**External Factors Associated with Opportunities and Threats**

The numerous opportunities that telemedicine brings to the table also has threats that prevent the effective flow of such programs. Breaking these threats and barriers has been important to mitigate costs associated with physicians and specialists treatment services to their patients. The key was to use local capacity to not only bring improvement in the quality of care but also to utilize a physician’s time in an efficient manner. Physician and specialist travel time to visit patients from rural or far reaching communities has always been contributing factor for their wait list. One physician indicates that his patients in need of specialists from Rockwood must be placed in their referral system waiting list until the appropriate specialist is contacted. When asked about the type of specialists required, the physician identified those psychiatric specialists from metropolitan areas like Greater Toronto Area has been more commonly linked to telemedicine services for his patients. These opportunities present a significant impact on patient waiting listings such that certain psychiatric specialists have little to no waiting list because of telemedicine types of services that are conducted over the internet. These opportunities extend beyond psychiatry; treatments in dermatology and arthritis have been important for linking
patient charts to certain specialists who can interpret these charts. Besides the benefit of shorted wait times, there are also many other key factors that leads to a success telemedicine program. Engaging with technology needs an environment that allows the opportunity for adoption and usage to occur.

Coinciding with such opportunities is patient comfort and acceptability that is such a large component of services connected to technology. Education and public health promotion of broadband-enabled devices for rural healthcare has been identified as an area that is not only underfunded but also underutilized. This is especially true for smaller organizations across urban centers like Guelph and more rural areas north of Arthur. Such smaller organizations adopt a community treatment model that depends on the program staff managers and facilitators to work in tandem with their clients through various group therapy sessions which range from cooking and cleaning to yard work. Building on life skills through these short-term programs helps deal with chronic or acute addictions. However these organizations struggle using broadband based technologies for their services because of the absence of a dedicated nurse to facilitate the use of such technologies.

Such integrated use of technology through broadband connectivity has increased the speed process for accessing treatment. However, a variety of challenges exist that healthcare providers are finding challenging to solve. Patient comfort and acceptability has been a large component of such services. Education and public health promotion of broadband-enabled devices for rural healthcare has been identified as an area that is not only underfunded but also underutilized. Table 5.9 summarizes the key issues discussed.
Table 5.9: Summary of Key Issues

<table>
<thead>
<tr>
<th>Investment</th>
<th>Barriers</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural - technological program solutions that adopt to different cultures such as the Francophone population and the Mennonites</td>
<td>Patient privacy</td>
<td>Learning and professional development</td>
</tr>
<tr>
<td>Geographic - connecting rural communities with metropolitan resources</td>
<td>Licensing and legal issues</td>
<td>Organizational networking</td>
</tr>
<tr>
<td>Clinical - Innovative program (Remote monitoring, remote diagnosis, Telepathology etc)</td>
<td>Limited resources/expertise</td>
<td>Conservation of time i.e. reduced waiting lists</td>
</tr>
<tr>
<td>Equipment maintenance and transportation</td>
<td>Infrastructure availability/limited bandwidth</td>
<td>Cost-effective way of delivering health care</td>
</tr>
<tr>
<td>Innovation in integrated software development</td>
<td>Internet congestion leading to delayed imaging</td>
<td>Greater tracking of information leads to more information of disease development and prevention</td>
</tr>
<tr>
<td>Use of virus and information protection software</td>
<td>Unreliable connectivity i.e. viruses</td>
<td>Infrastructure sharing (tower sharing)</td>
</tr>
</tbody>
</table>

Source: (Interview Respondents, 2013-2014)

Summary

This chapter categorized and analyzed the data gathered based on 4 key variables: usability, affordability, availability and accessibility and the experience and perception of broadband use across a wide variety of actors and organizations located in Wellington County. The chapter identifies a development strategy stemming from the systems, organizational and individual
levels while conducting a SWOT analysis of broadband provision and how internet-enabled devices influence the different sectors of Wellington County.

Based on the findings, the discussion surrounding broadband use has been focused around the investment requirements for various applications of having connectivity. Furthermore, the lack of resource allocation dedicated for broadband has prevented the interconnectivity within and between social actors that can be usually found among more developed urban settings. This has been tied to components in hardware and software availability, access to financial, social, human, natural and physical capital as well as the level of engagement to outreach programs that promote broadband deployment and its effective use. For Wellington County users this means that those located outside more concentrated areas like Palmerston or other areas considered to be more urban like Arthur, have experienced the digital divide in terms lack of access and provision despite having the basic necessary means to have the technological knowhow and resources to sustain connectivity related activities for productivity, growth, health and social development even for a certain period of time.

The final chapter discusses the conclusion of the study by examining the objectives of the study and how the objectives were addressed based on the study’s findings and the conceptual framework of an innovation, communication and information ecology. The chapter concludes by offering recommendations based on the objectives that were designed to investigate the role of broadband for Wellington County.
CHAPTER 6: Conclusions

Introduction

This chapter presents a final summary of this study by focusing on the findings and discussions that were presented based on the unit of analysis – the experience/perceptions of broadband technologies and the rationale (decision-making process), strengths, weaknesses, and effectiveness of broadband connectivity for Wellington County. By concentrating on agri-food businesses and health organization, this chapter highlights key aspects and concerns relating to internet connectivity and ICTs for capacity building. The chapter begins with a review of the objectives of this study followed by the methodological approach that identifies the post-positivist epistemological approach and conceptual framework that was employed. Following these components is a review of the findings and discussions in relation to each of the three objectives outlined in the introduction. The chapter concludes by offering key strategies and recommendations in order to support the role of broadband for the development of Wellington County and for bridging the digital divide and encouraging digital inclusion and participation. The end goal for this chapter is to facilitate information sharing in order to continuously improve the livelihoods of Wellington County residents.

Final Summary

As outlined in the introduction chapter, the purpose of this study is to understand and explore the role of broadband technologies and ICTs for rural socioeconomic development in agencies situated across agriculture and health. This research focuses on rural connectivity for southwestern Ontario, more specifically Wellington County, as a way to understand how broadband access impacts technical and institutional capacities by exploring 4 themes related to broadband adoption and utilization: value of adoption and acceptability, usability and accessibility. The purpose of this study is based on three main objectives. The first objective seeks to describe and analyze individual and social partnerships by characterizing cross sector co-creation of knowledge and understanding through the use of broadband enabled technologies. This involves the examination of the gap between societal level objectives for building an
Information Society and individual level broadband usage patterns for growth and productivity and their ability to innovate.

The second objective deals with the contextual factors that allow broadband deployment and new information technologies to foster better communication and innovation processes found in Wellington County agricultural farm sector and the rural healthcare sector. Analyzing the availability of broadband infrastructure as well as how internet enabled ICTs foster access to new market and treatment services is the underlying research questions being investigated for the second objective. The third and final objective aims to understand how rural broadband capacities can be supported in order to develop strong systems of equitable and sustainable socioeconomic development. This objective incorporates investment strategies and looks at the importance of the needs of end users in order to overcome existing challenges and constraints to participating in the digital economy.

The literature review in chapter two is written based on the assessment of broadband infrastructures and the benefits that can be derived from a robust infrastructure. The development of communication for social change and Manual Castells’ Network Society is discussed within the context of rural broadband connectivity for Wellington County. A conceptual framework was developed using literature developed from communication studies by Wilbur Schramm’s Model of Communication, Roger’s Diffusion of Innovation and Paulo Freire’s Indigenous Media Tools for communication. Superimposing the literature with the ecological works of an Information Ecology (Nardi & O'Day 1999), Communication Ecology (Nardi & O'Day 1999) and Innovation Ecology (Dougherty & Dunne, 2011) is the 4 thematic variables of the study. Chapter three provides background profile information regarding Wellington County and situates the broadband connectivity experience for the County. Chapter three describes how broadband has changed in the area and documents a few key stories of different providers in the area and the strategic response the county has adopted for broadband provision for all of its residents and businesses.

The methods employed for data collection described in Chapter four, based in post positivist epistemological approach, involves the use of a qualitative case study research design for
broadband connectivity in Wellington County using document (content) analysis, observations, key-informant and in-depth interviews. Each method of gathering data helps triangulate the information and form more contextual information regarding the state of broadband and its perceived use by respondents of this study. Analysis that was conducted was done through the use of QDA Miner Lite, a qualitative analysis software. The Findings Chapter was mainly composed of information data that was obtained through each of the interviews, observations and content/documentation analysis. The findings highlight how ICTs and broadband connectivity gets utilized and how end users face challenges within the confinements of health organizations and rural telehealth centres across Wellington County as well as small to medium agri-food businesses. The Discussion Chapter further explored the findings content with respect to enhancing livelihood capabilities through the effective adoption and management practices of broadband enabled ICTs.

**Conclusion**

Based on the findings, the exploration of broadband based programs and applications for both the health and agri-food sectors indicate that broadband enabled ICTs could contribute significantly to socioeconomic development from the perspective of health organizations utilizing the network to service their patients and agri-food businesses’ increase in productivity scale and growth. The research is an initial step towards demonstrating how broadband can be utilized, represented and misrepresented through the telecommunications industry. This study confirms that the thematic categories investigated (value of adoption and acceptability, usability and accessibility) suggests that simplifying connection and configurations to network access and use can institute greater integration of broadband based technologies. Exploring the delivery of innovative digital services means that any form of interferences from network insatiability to the lack of high speed transfer of data could prevent adequate broadband deployment for businesses and effective use of rural telehealth programs. This creates an inhibiting information ecology that prevents the effective network of a communication ecology and ultimately prohibits the mechanisms of an innovation ecology to develop and evolve based on the interactions of the local and foreign environments.
Broadband has also been particularly key for maintaining public/consumer relations and cultivating opportunities for peer-to-peer learning through partnership programs, especially between one health organization and another. The findings have been central for understanding how physical and human resources constraints have hindered the capacity of business or telehealth based programs from expanding and diversifying their use of broadband enabled ICTs. This is because of the lack of a reliable and affordable risk engagement that can potentially take advantage of additional bandwidth capacities. Ultimately this reveals that access to connectivity to promote livelihood strategies is not a priority for many Wellington County businesses and health organizations because of the severe lack in critical upsurge of broadband availability that bottleneck existing capacity building to the digital level i.e. Information Society. Challenges that persist as a result of Wellington County not meeting its resident’s future needs for building the last mile compromise developing broadband wireless and fixed access linked to a network backbone that is affordable and usable based on user requirements for bandwidth. Businesses that continue to invest in their digital online strategies have expressed their desire to innovate and focus on next-generation telecommunications networks, converging networks and 4G LTE (Long Term Evolution – a standard for wireless communication of high-speed data) service platforms, and ubiquitous, secure networks. However they are unable to do so because of availability issues.

With further consideration, implications of this study leads to further understanding of the uses of broadband for socioeconomic development and the demand side’s perception of closing the digital divide through the deployment of broadband based ICTs and their uptake and effective use. This study can provide the foundation for examining the short-term advantages and consequences of having access to a wide range of broadband speeds and bandwidth capacities. By documenting success stories and some of the failures that were experienced from short-term outcomes of ICTs, these experiences can then be linked and compared to the future pursuit of ICT-supported broadband growth through efficiency gains and increased productivity. Recognizing how ICTs and broadband in general are progressively changing work practices and entertainment at an exponential rate, it has quickly become apparent that documenting some of the success and constraint stories will help drive awareness building. Going from an organizational perspective to the individual level, agri-food businesses and mobile telehealth
clinics has allowed contextual information directly from Wellington County’s experience with broadband to be obtained and potentially used for evaluative purposes. Exploring the complexities that come with broadband can further facilitate those striving to overcome the barriers and bottlenecks to broadband usage by understanding some of the shared frustrations and positive outcomes of capacity development—As the discussion continues around what drives connectivity, there are several main conclusions that can be drawn from this study based on each objective that were identified in the Introduction Chapter.

**Objective 1: Identifying contextual factors for broadband deployment and its role for communication and innovation**

Both sectors of this study have demonstrated how different organizations and actors interact and work within their roles. What is concerning is the power relations that many providers of internet services have over their consumers thereby influencing how agri-food farm businesses conduct themselves online and the provision of rural healthcare by family health teams. It is evident that the information and communication ecologies surrounding the deployment and use of broadband in Wellington County has been on the notion that offering any form of service regardless of bandwidth quality can be sufficient for telecommunication technologies. As a result, moving into an innovation ecology has been less than successful because of the hampered penetration of broadband across much of rural Wellington County. Based on the consistency of the study findings’ responses and its discussion, the first conclusion that is drawn is:

A) Internet service providers must be encouraged in some manner to bring their services to rural areas and even less profitable areas

Through the responses of the research participants of this study, this study has shown in its findings that many respondents have agreed that broadband being available in only certain regions of Wellington County only further perpetuates the digital divide. Lack of competition in rural areas have been driving prices higher for connectivity thereby creating a detrimental cyclic pattern where businesses and organizations run out of compelling reasons to adopt to such faulty ICTs. There is a greater need for territorial mapping of underserved areas so that the last mile can
be implemented throughout Wellington County. Enhancing multiple private sector operators’ access to the market will be important for creating a competitive value of broadband access however success really depends on the ability to adapt to policies to national, regional and local conditions where “one-size-fits-all” model does not work for broadband. In order to avoid policy fragmentation, there needs to be vertical but also horizontal coordination that is locally systemic rather than piecemeal or patchwork operations. Policy measures like spectrum allocation based on the spectrum auction must be conducted in a manner that gives equal opportunities for smaller providers or new entrants to acquire spectrum from incumbents. Emphasis is placed on facilities-based competition (rather than service-based competition favouring the incumbents) for broadband deployment. Policies must promote infrastructure sharing and re-use while new property development must have mandatory installations of broadband facilities. This gives consumers a variety of choices for broadband provision which can subsequently produce higher speeds, lower prices and innovative internet access services. See table 7.0 in the appendix for more policy options for broadband infrastructures.

B) Broadband associated risk such as security risks, privacy & confidentiality, professional liability and management of sensitive data is an important factor for broadband adoption and usage.

Digital inclusion and the management of broadband enabled devices in the Information Society require a framework strengthened by information and network security. Authentication and privacy is critical for health organizations to maintain and uphold privacy legislation and security standards so the system does not get compromised. Businesses have a strong stake in the information that is transmitted through cloud computing. Relying on effective and secure strategies to prevent intruders from obtaining unauthorized data information will be critical for a Wellington County broadband strategy. The Federal Personal Information Protection and Electronics Act (PIPEDA) provide protection of personal information of identifiable individuals including health information. However many would agree that that the Act was not designed to deal with specific characteristics of certain data. The Health Care Consent Act provisions the type of information that patients must receive in order for consent to be informed. Maintaining strong healthcare-patient relationships is important, similarly, agri-food consumer protection is
equally as important as licensure of copyright material for many of the agri-food farm businesses have been a challenge to overcome.

**Objective 2 – To understand how rural broadband capacities can be supported in order to develop strong systems of equitable and sustainable social and economic development**

The second objective of this study relates back to asking the question of how socioeconomic development can be encouraged through the opportunities that broadband provides. This objective is to identify and characterize the level of value that is prioritized for the end user of broadband based on its adoption, acceptability, accessibility and usability of the enabling technologies. Using the framework of the three ecologies and these variables, the data has consistently suggested that telecommunication technologies based on broadband is more than just having a digital presence or achieving communication with geographically distant clients. Motivation for choosing broadband access has been inclined towards investment in future opportunities for acquiring new skills and abilities to gain greater efficiencies in the development of knowledge and innovation. Even for respondents that expressed an aversion to the use of electronic technology, the threat of an ever expanding global market has refocused the vision for broadband as an essential utility of the future like hydro. An actively engaged innovation ecology has been important for maintain equilibrium between the information and communication ecologies in order to support the use of broadband for systematically understanding the planning required for actively participating in digital inclusion and therefore its meaningful use.

C) Ability to access and share information and knowledge creation is more important than the broadband technologies itself where information and communication is necessary but not sufficient for innovation

Throughout the Findings Chapter, there have been a few cases reported where the presence of technology was not enough to mobilize its use. This has been attributed to the lack of human resources and skilled expertise to successfully adopt the technology in a meaningful manner. The ability to access and contribute information and knowledge is an essential component to an
inclusive Information Society for best practices. This creates a domino effect where benefits trickle down to education, job creation, innovation, newer business opportunities and the advancement of information and communication processes. Increasing awareness for all stakeholders involved with broadband ultimately leads to a more accessible support structure that enables new possibilities in software and hardware design. Subsequently this fosters the diversity of choice, increased competition and innovation as well as equal access to affordable broadband.

D) Broadband connectivity is not only essential for socioeconomic development and capacity building but also can act as a disruptive innovator and challenge current practices

The findings and subsequently the discussions suggest that Ontario policies that seek to deliver knowledge and technology products must shift to integrate within the local community context. Disrupting any status quo for further development remains to be a significant challenge for health (telehealth) clinics and organizations as well as the agri-food sector. However, broadband is only beginning to be a vehicle for impacting Wellington County’s growth and development in the digital economy.

Objective 3 – To describe and analyze the interactions and partnerships between individuals and social structures by characterizing cross sector co-creation of knowledge and understanding of connectivity process

The final objective of this study alludes to the dynamic interplay between social structures such as community organizations, governmental bodies, and family health teams and individuals identified in small businesses and users of broadband connectivity. Understanding how relationships has created, developed and dismantled has been an important component of this study and Manuel Castells’ work on the network society. Living in an age where information can be readily available, having connections to the appropriate network is all the more crucial. This study has highlighted just how dependent organizations and individuals can be with one another. A breakdown of these networks has been a major predictor of how much utility can be obtained from broadband enabled technologies. Investment allocation has been particularly important for
leveraging production-related costs for broadband infrastructure sharing and the reorganization of the structure of how broadband gets utilized within one’s organization. Therefore one of the conclusions that were drawn from this type of a finding was that:

E) Investment into broadband for innovation and growth is an important component for cooperatives and community-owned systems

Broadband connectivity and ICTs should be regarded as tools and not as an end in themselves. Under favourable conditions, these instruments can empower learners, developers, contributors, practitioners, entrepreneurs and decision-makers through the network of an inclusive Information Society. In order to achieve sustainable development of ICT’s capacity to operate, there are many complex interactions between stakeholders of governing bodies, researchers, and practitioners that allow organizations rooted in local communities to reflect public opinion and encourage support of ICT-relates initiatives. At the community level, civil society plays an important role for internet matters while intergovernmental organizations facilitate the coordination of broadband based public policy issues. Supporting “champions” of rural broadband access can foster strong independent regulators working to attract new entrants and encourage fair competition. A local champion can subsequently influence other agencies for evidence-based best practices by showcasing successful outputs of fostering telecommunications competition and driven growth.

Recommendations

Based on the findings of this study, the recommendations being suggested boils down to favouring a more inclusive measure of broadband adoption and effective use built around improving penetration rates, demand and infrastructure. Many of these elements depend on internet service providers’ abilities to integrate data, voice and video into packaged services that meet the requirements of end users from entertainment and business to education and healthcare. Governmental policies should not solely be focused on financial support for building the backbone infrastructure but rather focus on closing the digital divide between urban and rural areas in a sustainable manner. Achieving greater broadband penetration in rural areas also means
reducing the backbone and multimedia costs associated with the connection speeds. Identifying key successful private sector innovations will also help drive universal access by making connectivity an attractive investment for businesses and organizations locally and for multi-sectoral partnerships. Local content development for Wellington County will be important for preserving cultural identities including people living in rural, remote and marginal areas. The following chart briefly outlines some of the factors associated with broadband and who should be responsible for implementing each factor.

**Table 6.1: Recommendations Categorized for Practitioners and Policymakers**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Practitioners</th>
<th>Policymakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>• Evaluate decision to adopt broadband through a long term cost-benefit analysis rather than short term efficiency gains</td>
<td>• Industry Canada should consider free or very low-cost wireless broadband to address affordability issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Encourage internet service providers to enter underserved areas through incentivized programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Share cost/funding for building and maintain/updating infrastructure costs</td>
</tr>
<tr>
<td>Technology</td>
<td>• Hiring of I.T skilled employees</td>
<td>• Mandating installation of broadband facilities in newly built properties and homes – under municipal control</td>
</tr>
<tr>
<td></td>
<td>• Forming partnerships with regional broadband strategies from Wellington County to adopt wireless technology on a 4G platform using demand-driven standards that take into account needs of users that encourages accessibility of ICTs</td>
<td>• Prioritize public-private partnerships to increase relevancy of broadband for older populations of Wellington County</td>
</tr>
</tbody>
</table>
From a policy standpoint, it is important that municipal governments across Wellington County understand that cost is an important driver for internet provision. Despite many respondents’ willingness to adapt to broadband connectivity, the costs claimed by service providers have prevented them for providing connectivity to the underserved areas. As such, sharing infrastructure costs can be learned from other projects within Ontario such as the EORN’s (Eastern Ontario Regional Network) partnerships with the wireless telecom industry to share funding costs to build, upgrade and maintain the public broadband infrastructure. However where the plan would defer would be the logistics behind ownership of the infrastructure which
should ultimately remain within the public domain. Rather than shifting ownership of the infrastructure to the public sector after a certain period of the contract, the infrastructure should remain within the public while the private sector can still use the infrastructure to provide high-speed access to the internet that is both profitable and sustainable for the long-term future. The goal would be to foster competition driven through the use of public infrastructure available to Wellington County residents. Encouraging individuals and practitioners to adapt to broadband based on long-term strategies rather than short-term efficiency gains should be a part of the goal of infrastructure cost sharing.

With technology, hiring the appropriate IT skilled employees can be seen as an important aspect of how well ICTs are realized to their potential. This is evident with the use of OTN (Ontario Telemedicine Network) nurses that have helped integrate telehealth services to the facility that they are working in. Moreover, encouraging organizations to form partnerships with a Wellington County-wide strategy for broadband use can further consolidate the use of broadband from the beginning stages to everyday use. Municipal governmental programs that may help with technology for broadband may include mandating installation of broadband facilities in newly built properties and homes. This will ensure all development of property is future proof for the ever-expanding globalization of the economy. This study has unsurprisingly revealed the lack of broadband adoption amongst the older aging population of Wellington County. Increasing the relevancy of broadband for these older populations through specifically tailored broadband advocacy programs can help alleviate the lack of adoption for this segment of the population.

For the programming aspect for broadband, local leaders from municipal public bodies and independent entities play an important role for providing an example for locally built strategies for success to drive broadband adoption and its uses for innovation. Expanding the notion of “universal service” advocated by Industry Canada to bring broadband to all Canadians can be fostered by providing broadband connectivity to the public domain such as downtown areas by forming partnerships with independent ISPs. Municipal bodies must be called into action in order to formulate a board whose goal is to oversee the provision of broadband for the downtown core. Other issues like territorial mapping of broadband availability by key experts can help quantify the need while qualitative experts can determine drivers behind adoption practices.
Investment opportunities for practitioners is similar to its programming where content creation, innovation and exploring ways for community organizations to bring connectivity to their facilities can create the appropriate long term environment for digital inclusion. Moreover digital literacy programs spearheaded by educational institutions like the University of Guelph and public campaigns by private service providers can help further the cause for universal access of broadband for all.

**Future Research**

Areas of research that was not addressed in this study include a quantitative cost-benefit analysis of broadband networks across various rural regions of Wellington County. Factors affecting choice between mobile and fixed broadband were not explored in depth. Studying how both the health and agri-food sectors associate fixed and mobile technologies for the future will be important for the development and provision of rural broadband connectivity. Policy measures on the supply side were another component of broadband that was not examined in further detail. Examining the challenges, constraints and advantages certain providers have over others and their management structure is a research perspective that needs to be undertaken in order to complete the picture of broadband knowledge base for Wellington County. Furthermore, the effective uses of broadband enabled ICTs amongst patients themselves were not interviewed. Nor were any consumers of agri-food businesses in the county were interviewed. Therefore there is a whole new body of work that will be worthwhile exploring in terms of patients receiving care using the internet and consumer groups that are affected by the level of broadband connectivity that is available in the area of Wellington County.

Intellectual property protection and how this influences innovation within the online world will also be another field of research that will have strong implications of how broadband content is provided to Wellington County residents. The fundamental issues of capacity building through an inclusive Information Society still has a long journey for Wellington County, however there is much hope as progress towards digital inclusion and bridging the digital divide is gaining traction among residents and Wellington County businesses and health organizations.
References


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Figure 1.0: Schramm’s two-way circular process for communication
Source: http://communicationtheory.org/osgood-schramm-model-of-communication/

Table 1.0: Broadband infrastructure types and providers

<table>
<thead>
<tr>
<th>Service provider</th>
<th>Service type</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed</td>
<td>Mobile</td>
</tr>
<tr>
<td>Commercial (For-Profit)</td>
<td>DSL</td>
<td>Internet cafés</td>
</tr>
<tr>
<td></td>
<td>Cable</td>
<td>Fee for service wireless hotspots</td>
</tr>
<tr>
<td></td>
<td>Fibre-to-the-home</td>
<td>Subscription-based 3G/4G/WiMax services</td>
</tr>
<tr>
<td>Public Sector/Government</td>
<td>Municipal wireless projects serving residences</td>
<td>Municipal wireless projects serving public places</td>
</tr>
<tr>
<td></td>
<td>Municipal/utility FTTH projects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community access sites</td>
<td></td>
</tr>
<tr>
<td>User/Citizen</td>
<td>Individuals’ open wireless networks</td>
<td>Community wireless projects serving public places</td>
</tr>
<tr>
<td></td>
<td>Community wireless projects serving residences</td>
<td>Federated wireless sharing (e.g., FON)</td>
</tr>
<tr>
<td></td>
<td>User-owned FTTH networks</td>
<td>Sharing of 3G/4G/WiMax services</td>
</tr>
</tbody>
</table>

Source: (Middleton & Byrne, 2011)
**Figure 2.0:** Comparison of internet speeds  
Source: (Middleton 2007)

**Table 2.0:** Universal broadband speed goals for selected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Download Speed</th>
<th>Target Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>4 Mbps</td>
<td>2020</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2 Mbps</td>
<td>2012</td>
</tr>
<tr>
<td>Audtralia</td>
<td>2 Mbps</td>
<td>2018</td>
</tr>
<tr>
<td>Canada</td>
<td>1.5 Mbps</td>
<td>2010</td>
</tr>
<tr>
<td>South Korea</td>
<td>1 Mbps</td>
<td>2008</td>
</tr>
<tr>
<td>Finland</td>
<td>1 Mbps</td>
<td>2009</td>
</tr>
<tr>
<td>Ireland</td>
<td>1 Mbps</td>
<td>2010</td>
</tr>
<tr>
<td>Germany</td>
<td>1 Mbps</td>
<td>2010</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.5 Mbps</td>
<td>2010</td>
</tr>
<tr>
<td>France</td>
<td>0.5 Mbps</td>
<td>2010</td>
</tr>
</tbody>
</table>

Source: (Hudson 2010)  
http://books.google.ca/books?id=MLqpE6S6pqMC&pg=PA90&lpg=PA90&dq=Canadian%20and%20US%20broadband%20policies%20Heather%20Hudson&source=bl&ots=uRoa2xOU9M&sig=L57K_zn7khsS5XTtZ9YZNjR_mJo&hl=en&sa=X&ei=5avsUPfGl8iFqGbqoCABQ&ved=
Figure 3.0: Multi-layered benefits of broadband
Source: (Middleton 2007)
**Figure 4.0: The broadband cycle**  
Source: (Middleton 2007)

**Table 3.0: State of the characteristics of broadband services in Canada.**

<table>
<thead>
<tr>
<th>Current Status</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Penetration rates</strong></td>
<td>• Highest in G7 (2007)</td>
</tr>
<tr>
<td>• 10th in the OECD (2008)</td>
<td></td>
</tr>
<tr>
<td>• 94.5% of broadband customers are served by incumbent telcos and cablecos</td>
<td></td>
</tr>
<tr>
<td>• Top 5 providers generate 70% of revenues</td>
<td></td>
</tr>
<tr>
<td><strong>Market share and choice</strong></td>
<td>• The market is highly concentrated, with few new entrants</td>
</tr>
<tr>
<td><strong>Speed and quality</strong></td>
<td>• Choice exists between cable and DSL platforms, but other options are limited. There are few competitive DSL providers</td>
</tr>
<tr>
<td>• 1% of Canadians have broadband connections with download speeds &gt;10 Mbps</td>
<td></td>
</tr>
<tr>
<td>• 25th/30 in OECD for average connection speed</td>
<td></td>
</tr>
<tr>
<td>• Traffic shaping practices of many ISPs limit the quality of service provided to users</td>
<td></td>
</tr>
<tr>
<td>• 27th/30 in OECD for average monthly prices (relative to 4th most expensive) in terms of $/Mbps</td>
<td></td>
</tr>
<tr>
<td>• Restrictive download caps increase subscription costs</td>
<td></td>
</tr>
<tr>
<td><strong>Pricing</strong></td>
<td>• Relatively expensive broadband when assessed on basis of speeds provided</td>
</tr>
<tr>
<td></td>
<td>• Download caps restrict consumer innovation</td>
</tr>
</tbody>
</table>

Source: (Middleton 2007)
Figure 5.0: Primary framework for information ecologies
Source: (Steinerová 2010)
<table>
<thead>
<tr>
<th>Web 1.0</th>
<th>Web 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoubleClick</td>
<td>Google AdSense</td>
</tr>
<tr>
<td>Ofoto</td>
<td>Flickr</td>
</tr>
<tr>
<td>Akamai</td>
<td>BitTorrent</td>
</tr>
<tr>
<td>Britannica.com</td>
<td>Wikipedia</td>
</tr>
<tr>
<td>Personal websites</td>
<td>Blogging</td>
</tr>
<tr>
<td>Evite</td>
<td>Upcoming.org and EVDB</td>
</tr>
<tr>
<td>Domain name speculation</td>
<td>Search engine optimization</td>
</tr>
<tr>
<td>Page views</td>
<td>Cost per click</td>
</tr>
<tr>
<td>Screen scraping</td>
<td>Web services</td>
</tr>
<tr>
<td>Publishing</td>
<td>Participation</td>
</tr>
<tr>
<td>Content Management Systems</td>
<td>Wikis</td>
</tr>
<tr>
<td>Directories (taxonomy)</td>
<td>Tagging (“folksonomy”)</td>
</tr>
<tr>
<td>Stickiness</td>
<td>Syndication</td>
</tr>
</tbody>
</table>

Figure 6.0: A model of ecological dimensions of information literacy
Source: (Steinerová 2010)

Figure 7.0: Becoming an intelligent community
Source: https://www.intelligentcommunity.org/clientuploads/PDFs/TopSeven-ICs-2011.pdf
Table 5.0: Community E-Development Framework

<table>
<thead>
<tr>
<th>Elements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision (Self-Definition)</td>
<td>Involving an inclusive process to ask ourselves what kind of a community do we want in order to live our lives more meaningfully and productively?</td>
</tr>
<tr>
<td>Learning Process</td>
<td>Having the capacity to question “the way things are done around here,” to identify unexamined assumptions. Develop a community that is self-conscious. “Communities of Practice” to connect, collaborate, and coordinate local responses</td>
</tr>
<tr>
<td>Organizational and Institutional Adaptation</td>
<td>Online and networked, local business and organizations must acquire capacity to interact more thoughtfully and flexibly.</td>
</tr>
<tr>
<td>Relate and Attract</td>
<td>Community capacities to relate, build alliances, and attract external suppliers of resources.</td>
</tr>
<tr>
<td>Community Governance</td>
<td>Reinforce the internet’s capacity to facilitate resilient local action. Focus more on distributed and relational leadership: horizontal institutional and governmental collaboration.</td>
</tr>
</tbody>
</table>

Source: (Graham, 2011)

Table 6.0: 2009 Estimated Total Experienced Labour Force 15 Years and Over by Industry

<table>
<thead>
<tr>
<th>2009 Estimated total experienced labour force 15 years and over by Industry</th>
<th>Centre Wellington</th>
<th>East</th>
<th>Guelph/Elora</th>
<th>Kincardine</th>
<th>North</th>
<th>North East</th>
<th>Wellington North</th>
<th>Wellington County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry, fishing and hunting</td>
<td>839</td>
<td>373</td>
<td>409</td>
<td>1600</td>
<td>703</td>
<td>143</td>
<td>877</td>
<td>4534</td>
</tr>
<tr>
<td>Mining and oil and gas extraction</td>
<td>22</td>
<td>29</td>
<td>22</td>
<td>13</td>
<td>24</td>
<td>23</td>
<td>24</td>
<td>157</td>
</tr>
<tr>
<td>Utilities</td>
<td>9</td>
<td>0</td>
<td>21</td>
<td>43</td>
<td>61</td>
<td>14</td>
<td>12</td>
<td>248</td>
</tr>
<tr>
<td>Construction</td>
<td>1017</td>
<td>544</td>
<td>708</td>
<td>610</td>
<td>385</td>
<td>390</td>
<td>375</td>
<td>4115</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3608</td>
<td>1078</td>
<td>1347</td>
<td>1115</td>
<td>1170</td>
<td>653</td>
<td>1833</td>
<td>10733</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>582</td>
<td>494</td>
<td>534</td>
<td>273</td>
<td>282</td>
<td>310</td>
<td>257</td>
<td>2732</td>
</tr>
<tr>
<td>Retail trade</td>
<td>131</td>
<td>656</td>
<td>657</td>
<td>444</td>
<td>487</td>
<td>405</td>
<td>554</td>
<td>4713</td>
</tr>
<tr>
<td>Transportation and warehousing</td>
<td>921</td>
<td>496</td>
<td>433</td>
<td>250</td>
<td>239</td>
<td>293</td>
<td>372</td>
<td>2733</td>
</tr>
<tr>
<td>Information and cultural industries</td>
<td>291</td>
<td>134</td>
<td>60</td>
<td>57</td>
<td>106</td>
<td>103</td>
<td>67</td>
<td>893</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>471</td>
<td>212</td>
<td>256</td>
<td>142</td>
<td>63</td>
<td>193</td>
<td>104</td>
<td>1411</td>
</tr>
<tr>
<td>Real estate and rental and leasing</td>
<td>304</td>
<td>151</td>
<td>109</td>
<td>44</td>
<td>52</td>
<td>120</td>
<td>57</td>
<td>841</td>
</tr>
<tr>
<td>Professional, scientific and technical services</td>
<td>112</td>
<td>610</td>
<td>519</td>
<td>77</td>
<td>86</td>
<td>39</td>
<td>167</td>
<td>2969</td>
</tr>
<tr>
<td>Management of companies and enterprises</td>
<td>54</td>
<td>12</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>Not available</td>
<td>69</td>
</tr>
<tr>
<td>Administrative and support, waste management and remediation services</td>
<td>65</td>
<td>303</td>
<td>252</td>
<td>119</td>
<td>165</td>
<td>21</td>
<td>318</td>
<td>2023</td>
</tr>
<tr>
<td>Educational services</td>
<td>114</td>
<td>365</td>
<td>654</td>
<td>293</td>
<td>232</td>
<td>319</td>
<td>197</td>
<td>3192</td>
</tr>
<tr>
<td>Health care and social assistance</td>
<td>157</td>
<td>421</td>
<td>717</td>
<td>292</td>
<td>880</td>
<td>355</td>
<td>724</td>
<td>4467</td>
</tr>
<tr>
<td>Arts, entertainment and recreation</td>
<td>373</td>
<td>218</td>
<td>187</td>
<td>22</td>
<td>54</td>
<td>40</td>
<td>14</td>
<td>923</td>
</tr>
<tr>
<td>Accommodation and food services</td>
<td>883</td>
<td>390</td>
<td>285</td>
<td>207</td>
<td>222</td>
<td>284</td>
<td>285</td>
<td>2482</td>
</tr>
<tr>
<td>Other services</td>
<td>742</td>
<td>438</td>
<td>489</td>
<td>216</td>
<td>325</td>
<td>266</td>
<td>335</td>
<td>2751</td>
</tr>
<tr>
<td>Public administration</td>
<td>436</td>
<td>291</td>
<td>311</td>
<td>103</td>
<td>82</td>
<td>185</td>
<td>119</td>
<td>1466</td>
</tr>
<tr>
<td>All industries</td>
<td>16144</td>
<td>7174</td>
<td>7951</td>
<td>6043</td>
<td>5138</td>
<td>4513</td>
<td>6608</td>
<td>53581</td>
</tr>
</tbody>
</table>

Source: (Country of Wellington Credit Review, 2011)
**Figure 8.0 – ICT capacity building for broadband.**

Source: (Nobuyuki, 2012)

**Table 7.0: Policy levers in the direct development of broadband infrastructures**

<table>
<thead>
<tr>
<th>Policy lever</th>
<th>Element of Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of investment/activity in the broadband value chain</td>
<td>Passive infrastructures</td>
</tr>
<tr>
<td></td>
<td>Active infrastructures</td>
</tr>
<tr>
<td></td>
<td>Services</td>
</tr>
<tr>
<td>Choice of geographical location of investments</td>
<td>Overbuild in already served areas</td>
</tr>
<tr>
<td></td>
<td>Coverage of areas in digital divide</td>
</tr>
<tr>
<td>Choice of Technology</td>
<td>Wireline/wireless</td>
</tr>
<tr>
<td></td>
<td>Scalability</td>
</tr>
<tr>
<td>Choice of appropriate interface with private operators</td>
<td>No private involvement</td>
</tr>
<tr>
<td></td>
<td>Public procurement</td>
</tr>
<tr>
<td></td>
<td>PPP</td>
</tr>
<tr>
<td>Governance</td>
<td>Involvement of stakeholders</td>
</tr>
<tr>
<td></td>
<td>Adoption of knowledge management techniques</td>
</tr>
</tbody>
</table>

Source: (Florence School of Regulation, Communications and Media, 2011)
Figure 9.0: Rural Connections Broadband Program for Wellington County
Figure 10.0: Before Broadband Coverage 2008
Source: (Wellington County Economic Development Strategic Plan, 2012)
Figure 11.0: After Broadband Cover 2011

Source: (Wellington County Economic Development Strategic Plan, 2012)
Annex 1 – Semi-structured interview questions

Information technologies and communication process

1. What type of results would you expect by having access to a readily available high speed internet?
   1.1 If you could have anything you wanted where access to high speed internet was considered, what would it be?
   1.2 How would it benefit you?
   1.3 How would it influence what you are doing today?

2. What is the importance of mobile technologies for your organisation/enterprise?
   2.1 How much of the available services are dedicated for broadband related activities through mobile technologies?
   2.2 Are different applications such as access to market information, extensions information, pricing, e-banking, distance education, and trade shows/magazines etc being used through any form of mobile technologies or broadband networks?

3. What is the relative education/skill set required to work with broadband ICT practices within the organisation/enterprise?

Community development process

1. How does the role of communication support the exchange of expectations and the development of learning opportunities among service providers and recipients for broadband ICTs?
   1.1 How does the community play a role in developing programs/treatments that are integrated within user-friendly mobile technologies such as cell phones, computers or broadband/internet ICT program?

2. What processes are in place to track the results of your social engagements with your clientele and how do you stay on top of the latest innovations in social media tools?

3. Is your social media response designed to illicit action or response?
   3.1 How should you determine the best channels through which to communicate with your clients?

4. In your opinion what is a reasonable time for clients to adopt and adhere to mobile ICTs that have been implemented by your enterprise?
   4.1 What is your strategy if this does not occur?
Annex 2 – Key Informant Interview Questions

1. Is there a significant presence of mobile technologies and/or access to broadband connectivity in the organisation’s core practices?
   1.1 If so are you satisfied with the communication technologies being utilized (i.e. current speed of access) or do you feel there is room for improvement?
   1.2 Who are your internet service providers and which bandwidth service tier are you subscribed to?

2. How much of your core practices and/or goals have been shifted by the impacts or lack thereof broadband ICTs and mobile technologies in general?

3. How much resources or time are you willing to invest into developing new programs or initiatives that is associated with broadband ICT tools that maybe unconventional for commonly accepted practices in agri-food and health?

4. How does the role of communication support the exchange of expectations and the development of learning opportunities among service providers and recipients for broadband ICTs?
   4.1 How does the community play a role in developing programs/treatments that are integrated within user-friendly mobile technologies such as cell phones, computers or broadband/internet ICT program?

5. What processes are in place to track the results of your social engagements with your cliental?
   5.1 How do you stay on top of the latest innovations in social media tools?
Annex 3 – Qualitative Question Sheet

About
The Following question sheet will be used to identify how Wellington County farm families utilize Information, and Communication Technologies (ICTs) and internet based technologies to operate and communicate within its environment.

Confidentiality:
Your name, and any identifying markers that link directly back to yourself will not be used during the writing of this report, nor will they be made public. There will be no reimbursement for your participation in this study. Please fill out the following as truthfully as possible. You may withdraw from this research at any time by emailing whalder@uoguelph.ca

Consent
By completing this survey, you agree you have reviewed and signed the associated consent form.

1. Do you have access to an internet subscription?
   [ ] No
   [ ] No – I plan to subscribe for an internet subscription in the near future
   [ ] Yes – I am satisfied with the services I am receiving
   [ ] Yes – The services I am receiving are poor (i.e. low speed and/or high costs)

2. As a farm business of Wellington County, how familiar are you with using communication technologies (i.e. online service delivery, access to market data, smart phones, tablets, social media etc) within specific operations such as production, processing or distribution?

3. How much of your day to day operations are influenced by technologies connected to an internet subscription?
4. What ‘tends to work’ when using technologies connected to the internet? What frustrates you when working with such technologies?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

5. Which of the following technologies do you use to promote your business or keep up to date with the latest news and information for Wellington County? (Required only if question 1 was answered yes)

[ ] Government Websites
[ ] Online Newsletters
[ ] Use of smart phones, tablets or external devices
[ ] Online databases for produce (i.e. Cattle Records)
[ ] Surveying current market crop prices via online sources
[ ] Attaining weather details from Environment Canada or other online sources
[ ] Video-conferencing with other organisations or farmers
[ ] Webinar (i.e. to learn about new techniques)
[ ] Social Media (Facebook, Twitter, Youtube etc)
[ ] E-mails
[ ] ListServ
[ ] RSS Feed
[ ] External blogs (i.e. farmer blogs)
[ ] Online forums for farmer groups
[ ] Websites
[ ] Other

6. Would you be interested in learning more about how communication technologies can impact your daily operations?

[ ] Yes
[ ] No
Annex 4 – Recruitment Letter

Knowledge Mobilization through Broadband ICTs in Services & Applications for Mobile Agri-food Innovation and Health in Wellington County

Wilson Halder
Graduate Student
whalder@uoguelph.ca
MSc. Capacity Development & Extensions
University of Guelph

Agri-food Respondent Recruitment Letter

My name is Wilson Halder and I am currently a graduate student from the University of Guelph under the program of capacity development and extensions (MSc.). I am presently involved with a research study that primarily seeks to gather qualitative data regarding the existing knowledge and the social impact of information, communication technologies (ICTs) in agri-food businesses within Wellington County and surrounding rural south-western Ontario. How the role of technologies and communication within agri-food influences the development and use of effective innovations will be examined; subsequently, the data gathered can provide an indication needed to determine how new information technologies can build better communication among agricultural knowledge workers and entrepreneurs.

My objective is to develop a qualitative research case study on the social impacts of ICTs used
within a broadband network for keeping a competitive edge in engaging with clients in agri-food businesses. The expecting outcomes are to develop a framework of information related to broadband activities that can contribute to innovation systems already in place. As such, I am seeking agricultural knowledge workers or entrepreneurs that are involved with agri-food in southwestern Ontario in order to further develop the existing knowledge and social impact of previously mentioned broadband initiatives. The research questions being proposed are as follows:

I would greatly appreciate it if I can book an appointment to speak with an individual representing your enterprise or organisation,

I thank you for your time,

Wilson Halder
whalder@uoguelph.ca
226-203-4188
Wilson Halder  
Graduate Student  
whalder@uoguelph.ca  
MSc. Capacity Development & Extensions  
University of Guelph

Mobile Telehealth Respondent Recruitment Letter

My name is Wilson Halder and I am currently a graduate student from the University of Guelph under the program of capacity development and extensions (MSc.). I am presently involved with a research study that primarily seeks to gather qualitative data regarding the existing knowledge and the social impact of information, communication technologies (ICTs) for health, more specifically for telehealth (otherwise known as mobile or e-health) and its branch of services such as telehomecare and the services of the Ontario Telemedicine Network for Wellington County and Waterloo region.

My objective is to develop a qualitative research case study on the social impacts of ICTs on the
provision of rural healthcare and to identify the perceptions and understanding of providers and end users of such services. As such, I am seeking participants that are pertinent to mobile telehealth in southwestern Ontario in order to further develop the existing knowledge and social impact of previously mentioned broadband initiatives. The research questions being proposed are as follows:

I would greatly appreciate it if I can book an appointment to speak with your Community Health program director or coordinator.

I thank you for your time,

Wilson Halder
whalder@uoguelph.ca
226-203-4188
You are asked to participate voluntarily in the study for examining how information and communication technologies benefit organisations involved with telehealth or mobile health systems and their contribution to socio-economic development in Wellington County.

The main purpose for this project is to characterize the relevant role of broadband related initiatives in communication technologies for rural southwestern Ontario. The purpose of this study is two-fold: a) to identify information flows and communication within the context of technologies used under a broadband connection; and 2) to determine how new information and communication technologies (ICTs) can act as enabling agents to build better communication in order to help overcome existing bottlenecks to rural socio-economic development.

If you have any questions or concerns about the study, please feel free to contact Wilson Halder, 203-220-4188 at whalder@uoguelph.ca. The assignment sheet is attached to this form and available for your review.

The faculty responsible for advising the researcher is Professor Helen Hambly. She can be contacted with questions or a request for feedback at:

School of Environmental Design and Rural Development
PURPOSE OF THE STUDY

The purpose of this study is to explore how specific information and communication technologies such as high speed internet or cell phones can help build better communication processes for telehealth organisations and their communities. We are interested in the current use and outcomes of using new information technologies.

Through this study we expect to gain a greater understanding of how broadband and information and communication technologies contribute to the provision of rural healthcare and socio-economic development in Wellington County.

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

1. Participate in a face to face, in-depth interview.

Participation will be on a one time basis only, it is voluntary and takes place at a time convenient for you and your organization. The interview will last approximately 45 minutes. You will receive background information on the study, and a copy of the request for signed consent (as explained below).

In general, in the interview you will be asked questions about your perception of and use of information and communication technologies. You have an opportunity to discuss information and communication technologies (ICTs) that are of particular interest to you or your colleagues.

The summarized information gathered in this study will later be shared with you in the form of a link to the MSc thesis after the study is completed (tentatively by Summer 2013).

Below we will explain clearly any risks, protection of information you provide and other logistics of this study.

POTENTIAL RISKS AND DISCOMFORTS
We do not anticipate any potential risks or discomfort. However, if you feel embarrassed, worried or concerned you should let us know and we will reassure you that it is not our intention to make you uncomfortable.

**POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY**

The greatest benefits for the participants of this study would be the potential for developing and expanding knowledge about ICTs as well as discussing partnerships with community leaders, practitioners and entrepreneurs so that research findings can be mobilized to increase economic and social prosperity in rural communities.

This study’s findings are expected to be disseminated to interested individuals, other researchers and institutions so that they can benefit from learning more about the role of ICTs in agricultural-food innovation processes.

**PAYMENT FOR PARTICIPATION**

Your participation in this study is entirely voluntary and you will not receive compensation.

**CONFIDENTIALITY**

*Every effort will be made to ensure confidentiality of any identifying information that is obtained in connection with this study.*

As we know your name because of the contact we have made with you and the small number of participants involved in the study, we cannot guarantee anonymity. This means that your organization and your position within the organization is known and potentially identifiable. However, we will guarantee that all information provided in this interview is kept confidential and not traced back to you specifically. We will use no names in analysis or final reporting of the research. We will report findings a summarized group or generalized manner.

We will keep your name and email/phone contact private and it will not be distributed further. Each respondent will be given an alphanumerical label/identifier for note taking and data transcribing purposes.

Several more steps will be taken to ensure confidentiality of the data acquired. Only the
researchers directly involved with this study will have access to this information for the purposes of analysis and conducting the study. Throughout the duration of the data collection phase, all notes will be coded by the researcher and kept in a separate secure location or in the case of electronic files, under password protection and encryption. Raw data will not be shared with any party other than the researcher and research advisor.

Any reports of this study made available to participants or sent to publication to a journal will contain information that reflects summary group results and not information about specific individuals. Following final reporting and publication data will be disposed of in a secure manner (i.e. electronically deleted).

**PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your information from the study. You may also refuse to answer any questions you don’t want to answer and still remain in the study.

**RIGHTS OF RESEARCH PARTICIPANTS**

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study.

This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board.

If you have questions regarding your rights as a research participant, contact:

- **Sandy Auld**
  - Research Ethics Coordinator
  - University of Guelph
  - 437 University Centre
  - Guelph, ON   N1G 2W1
  - Telephone: (519) 824-4120, ext. 56606 / Fax: (519) 821-5236
  - E-mail:sauld@uoguelph.ca
INFORMED CONSENT - In-depth Interview Participants

Date of Interview: ________________________

I have been read the information provided for the study entitled *Knowledge Mobilization through Broadband ICTs in Services & Applications for Mobile Agri-food Innovation and Health in Wellington County*

My questions have been answered to my satisfaction, and I agree to participate in this study.
I will be given a duplicate copy of this form.

____________________________________
Name of Participant (please print)

____________________________________
Signature of Participant (please print)

SIGNATURE OF WITNESS (Student Researcher)

____________________________________
Name of Witness (please print)

____________________________________
Signature of Witness

____________________________________
Date
INFORMED CONSENT - Key Informants

Date of Interview: ________________________

I have been read the information provided for the study entitled Knowledge Mobilization through Broadband ICTs in Services & Applications for Mobile Agri-food Innovation and Health in Wellington County

My questions have been answered to my satisfaction, and I agree to participate in this study. I will be given a duplicate copy of this form.

______________________________________
Name of Participant (please print)

______________________________________
Signature of Participant Date

SIGNATURE OF WITNESS (Student Researcher)

______________________________________
Name of Witness (please print)

______________________________________
Signature of Witness Date
You are asked to participate voluntarily in the study for examining how information and communication technologies benefit agricultural knowledge workers, entrepreneurs and institutions/organisations and contribute to socio-economic development in Wellington County.

The main purpose for this project is to characterize the relevant role of broadband related initiatives in communication technologies for rural southwestern Ontario. The purpose of this study is two-fold: a) to identify information flows and communication within the context of technologies used under a broadband connection; and 2) to determine how new information and communication technologies (ICTs) can act as enabling agents to build better communication in order to help overcome existing bottlenecks to rural socio-economic development.
If you have any questions or concerns about the study, please feel free to contact Wilson Halder, 203-220-4188 at whalder@uoguelph.ca. The assignment sheet is attached to this form and available for your review.

The faculty responsible for advising the researcher is Professor Helen Hambly. She can be contacted with questions or a request for feedback at:

School of Environmental Design and Rural Development
Ontario Agricultural College
University of Guelph
Fax Number: +01 (519) 767-1686
Guelph, Ontario, Canada N1G 2W1 +01 (519) 824-4120, ext. 53408
e-mail: hhambly@uoguelph.ca

PURPOSE OF THE STUDY

The purpose of this study is to explore how specific information and communication technologies such as high speed internet or cell phones can help build better communication processes for agricultural knowledge workers, entrepreneurs, institutions and organisations. We are interested in the current use and outcomes of using new information technologies.

Through this study we expect to gain a greater understanding of how broadband and information and communication technologies contribute to agri-food innovation and socio-economic development in Wellington County.

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

1. Participate in a face to face, in-depth interview.

Participation will be on a one time basis only, it is voluntary and takes place at a time convenient for you and your organization. The interview will last approximately 45 minutes. You will receive background information on the study, and a copy of the request for signed consent (as explained below).

In general, in the interview you will be asked questions about your perception of and use of information and communication technologies. You have an opportunity to discuss information
and communication technologies (ICTs) that are of particular interest to you or your colleagues.

The summarized information gathered in this study will later be shared with you in the form of a link to the MSc thesis after the study is completed (tentatively by Summer 2013).

Below we will explain clearly any risks, protection of information you provide and other logistics of this study.

**POTENTIAL RISKS AND DISCOMFORTS**

We do not anticipate any potential risks or discomfort. However, if you feel embarrassed, worried or concerned you should let us know and we will reassure you that it is not our intention to make you uncomfortable.

**POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY**

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and not traced back to you specifically. We will use no names in analysis or final reporting of the research. We will report findings a summarized group or generalized manner.

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*Sandy Auld*
Research Ethics Coordinator
University of Guelph
437 University Centre
Guelph, ON N1G 2W1
Telephone: (519) 824-4120, ext. 56606 / Fax: (519) 821-5236
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INFORMED CONSENT - In-depth Interview Participants

Date of Interview: ________________________

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My questions have been answered to my satisfaction, and I agree to participate in this study. I will be given a duplicate copy of this form.

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Name of Participant (please print)

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Signature of Participant (please print)

SIGNATURE OF WITNESS (Student Researcher)

____________________________________
Name of Witness (please print)

____________________________________
Signature of Witness

________________________            ______________
Date
INFORMED CONSENT - Key Informants

Date of Interview: ______________________

I have been read the information provided for the study entitled Knowledge Mobilization through Broadband ICTs in Services & Applications for Mobile Agri-food Innovation and Health in Wellington County

_______________________________________________________________________________________________________________

My questions have been answered to my satisfaction, and I agree to participate in this study. I will be given a duplicate copy of this form.

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Name of Participant (please print)

______________________________________
Signature of Participant Date

SIGNATURE OF WITNESS (Student Researcher)

______________________________________
Name of Witness (please print)

______________________________________
Signature of Witness Date