A New Horizon for First Nation Peoples: Embracing the ICT Universe

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Abstract

Many First Nation communities across Canada are under pressure to resolve the current social, economic and health disparities between First Nations and non-First Nations people; conditions that have evolved over a long time. However, a transition to the "information age" maybe a catalyst for the transformational change First Nation communities are searching for. The challenge, when adopting ICT, is overcoming complex social factors. This research asks the question "What are the challenges and strategies for implementing ICT in First Nations Communities?". The framework for the research design and analysis were based upon Gursteins' Community Informatics and allowed for an exploration of his theoretical model as it applies to local First Nation communities. The action research design provided an opportunity to consider the direct application of the research to First Nations experiences in ICT adoption, with the goal of providing information for making informed decisions about ICT. This research indicates that resources alone are not the only, or even the most significant, obstacle to ICT adoption by First Nations communities. Other factors such as community capacity, skills transfer and most importantly a community driven approach are often the critical factors to successful implementation. Understanding the critical processes to successful ICT implementation will increase the success of communities' development of ICT strategies.

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Introduction: Study Problem

While resistance to change is universal, there are a number of other factors that limit society's capacity for advancement. For First Nation communities and numerous other marginalized peoples, the ability to advance is further hampered by numerous other socio-economic conditions. As First Nation communities look to address the complex internal issues, a new challenge is developing as innovations in technology have triggered a paradigm shift. The global dynamics are shifting towards a society where innovation and technology are becoming drivers of the economy; will change how society interacts; and will alter how information is processed. This is a historical era which marks the transformation from the Industrial Revolution to the Information Age, and this fragile population is on the cusp of falling further behind as innovations in technology have triggered this paradigm shift.

In order to address these deficiencies, efforts are under way by the global community to find ways to engage the world's disadvantaged in the new economy. In 2001, the United Nations Information, Communications, and Technology Task Force (ICT Task Force) organized by government officials, private industry experts, non-governmental organization leaders and numerous other stakeholders from every part of the world (Anonymous, 2005), gathered with the goal of informing global leaders on how to best engage the world's disadvantaged in the new economy. Through extensive consultation and research, the ICT Task Force has made extensive progress in bridging the digital divide in some of the neediest regions of the world. Their findings along with Dr. Michael Gurstein's community informatics theory, informs and provides the foundation for this research. This project also provides an opportunity to explore the

potential to transfer the global understanding of engaging disadvantaged people with ICT to a local context, specifically that of First Nation peoples.

The focus of this research is to understand the challenges First Nation peoples face in making the transition to the information age by asking questions such as "What are the barriers to implementation? Who should take the initiative to engage First Nation peoples? Can the concepts be adopted? Is there a need for communities to conform?" and "What are the risks and benefits to the communities?". The research findings may serve to create an agenda for change by identifying the origins of resistance and/or obstacles to successful implementation of ICT and proposing strategies with proven success in the global community as First Nation peoples move into the information age.

Background

Information, Communication, and Technology (ICT) is being explored by the United Nations (UN) as a tool that may improve the standard of living in societies that lack the means to do so independently. In communities where socio-economic conditions have been dire for so long, the challenge to implementing such radical change is addressing the obstacles that prevent the opportunity to fully participate in the new economy (Johnson, 2005). While ICT is not capable of cleaning the environment, treating water or feeding the poor (Brito, 2005), ICT is capable of creating opportunities that can lead to an improved standard of living. Such inequalities, caused by long periods of exclusion, are deeply rooted in the intended and unintended consequences of the industrial revolution. However, as the industrial revolution continues to lose momentum to the information age, those who haven't benefitted from the unprecedented period of

growth of the industrial revolution are now positioned to use ICT as a means to "Leapfrog" (Crossing Boundaries National Council, 2006) into the information age.

Numerous countries, businesses, and individuals are benefiting from the information age; however it has also created a digital divide. The UN has identified the digital divide as another contributing factor to the increasing disparity between industrialized nations and underdeveloped countries. Cognizant of the multiple detrimental impacts caused by such great disparity between industrialized and underdeveloped countries, the UN is looking to address the disparity by developing a long term strategic plan known as the Millennium Development Goal (MDG). As part of the MGD, an ICT Task force was assembled and tasked with exploring how ICT may be used to elevate the living conditions of the poor. Their research, consultation, and collaboration with world wide partners has generated a growing list of solutions aimed at increasing ICT uptake by those most in need of making the transition to the information age.

The work done in third world, developing countries is relevant to an examination of ICT readiness in First Nations communities as the literature demonstrates the similarities between the two peoples. At present, both groups of peoples make up significant populations, are over-represented in all areas of socio-economic disparity and are being left behind at a staggering pace. UNICEF (Report Card, 2008) recently drew parallels between their work with third world countries and First Nations communities in the industrialized world. Unless a conscious effort is made to close this gap, the disparity and the digital divide will continue to escalate. In addition to what has been learned from work in the global context, community informatics theory provides the impetus and

foundational work for exploring the research question: *What are the challenges and strategies for implementing ICT in First Nations Communities?*

Problem Definition

Reports and research continue to advocate for a top down solution to ICT adoption. The focus of these strategies is on delivering the skills to the community with little or no consultation; there is the assumption that the uptake will then take hold (Gurstein, 2007). However, this approach has led to recommendations for actions that are inconsistent with the results First Nations desperately seek. To illustrate, First Nation communities have stated that self determination is an important step towards healing, socio-economic status, and ensuring the future (First Nations Development Institute, 1995). However, there has been a heavy emphasis on other stakeholders (i.e. government, policy makers) to assume responsibility for implementing the changes (Gurstein, 2007). Although their position is understandable, it does not create an environment conducive to achieving the goal of self determination. In addition, recent reports show that a "bottom-up" approach in collaboration with other stakeholders is more likely to generate positive results (Beaton, 2008; Greenall, 2005).

By not assuming an active and equal role, these recommendations effectively put the future of ICT in the hands of others (for example, government or private enterprises). First Nations then lose the power to become self-determining, as strategies, as proposed, do not encourage members to seek innovative solutions or solicit support from the community. Research such as the Aboriginal Voices report (2006, p.29), advocate for a series of actionable events (opportunities) that increase the chances of First Nations full

participation. Unless more attention is given to the root causes of what makes adoption so difficult, these opportunities are unlikely to result in ICT adoption in First Nations communities.

Statement of Purpose

The purpose of this research is to explore ICT adoption in a First Nations context. In order to achieve this, the following objectives were identified:

1) to provide the historical context for First Nations in relation to the emergence of the information age,
2) to explore models of success and challenges to ICT adoption,
3) to document the inconsistencies between existing conditions in First Nations communities and necessary conditions as defined by Dr. Michael Gurstein, and
4) to consider 1, 2, and 3 within the framework of the community informatics theory and propose strategies for improving ICT uptake in First Nation communities.

Preamble to the Literature Review

There are a number of overlapping terms and references applicable to Information and Communications Technology (ICT) that require clarification prior to presenting the literature review. Therefore, a short discussion of two terms common throughout this paper is presented to set the context. The first term, the "digital divide", while commonly used, is not always understood. Therefore, a brief discussion is presented that will help the reader to better understand the technical discussion within the literature review

Confusion is also created by the various terms being used to describe the

transformation from the industrial revolution to a new era based on ICT. The intent is to describe the terms that are commonly used and establish a standardized term which will be applied throughout this paper.

Digital Divide

The term "digital divide" was developed in the mid 1990's (Digital Divide, 2008) to address the increasing gap in access to technology. Globally speaking, the term is intended to distinguish between industrial nations such as Canada and the U.S. and developing countries such as Nigeria or Burma. Bridges.org (2006) defines the digital divide as "…the division between those who have access to ICT and are using it effectively, and those who do not". To illustrate in practical terms, the digital divide is measured using indicators such as the number of children who have access to computers versus those who do not. Children in industrialized countries, like Canada, are far more likely to have access to a computer than children in most third world countries. Other indicators include the availability of ICT tools such as telephone infrastructure (for internet access); access to computer hardware; and the capacity to utilize the technology. The digital divide "…is not a single thing, but a complicated patchwork of varying levels of ICT access, basic ICT usage, and ICT applications among countries and peoples" (Spanning the Digital Divide, 2001, p.4).

Terminology

To complicate understandings of ICT, many terms are used somewhat interchangeably to describe the shift in global dynamics. All of the following terms are

commonly used: the information revolution; the information age; the knowledge economy; and the new economy are all used to describe what ICT represents and the impact ICT has on society. To illustrate the varying descriptions, the National Museum of American History described the Information Age as a series of events that lead up to today (Smithsonian Institution, 1995), while Wikipedia provides the following description "The name alludes to the global economy's shift in focus away from the production of physical goods (as exemplified by the industrial age) and toward the manipulation of information" (Information Age, 2008). While each term is distinct in terms of their origin, they both refer to social impacts associated with the evolution of information, communication and technology. For the purposes of this project, the term "information age" will be used.

Literature Review

This section reviews existing research and literature central to the complexity of adopting ICT including: the historical information essential to understand the impact of the ICT revolution, an examination of models of success for ICT uptake, and the theoretical perspective that underpins the research.

Historical Information: Four Forces of Change

There is a perception that society is undergoing a revolution in technology fueled by the increasing impact of ICT in everyday life. However, contrary to this popular belief, the information age has been evolving for centuries (Winston, 1998), each progression in ICT contributing to the development of the information age. The history

of communications is rich in innovation whereby each new innovation in technology exponentially advanced human development. The momentum created by the development of the various communication mediums is demonstrated though a brief historical review on the evolution of ICT. There are four specific mediums examined here that have a direct connection to ICT. The purpose of this section is to illustrate how forms of communication evolved and how they came together to create a new communication medium over the internet.

Today's internet is the convergence of four mediums now accessible through one central point. In essence, the convergence of these technologies has created a whole new medium and has sent the information age into overdrive. The start of this convergence begins with text, which consequently was the first form of communication available on computers. As computers evolved, new technologies improved and other mediums became accessible. Visual images became available (i.e. photographs, video) then the ability to transmit data wirelessly (broadcast and receive data by remote), and audio (i.e. error messages, voice, and music). This transition appeared virtually seamless as each of the technical advances become intertwined while the technology was converging into a single medium.

Each of the mediums that are utilized through technology all have a connection to ICT and the purpose of this section is to demonstrate how four forms of communication evolved and how they came together to create a new communication medium over the internet. The literature review will begin with a brief historical summary and a narrative of the four forces that make up the internet including: the origins of text; the power of images; the new wave in global communications-electronic messaging; and the brilliance

of broadcasting (Crowley and Heyer, 2003). Rounding out each section is an examination of the impact each innovation had on society.

Text

The development of text (or written communication) is not a single event; rather it is a series of events that led to a form of communication used universally. The power of writing as a communication medium is said by Andrew Robinson (2003) to be among the greatest innovations of all time. What makes this medium so powerful is the historic connection text has to the standardization of the alphabet & numeric system, the invention of paper, and the invention of the printing press. For the purposes of this paper, the term "text" encompasses the development of paper, the creation of both a standardized numeric and alphabet system and the ability to reproduce information on a mass scale. The review in this section will begin by analyzing the contributing factors that led to the advancement of text.

Alphabet & Numerals

The alphabet and numbers as an agent of social change is often underestimated even though "Writing made possible the storage and retrieval of vast amounts of information" (Crowley and Heyer, 2003 p.42). It goes without saying that the development of the written language was a complex evolutionary process involving numerous cultures and spanning thousands of years. However, a complete history of the written language evolution is beyond the scope of this research; rather, the intent of section is to briefly highlight the development and functionality of both forms of notation.

Robinson (2003) describes how the invention of a numeric system likely superseded the alphabet due to the rapid growth in early urban centers and the increasing commerce that took place. In Robinson's chronicle, he describes the rise of mathematical tools used to record transactions that date back to 8000 BC. Complex commerce problems drove the innovation to develop a notation that could be used and accepted on a large commercial scale. As the values became accepted, operations too complex to figure "in ones head" were now possible as a result of this mathematical notation (Logan, 2003). While the first forms of math were not capable of solving complex problems, the ability to utilize a standardized numeric system ultimately created the ability to transfer and expand knowledge over greater periods of time. The development of numbers was also critical in the creation in scientific areas such as astronomy, physics and mathematics.

The development of the first known alphabet dates back thousands of years to roughly the 7th century BC (Drucker, 2003). Early writings illustrate how societies were forming and becoming more complex. They also demonstrate societies' need to record "…law and medicine, magic, astronomy, literature, and many other rapidly developing fields of human knowledge" (Drucker, 2003 p.44). While the transformation of the alphabet has been the result of thousands of years of innovations, the creation of the modern day alphabet is attributed to the Greeks dating back to 700 BC (Haveloc, 2003). Haveloc noted that while developing the alphabet, the Greeks simultaneously created literacy. Literacy marked a significant transition from a time when societies were primarily oral based (Ong, 2003). Prior to using written language, most information exchanged was done orally person to person or the information was simply irrelevant in most people's daily lives.

Paper

The need to transcribe on a medium, other than stone, resulted in the invention of the papyrus sheet by the Egyptians some four thousand years ago (Dunn, 2005). Although this wasn't the first form of data storage [other methods include inscriptions in metals, stone, walls, pavements, and buildings (Sawyer, 1999)], papyrus would become the most efficient form of data storage of its time. This first form of paper was made from the papyrus plant and was used for thousands of years with little modification. The value of and uses for papyrus were soon recognized by Egypt's trade partners and "Egyptian rulers realizing the importance of Papyrus, made its production a state monopoly, and guarded the secret of Papyrus jealously" (Dunn, 2005). Papyrus was utilized for thousand of years by numerous cultures until "The Egyptian placed an embargo on exporting papyrus at the end of the 7th century AD" which "led the way to parchment, and later on to 'modern' paper, the successor to the papyrus" (Dunn, 2005 p.1).

Centuries later, paper (as we have come to know it) was invented by the Chinese dating back to 105AD (Carter, 2003). The advent of paper resulted from a pulp processing method whereby various plants, cloth and bark were ground together (Carter, 2003). This process provided a durable surface material that could be readily and more efficiently produced then the papyrus. The development of paper would undergo hundreds of years of refinement and was also a carefully guarded secret until the technique was discovered by other cultures. Once this secret was uncovered by the Arabians of Samarkand some seven hundred years later, the technology spread over vast

geographical areas (Carter, 2003). By the thirteenth century, paper use would rise substantially as the costs to produce it fell dramatically. By the fifteenth century, every major European city had a paper mill which in turn contributed to an increase in literacy (Crowley and Heyer, 2003).

The Printing Press

The concept of copying information, images, and impressions is without question another significant development in human history. Just as the Chinese invented paper, so too are they recognized for inventing the first block printing tool. Depending on the scholar, this invention is said to date back as far back as the seventh century AD (Carter, 2003). Carter documents how Chinese society in the 7th century had undergone a major transformation, one that would mark one of the greatest periods in their history. This transformation included a new focus on the arts, religion and literature which intern led to a period of discovery including the development of block printing. The simplicity and practicality of block printing led to the technology being adopted by cultures from the far reaches of Asia to Europe in the span of a century (Mumford, 2003 p.95).

By the 14th century, Europe experienced an increase in literacy, due in part to the adoption of Arabic numbers, coupled with an increase in paper supply. The end result was a significant demand for copying services (for legal purposes, bibles, and other books) which, during this period, was all done by hand (Graff, 2003). As a result of this increase in demand, there was a shortage in skilled workers (those who could hand write) for copying services which drove the innovation for a machine that could copy (Burke, 2003). According to Mclynn (2002) “in the early 1450s, Johannes Gutenberg, a German

goldsmith, along with his partners developed the first printing press. By 1827, steam power was added to the printing press which enabled the printer to make 2,500 copies/hour; that number increased to 96,000 copies/hour by 1893 (Beniger, 2003).

Images

The concept of using images as a communication medium has been in place for thousands of years. Early images represent a time when early peoples used cave drawings, or when Egyptians and Mesoamerican's used hieroglyphics to document important events. The use of imagery has been a valuable tool in preserving images of the past while preserving cultural footprints. In modern times, images have been used to challenge society to imagine new worlds (i.e. outer space, micro-technology, digital graphics). Through photography, film, and television, the power of images has been transformed through technology beginning with the advent of the early photography process. This section provides a glimpse into the rise and impact of modern images with a look at the development of photography, film and the progression of television.

Photography

The development of the first modern photograph dates back to 1814 when inventor Joseph Nicéphore Niépce of France, created the first photograph (Bellis, 2009). Niépce's ideas (the process of capturing an image) were shared with other inventors and in 1839 a new process (called the Daguerrotype named after the inventor) was unveiled in Paris (Manovich, 2003). By 1851, the photography process had undergone significant improvements to the design and function of both camera and prints. For instance, the

first negative process capable of making multiple copies occurred in 1841 (Bellis, 2009). Years later, the first paper-based photographic film was invented by George Eastman in 1884 (Bellis, 2009), and, by 1888, the first commercial cameras were being sold by Kodak (Sontag, 2003).

The number of practical uses of photography became evident quickly as the technology could capture images with a precision never seen before. As early as the 1860's, photography played a role in increasing the public's awareness. For instance, Keller (2003) describes how each innovation in photography improved society's view of the world by recording images of global events like war [the first photos of war were taken in 1847], human triumph [the first photos of Machu Picchu appeared in 1912] and disasters [the first tornado photo appeared in 1884] (National Geographic, 2009). Additionally, in 1871, police departments in France began using photographs as a tool to identify and catalog felons (Sontag, 2003). A dramatic step in the development of photography occurred in 1890, when technology improved to include photographic images in daily newspapers (Keller, 2003).

Film

The invention of film was originally driven by scientists researching time and motion in the 1870's (Czitrom, 2003). However, by 1892, research had taken a new focus. The commercial prospect of film drew numerous inventors (including Thomas Edison) to invest in this "new" medium (Czitrom, 2003). The first moving picture camera was built in 1892, followed a year later with the first projection booth (Watson, 1990). The first commercial viewing of a film was "The Arrival of a Train at La Ciotat"

in 1895 (Czitrom, 2003). Within the next twenty years, an industry began to form, and the rise of stars (i.e. Charlie Chaplin and Mary Pickford) had grown substantially (Fowles, 2003). The popularity of film can be demonstrated by the increase in daily viewers. In 1911, there were five million rising to seven million daily viewers by 1914 [in the U.S. alone] (Watson, 1990).

Driving this new interest in film was the rising population in cities due to the mass influx of people either by immigration or by rural decline (Fowler, 2003). The living conditions of the average person living in the city were difficult, given the change in environment and difficult socio-economic circumstances. However, the influx of people created the perfect conditions for entertainment industry. As more people needed a break from everyday pressures, films filled this void, easily overtaking other forms of entertainment. Early films thrived for a number of reasons such as the low cost to reproduce films and the way stories were written that appealed to millions of people. The storylines, actors and settings provided a temporary distraction to massive audiences particularly in difficult socio-economic times. Early films such as the Arrival of a Train at La Ciotat and film clips of Charlie Chaplin have been digitized and can be viewed on various websites.

Television

The invention of television is credited to a Scottish engineer, "John Logie Baird", "who in 1922 began to research into the possibilities of transmitting visual images via radio waves and who, three years later, gave the first demonstration of a television image" (Newby, 1997 p.42). Television in its early years took one of two positions: a

nationalized media [in Canada and the United Kingdom which began with the CBC and BBC] or an open-market commercial system [in the US, the major operators during this time included NBC, CBS and ABC] (Boddy, 2003). The two forms of regulation are still utilized to this day, although not to the same degree. The first television service began in 1939 in north London which would later become home to the BBC (Newby, 1997). The first TV broadcast in North America is reported to have been in 1939 (Crowley and Heyer, 2003).

By the early 1950's, the technology became widely accessible and televisions began appearing in most homes. Crowley and Heyer (2003) write that the introduction of the TV as a household item would have likely arrived sooner had World War I and II not interrupted the development. To illustrate, the only TV network in the UK was forced to shut down in 1939 to accommodate the role of radio in the war effort. The network did not resume normal functions until 1946 (Newby, 1997). Also in the early 1950's, US television broadcasters had taken the lead on innovation and programming. Television had become the communication medium of choice as most people were spending more time watching television than using any other form of mass media, including film, radio, and newspapers. Boddy (2003) reported that in 1950 alone, over three million television sets were sold.

Electronic Transmission

The first recoded use of wireless communication occurred in 1837; however, the concept of wireless communication has existed in one form or another for centuries. Crowley and Heyer (2003) describe other methods of communication used throughout

history to convey messages over distances. Drum beats, carrier pigeons, reflecting sunlight, and smoke signals were all early methods of sending messages. The development in communication technology was significantly advanced after the ability to send messages through electronic impulses was invented. Electronic transmission is any form of communicating or transmitting messages by way of electronic signal. Within this section, the focus is on the development of: the telegraph, telephone, and radio, and how these forms of communication contributed to the information revolution.

The Telegraph

The invention of the telegraph can be viewed as developing in two phases: phase one was finding a way to utilize the technology; the next was the development of the infrastructure. In 1830, inventors of the first telegraph knew the potential of their discovery; however, they needed to find of way of transforming electricity into meaningful communication (Headrick, 2003). Initially, the idea was to transform the letters of the alphabet into electronic pulses. This idea proved to be too complex for the technology and, ultimately, the Morse code was adopted (using dots and dashes to represent number and letters). Once a standardized code had been developed, the next challenge was establishing the network. By 1846, the US was in full gear to implement a national telegraph infrastructure, utilizing the right of way by the railways (Standage, 2003). By 1852, there were over twenty-three thousand miles of wires connecting cities all over the US.

The telegraph is unique in that it was the first communication medium that was not developed based on existing technologies; rather it was the first communication

medium driven and designed by science (Headrick, 2003). The invention of electronic transmission eliminated geographical distances as an obstacle to communications and as the technology improved, time also became less of a factor. Headrick noted that the demand for rapid communication fueled innovations that "…opened up real-time information to railways, stockbrokers, capitalists, and merchants, to newspapers, and finally to the general public" (2003 p.129). At no other time in history was it possible to send messages over long distances in such a short time. Crowley and Heyer noted that with "the development of transoceanic cable technology, [the telegraph] became a global system before the end of the century" (2003 p.120).

The Telephone

The advent of the telephone was the result of an accidental discovery; whereby, inventors looking to improve on the telegraph; discovered the possibility of "developing a device that would transmit speech electrically" (Bellis, 2009 p.1). The eventual discovery of the telephone was made by Alexander Graham Bell in 1876, at which point he had created the first interactive medium (Crowley and Heyer, 2003). Through a series of partnerships, Bell was able to establish a network consisting of phones and phone lines and, by 1878, had some ten thousand customers growing to over sixty thousand in 1880. In 1900, Bell had redeveloped the technology including design changes to the equipment (switchboards and the telephone) to meet the growing demand. These changes were vital to Bell in order to attract new customers (Fisher, 2003). By the early 1900's, the telephone was widely accepted and would continue to grow in use in all industrialized countries.

Despite the fact the telephone had become the first two-way communication tool; it had to overcome a series of challenges before the technology would become a household item. The first obstacle was acceptance of the technology. During the initial introduction, Bell (the patent holder) and his associates spent the early years trying to overcome the stigma that the telephone was just a novelty. The first uses for the telephone included broadcasting concerts, sermons, and reporting of the news (Kern, 2003). Next was building the network (as in the case for the telegraph), forcing Bell and associates to focus their attention on connecting cities (economies of scale). Full service to remote areas would take some time due to the high cost of infrastructure. However, it wouldn't be long before the potential of the telephone was discovered and to this day "the effects of this breakthrough are still occurring" (Crowley and Heyer, 2003 p.120).

Radio

The development of radio is also the result of a series of innovations that led to the ability to broadcast. A look back in history recognizes the theory written by James Clerk Maxwell back in 1864, followed by a prototype by Heinrich Hertz 1887 as the first steps in Radio (Kern, 2003). However, it was Guglielmo Marconi who, in 1885, wanted to develop a way to send Morse code without using wires that led to the concept of radio (Beniger, 2003). Marconi ideas were expanded on by a Canadian (Reginald Fressenden) who realized the potential of utilizing the technology to transmit voices (Crowley and Heyer, 2003). In 1894, the first working model radio was ready for use and testing began in England. By 1901, voice signals were being broadcast across the Atlantic

Ocean (Kern, 2003). 1906 marked the first instance of public radio, followed in 1920 with the development of commercial radio (Beniger, 2003).

The invention of radio was described by Susan Douglas (2003) as a Cultural Revolution taking place in three stages of development. The beginning was a time of the amateur inventors, next was the addition of music, followed by network programming. The amateur phase was characterized by networks of young people who worked on short wave radio as part of a hobby, which was instrumental in the improvement of technology. The music phase occurred once radio had become a legitimate form of communication and signaled the beginning of corporate ownership of radio stations, record companies and an amalgamation of stations. The final stage in the early rise of radio was the network programming period, which marked the beginning of a long standing form of entertainment. It was in 1935 that "soap operas" were first developed for radio (Douglas, 2003). The radio phenomenon had been adopted by so many, so quickly that Douglas was quoted in *The Nation's Business* magazine, stating "Its rapid growth has no parallel in industrial history" (Douglas, 2003 p.218).

The Next Frontier in Communications

The final section looks at the convergence of technologies that led to the rise of a new media. When computer technology combined with electronic transmission, the result was a rapid transformation in how information was communicated. This section begins with a brief look at the progress and development of the computer, followed by a look at the factors that led to the development of the Information Superhighway-Internet.

The computer

The technology encompassed in computers is based on the concepts dating back to the early 1800's. In 1801, punch card technology was invented by Joseph Marie Jacquard. His invention was used in manufacturing textiles and was the first time a machine was controlled by a "program" or the instructions outlined in a punch card (Ament, 2003). The development of computers continued in 1833 with "the Analytical Engine" designed by Charles Babbage (Manovich, 2003). Using punch card technology, Babbage designed the Analytical Engine specifically for numerical calculations (Manovich, 2003). This technology wasn't pursued until 1890 when the US government began using the Hollerith Tabulator (which used punch card technology). The tabulator technology was soon used by a number of businesses which resulted in the creation of a few large corporations specializing in data processing. Through a series of developments, these three companies amalgamated to form the International Business Machines Corporation (IBM) in 1914.

The development of the computer stemmed from the need to process vast amounts of information. As populations around the world grew, it became critical to maintain records such as census data, manufacturing statistics and phone numbers (Beniger, 2003). To illustrate, in 1890, there were almost 63 million people in the US alone and "in 1887 the U.S. Census Bureau was still interpreting figures from the 1880 census" (Manovich, 2003 p.295). The need for data processing at this time was met with some success; however it would take years for the technology to develop. The first computer to be built in the present was completed by a group of engineers working for IBM in 1942. This computer, known as the calculator, "was built as a line of panel-like structures about 8

feet high and 51 feet long, with two panels extending for about 6 feet" (Cohen and Welch, 1999 p.38). It was a remarkable accomplishment.

The Convergence of Forces

Nineteen Forty-five is said to be the date when years of technological breakthroughs in communication began to converge. Early pioneers began developing the notion of a global communications network in 1945 (Griffin, 2000). These ideas triggered research and development which led to a US coalition in 1950, between the military, universities and businesses. In 1965, the first computers, one in Massachusetts and one in California, were connected using telephones lines (Howe, 2007). As technology improved, the Internet, known as ARPANET (Advanced Research Projects Agency) was brought online in 1969, by connecting four major computers at universities (Howe, 2007). In the mid-seventies, countries from around the world began developing state-run networks, and it was only a matter of time before these networks would converge (Abbate, 2003).

By the early 1990's, extensive users from all over the world began bringing their networks online. However, this created a problem in that the various programs were not designed to interface with other programs. In the early stages of internet, that data contained only text as in research documents, so interfacing with other networks was less complicated. Once other media began to surface on the Internet, an international set of rules was required. This problem was addressed through a number of international forums and, today, "The Internet is essentially the protocols (TCP/IP) which allow any computer to 'talk' to any other computer" (Hart, 2000 p.1). The popularity of the internet

would not likely have grown to the heights it has without the ability to access the various forms of media (i.e video, music etc). However this all changed in 1993 when Marc Andreessen and his colleagues developed the first graphical browser (Bolter and Grusin, 2003). After the introduction of the browser, other notable improvements to Internet technology occurred and the use of the internet flourished beyond anyone's expectations.

Models of Success for ICT Uptake

In communities throughout Canada, initiatives are underway that utilize ICT to increase the stability of communities in areas such as; economic development; education; the environment; and health. These strategic initiatives are taking hold particularly in some of the most remote regions in Canada. Beaton (2004) and Greenall (2005) document how communities are utilizing ICT "networks" to improve on the delivery of health services, online education, and numerous other services that support community needs. Within this section, two case studies are presented that illustrate how ICT can be an enabler for development.

The two examples are of First Nation communities that have designed and implemented an ICT network that is not only used by their membership, but in other communities and territories as well. The K-Net project in Northern Ontario and the Sunchild E-learning Community in Central Alberta are two examples of communities that have successfully implemented an ICT strategy. Their locally driven initiatives have garnered them international recognition. Each example will begin with a brief history on their development and implementation, followed by a section that discusses critical factors that define their success.

K-Net

The K-Net initiative originally grew out of the development of a pilot project in the early 1970's with a high frequency radio network. During this pilot project, twenty-five First Nations collaborated to bring a communications network into their remote communities which would become the framework for future development (Ramírez, Aitkin, Jamieson, and Richardson, 2004). The K-Net project officially began in 1995-96 when stakeholders (including community members, the private sector, and government) formed a working group aimed at establishing a localized Internet Service Provider (ISP). Through this network, K-Net facilitates the delivery of Internet, technical services, application and data services (Beaton, 2004). As a result of their efforts, this network spans over an incredible area previously overlooked by other ISPs. To illustrate the magnitude of this initiative, Ramírez et al. (2004), describe it as: "…a regional organization representing the political, social, and economic interests of 49 First Nations in northern Ontario, across an area roughly the size of France" (p.2). The success of K-net has also been expanded to include First Nation communities in Northern Quebec along the Hudson Bay.

The capacity of this network is impressive by any standards; however, equally impressive is the challenges they overcame prior to implementation. Being pioneers in developing an ICT strategy within a remote community; K-Net organizers had to first change Canadian Radio-television and Telecommunications Commission (CRTC) regulatory policies; so that phone service providers would include remote communities as part of their basic service. This change in CRTC rulings would provide households not

only access to basic phone lines, but access to the Internet (albeit dial up). Until the K-Net initiative, the notion of internet access to remote communities had not been an issue and nothing would have been done to change the existing service delivery. However, as a result of their actions, numerous remote communities no longer have to undergo this part of the process. Other challenges for K-Net included creating awareness and acceptance within the community, developing the technical infrastructure, and providing training so members could utilize the network. Ramírez et al. (2004) describe how the community came together to develop a coordinated approach to meet these challenges.

Critical Success Factors

Success of the K-Net initiative was not easy; in fact Ramírez et al. (2004) provide an outline of the five phases of development which took place over a twenty year period; however, there are a number of actions that contributed to the development of K-Net. Organizers were effective at creating awareness within the community of the benefits of ICT; designing a strategy with direct input from community members; looking at new partnerships to assist in the training of members, capitalizing on opportunities, and coordinating the resources required to ensure operations (Ramírez et al, 2004). Key to this initiative was their mandate which motivated the development of their objectives:

> The technology and network infrastructure have grown from a vision and are the result of the community's unique needs and demands. The technology is directed by and for the community (p. 4).

By taking a proactive approach, the community was prepared for the significant changes. Afele (2002) writes that it is "…important to prepare the

local environment to match the incoming large pipe of knowledge and resources…" (p. 19) which will ultimately impact the community. The transformation communities have endured since the implementation of K-Net is nothing less than remarkable and the impact is summed up in the following statement by one of the community members:

> Telecommunications means that the small First Nation north of Sioux Lookout is no longer isolated, according to community member, Lorraine Crane. "Everything has changed," she said. "Before we had one phone booth to serve the entire community. Now, we can shop, bank and do just about anything on-line." (Walmark, 2008, p. 1)

A detailed description of their goals and objectives, along with the network platform the community utilizes can be found on their website http://www.knet.ca/.

Sunchild E-Learning Community

In 1999, the Sunchild E-Learning Community (SELC) formed as the result of a vision to improve education levels within their community. Frustrated with the existing education curriculum and low graduation rates, the community looked for alternative ways of improving how education could be delivered within the community (Bourque, 2004). A presentation on how technology could bring education into an online environment triggered the interest of the community which led to the development of a pilot project. In this case, technology was used to meet the individuals' needs by using multi media (i.e. audio, visual, text). The organizers began by developing a curriculum that meets provincial standards, so that the courses could be transferable to any post

secondary institution. The program was also designed from the beginning to promote accountability (by the students) and interaction (peer to peer relationships) using the latest technologies (i.e. real time learning). Five years after the initial development, the SCEL is said to be…

> a concrete example of how First Nations are exerting control over their educational futures by embracing the benefits of technology in order to meet the specific learning needs of First Nations learners. (Greenall, 2005 p.1)

The system that works for students in classrooms outside the First Nation has proven to be ineffective for students on First Nations (Greenall, 2005). Whether it is the instruction of traditional based education, the geographical settings or the presentation of materials, there is clearly a gap in current school system that is not meeting the students' needs (Greenall, 2005). The strength in e-learning is how this initiative connects with students using non traditional methods. Since the development of their online learning tool, Dr. Pier De Paola, Director of Education, stated "Our students are completing their course assignments in greater numbers and higher skill mastery than at any time in the past" (De Paola, 2007, p. 1).

Critical Success Factors

The decision to design a system based on the community's needs led to a number of advantages for the community; first, students could access the network at any time (which allowed students with access issues i.e. single parents, to continue their studies). Next, students could develop at their own pace, with classes recorded so

students can review the instructional piece when it fits within their schedule. Finally, the designers were able to address a number of resource issues (i.e. such as limits on community finances that limit the ability to recruit and retain qualified instructors). Most importantly was the ability to design extra credit courses to meet the interests of the community. The benefit to other communities that access their network is that the infrastructure has already been developed, so there is no need to recreate the process. Additionally, access at any point to the network provides a link to the entire network, creating a number of opportunities.

The rise of the Sunchild E-Learning Community hasn't gone without their share of challenges. From fund raising, risk of community support, to operational design, each year the program grows, substantial planning and commitment is required. To mitigate the challenges of their rapid growth, management had external consultants (The Conference Board of Canada) conduct an overall evaluation of this program. The evaluation was an opportunity to have someone independent of the operation, to provide direct feedback without fear of an agenda to influence the outcomes. The consultants identified a number of strengths and weaknesses, which are critical to keep the organization from becoming complacent. The decision to seek input on their progress is a definite strength and is an indication of their commitment to the sustainability of this initiative. The overall feedback from the evaluators was stellar with the consultant providing the following remark:

> The Conference Board is of the opinion that the Sunchild E-Learning Community presents a unique, First Nations oriented,

learner-centric and reasonable cost education service that delivers positive educational results. (Greenall, 2005 p.12).

Community Informatics Theory

There is substantial research that highlights the complexities of analyzing communities with little or no involvement in ICT. Community Informatics (CI) theory incorporates a number of insights based on existing social, technical, and critical theories (among others). The primary focus of CI is the study of the relationship between communities and the impact of technology. Additionally, there is a strong desire to focus on developing strategies for how ICTs can enable and empower (Stewart, 2003), specifically in marginalized communities. This segment will focus on four themes from Dr. Gurstein's CI theory that are particularly relevant to the research.

Theoretical Concepts - Preface

When identifying the theory that formed the basis of this research, it was critical that the theory speak directly to sociological impacts of ICT on communities. There are a number of fields of study that developed various theories such as communication theory and organizational behavior; however, finding a theory that focused specifically on the impact to society proved to be challenging. Contributors to CI theory argue that there is significant research done on the impact to organizations, governments, and businesses in general; however, much more attention has to be given to how technology impacts the fabric of society beginning with communities (Stewart, 2003).

There is a substantial body of research within CI that highlights the complexities of analyzing communities with little or no involvement in ICT. CI theory has evolved from a number of principals based on existing social, technological, communication and critical theories (Gurstein, 2003) that address the growing problems associated with the Digital Divide. However, "CI involves much more than the adoption of ICT in itself, but it goes to the heart of application of ICT for local community benefit" (Stewart, 2003. p2). To be more specific, Dr, Gurstein describes CI as…

> …the application of information and communications technologies (ICT) to enable community processes and the achievement of community objectives including overcoming "digital divides" both within and among communities. But CI also goes beyond discussions of the "Digital Divide" to examine how and under what conditions, ICT access can be made usable and useful to the range of users and particularly excluded populations and communities, for example to support local economic development, local cultural retention and creation, and civic empowerment. (Stewart, 2003, p. 2)

The focus of Dr. Gurstein's community informatics theory has been to understand ICT within the context of community and to consider why ICT matters in this context. Four themes that emerge from Dr. Gurstein's work will be presented as they relate to First Nation communities. This section provides detailed information on place-based CI; effective use and community capacity; CI for development; and social capital and sustainability.

Place-based Community Informatics

Dr. Gurstein (2007) develops the notion of place-based CI by defining the characteristics found in communities such as participation, and collaborative decision making and uncovers some critical issues that deserve further discussion. Gurstein introduces the concept of central and bottom up decision making models; which speaks directly to community dynamics in terms of where change occurs. In doing so, Gurstein raises the question of which decision making process communities utilize as a means of introducing changes that can impact the community. This point, in particular, speaks to the historic governance models within First Nation communities and the impact of how change is managed. By understanding how change is introduced (either centrally or bottom up) and the effectiveness of the process, it is possible to look at alternate methods of introducing new ideas into communities.

In a centrally driven approach, a central entity (such as a local government or a school board) is responsible for change. For instance, school boards might be responsible to research and approve changes to various school(s) curriculum. In this case, if the board chooses to implement a change to the curriculum (perhaps based on provincial standards) that decision will have been made *on behalf* of the community. These changes would normally be made by a small group of representatives (like an elected board) based on what is determined to be in the best interest of the community. In this type of decision making process, it is not normal for the board to solicit input from the community. That is not to say that a central approach is not effective and there are a number of reasons that communities would choose this process of decision making. For instance the daily administrative function of a municipality utilizes a centrally drive approach.

In a bottom up approach, the dynamics of the decision making process are more diverse and integrated, having much more input from the membership of the community, making it more inclusive. As a result, participation in the community is seen as more rounded and collaborative (Gurstein, 2007). Using the same school board example; in a bottom up approach, the school board would seek input from community members to determine what changes they would deem important to the development of their community. Outcomes might include more attention to cultural programming such as how the land relates to the community. In any case, the community's priorities would be reflected through consultation by the board to the membership prior to any final decision.

Effective Use and Community Capacity

Within this section, the focus is on the aptitude of the community to meet social and local objectives. Gurstein (2007) addresses this by discussing what conditions promote effective use of ICT by focusing on the abilities of the community that may or may not contribute to their success. The focus of communities tends to be on addressing hardware issues such as computers, satellite networks, and servers. However, Gurstein argues that understanding the transformational change that ICT brings is often more important than the technology itself. Specifically, when characteristics such as experience and ability are complemented with a supportive community structure, then other barriers to implementation (such as hardware access) can be addressed more effectively.

From a community perspective, this requires developing a strategy that includes as much community input as possible. There are a number of tools available that support

the input of community members such as the citizen's panel project developed for the city of Edmonton (see http://www.edmonton.ca/for_residents/citizen-panel.aspx for details). The tool was designed to include measures that ensure the community not only has a voice in the development of the city, but they also have the information to arrive at a well informed opinion (Adria, 2009). Most importantly however, this process can be adopted to meet the needs of most communities regardless of size or dynamics.

Community input to the long term planning ensures that the resources are in place to be able to contribute to the design of the network, ensure a sustainable strategy, and meet the technical requirements. In the case of adopting ICT, it means having the people in place that can actively participate in the development of the network. By doing so, community members are able to add the features that facilitate a culturally appropriate environment. This in turn promotes efficient use of the resources (i.e. avoiding duplication of services, coordinated approach to design and having members utilize the network), that speak directly to the needs of the community (having the programs members require such as tele-health), and program designs that meet the communities capacity level (i.e. being user friendly).

CI for Development

There are a number of strategies that have been developed to assist communities in developing ICT. However, Gurstein (2007) distinguishes CI from these differing approaches by focusing on how the community is engaged when introducing change into the community. Specifically, there are two key items within his theme that distinguish CI from other strategies. The first is engaging communities in a way that effectively

promotes participation in ICT. The second is finding a way to transfer the skills and knowledge to the community so these skills remain in the community. Each of these two items are conditions that First Nation communities have had to contend with at some point and are examined in the focus group section. Beginning with how to engage communities, this segment reviews Gurstein's position on what strategies are effective in developing a collaborative relationship, followed by a review of what methods promote effective transfer of skills.

In a top down approach to community development, the strategy(s) is developed prior to approaching the community and introduced at the top level (i.e. local administration). These ideas are then communicated to others in the community for implementation. An example might be the introduction of a program intended to increase high school graduation rates. This strategy may have been developed to address the needs of thousands of students and regardless of whether the program is effective for all; it is introduced as a blanket approach. In doing so, there is a missed opportunity to solicit input from the community and support from the users. In contrast, using a bottom up strategy, community input is sought in advance and the solutions are community driven prior to implementation. An example is a community plan which represents the kind of consultation that actively engages its members to identify their priorities as a means for developing solutions.

Equally important in this theme is addressing how communities develop capacity. Specifically, Gurstein looks at the benefits of having others come in and provide services intended to increase capacity. This could be consultants that are brought in to provide services such as accounting or other technical expertise. If the service providers only

have the service completion as end outcome, there is little opportunity for the community to benefit from the service in the long term.

Social Capital and Sustainability

Concluding this section is a look at Gurstein's theme of sustainability. Within this portion of his theory, Gurstein discusses the advantage of utilizing social capital to increase the success of ICT adoption. To illustrate, when community members give (in terms of non-monetary contributions) to the community, all members benefit in one way or another. This in turn leads to a form of capital (social capital specifically) which is returned to the community in the form of a healthy community. When this tipping point occurs, the community is much more likely to be united in its approach to issues such as community development. According to Gurstein when social capital is combined with CI, it is a powerful force to overcome obstacles in the face of change. In this way, Gurstein's theory captures the importance of social capital's critical role in building sustainability.

Social capital is evident when community members are willing to contribute without thought of repayment or recognition. These services are instead given as a means of improving local conditions, making the community a better place. Gurstein provides some examples of social capital characteristics that would support ICT in communities including, but not limited to: utilizing local expertise in the transfer of skills between members, community volunteer contributions (i.e. time or expertise) and the formation of special interest groups that develop to share common interests. Using and

building upon existing social capital leads to capacity that is developed and shared, so as individuals develop, so too does the community.

Gurstein also discusses some of the critical factors that impact the sustainability of a community network. Sustainability in this case may refer to consistent funding resources to maintain a network; keeping pace with constant innovation; maintaining sufficient data storage, and the security of the network. Gurstein makes the connection between social capital and sustainability and how they can complement and even mitigate the numerous challenges associated with such a complex initiative. It is in this context that Gurstein outlines how the benefits of a community driven approach to the design, maintenance and funding of the local networks is far more effective than non-collaborative initiatives.

Research Design

The dimensions of this study were purposely designed to be limited in scope to ensure that the research findings have meaning to the participants and their communities during the study and beyond. Therefore, in order to make the most effective use of the study, an action research approach was selected. Riel (2007) described action research as a process where the researcher has an interest in change. "As designers and stakeholders, they work with others to propose a new course of action to help their community improve its work practices" (Riel, p. 1). As a result of the technical challenges and rapid advancement in ICT, the likelihood that First Nation communities will benefit from the outcomes improves with an action research approach.

As ICT continues to be a significant driver of change, research indicates that there are factors preventing ICT adoption that are difficult to measure (i.e. “root causes” such as capacity or politics). In order to explore and capture these root causes in detail, it was decided to use a qualitative data collection method. A qualitative research approach was deemed appropriate as the research question and objectives, being social scientific in nature, required in-depth, contextual analysis better suited to qualitative methods (Silverman, 2005). Additionally, it was decided that the intangible nature of the study would benefit from “…an in-depth understanding of human behavior and the reasons that govern human behavior” (Qualitative Methods, 2008, p. 1) found within qualitative methods.

The research design was also influenced by Michael Gurstein’s CI theory. As emerging fields of study focus on the direct impact of ICT, CI is a theory that challenges traditional wisdom about the impact of technology (Stewart, 2003). For instance, Gurstein (2004) suggests that communities can no longer ignore ICT as “technology, for better or worse, binds, links and *networks* communities into a larger world, and as the larger world is transformed with ICT, so communities must evolve and adapt in response”(p.1). The limited research within First Nations communities in this field and the applicability to this project were therefore instrumental in selecting this theory.

Methods

Focus groups were used to gather information on the necessary conditions for increasing ICT use in First Nation Communities. The decision to use focus groups as the method for the collection of data and development of the focus group guide was based on the CI theory outlined in the literature review. CI was selected as the theoretical

framework, as it combines a research and development agenda with direct input from communities (Stewart, 2003). Focus groups facilitate community input, proven to be an essential component when developing strategies that involve First Nation communities. Moreover, the deciding factor in selecting CI theory was its focus on the relationship between communities and the impact of technology on communities with little or no ICT history.

Utilizing focus groups as a testing method was based on two specific strengths; the first was to capture the professional judgment and life experiences of the participants (Berg, 1998), and the second was due to the suitability of focus groups and their ability to capture the cultural characteristics of a collaborative discussion (i.e. the dialogue featured conscious and unconscious perspectives that assisted the participants in developing a realistic perspective on the current conditions afflicting First Nations). Although the participants were selected from a relatively small sample from the researcher's network; they managed to capture a broad base of knowledge and expertise of First Nations experiences in ICT adoption. These well-informed individuals, while not representative of an entire population, were drawn from a segment of stakeholders whose views capture a diverse perspective well within the scope of this research.

Sample Description

The focus group was assembled using purposive sampling (Berg, 1998), meaning the focus group was comprised of "knowledgeable participants" in First Nation socio-economic conditions and who are familiar with ICT. The intent was to seek input from a diverse panel in order to move into complex issues of ICT adoption. The use of

purposive sampling ensured that limited background on the topics was required prior to the focus group session. This increased the efficiency of the limited time with the participants and ensured the discussions reflected first hand opinions and beliefs. The questions for the focus group were designed to solicit experiences and ideas to find solutions that aid in raising awareness to the challenges indicated above.

A single focus group was held with six participants from various backgrounds to ensure a broad perspective and to reflect a number of factors including: (1) a diverse demographic representation (ages from 27 – 66); (2) gender (4 men & 2 women); (3) native representation (5 of the 6 participants identified themselves as First Nation or Métis); (4) first hand working knowledge of First Nations (all participants had significant experience working either with or directly for FN communities); (5) varying degrees of professional experience (two participants with a background in Information Technology, one person in Land stewardship, one person in Arts & Culture, one person in Income Assistance and one person in education & policy); (6) and a segment of the group were raised on a First Nation community (3 of the 6 participants grew up in FN communities).

The recruiting of volunteers began shortly after the ethics approval. An initial letter of invitation was sent to potential participants. The invitation provided details including: the voluntary nature of their participation, confidentiality, anonymity, and an unconditional commitment that they are free to withdraw at any time (Appendix A).

Focus Group Guide

Gurstein takes into consideration a number of variables that may impact ICT adoption by examining the relationship between technology and community. These

relationships were then scaled down into four areas with a strong connection to First Nation communities and are the central focus of the discussion. The questions were intended to have participants reflect on the current conditions while challenging them to identify strategies to overcome obstacles to adopting ICT. The theoretical foci and associated focus group questions are documented in Appendix B.

Analysis

The analysis of First Nation people's experiences with ICT adoption and barriers to ICT adoption was informed by the historical research and theory referred to throughout the literature. The discussion was recorded, transcribed and then analyzed using content analysis. Within the content analysis, the data was derived from the number of times a particular theme(s) arose from the discussion (Burg, 1998). During the analysis, multiple reviews of the focus group transcripts and thematic coding were completed. The data captured their experiences and unique impressions of ICT adoption in First Nation communities. Within each question, differing themes arose that touched on the varying socio-economic conditions afflicting First Nation communities. The themes were then applied to the four segments of Gurstein's theory for comparison and contrast. Preliminary findings were shared with the participants in order to verify the interpretation and to validate the research findings.

Findings and Discussion

Each of the four CI theories are explored, beginning with a brief description of the CI theory, an analysis of the research, followed by a review of the focus group question

and responses. This segment will also review the thematic (threads) throughout the discussion breaking down the key points of the discussion to reveal emerging trends. The results of the focus group were then applied to the Gurstein's themes to see how the theory would compare to the experiences of individuals with first hand knowledge of First Nation communities.

Place-based CI

Gurstein's thoughts on the importance of place-based were explored during the focus group when participants were asked "Does change within FN communities come from a de-centralized (from the community inward) or centralized (central) structure?**"**. The question itself developed from Gurstein's idea about where change is initiated within communities. Ideally, strong communities initiate change from the membership (in a peer-to peer relationship), rather than waiting for change to be introduced from a central authority or governance. Within a centralized approach of governance, innovation is discouraged as this form of innovation falls outside the real of control of the centre. Gurstein argues that within a centrally driven approach, the tendency is to maintain the status quo whereby:

> Centrally driven networks are almost always structured so as to preclude the possibility of peer-to peer connections (bypassing the centre) recognizing that this type of "organizing" would be little advantage to those in the centre… (Gurstein, 2007 p. 24).

How the community historically perceives how change is introduced, is a strong indicator of how decision making will take place in the future. In the case of First Nation

communities, a common pattern is the close relationship they maintain with the federal government indicating a centralized approach. Regardless of which approach communities undertake, the issue is to examine whether a centralized approach is effective in bringing about change. The participants were asked to speak about whether they felt community members view themselves as having any direct involvement (as in a bottom up approach) in initiating change.

A number of themes arose during this question; however the concept of "decision making" stood out more than others. From the responses, the foci quickly evolved towards which entity(s) impacted the decision making process within First Nations with the following theme emerging: A majority of the group members indicated that First Nations ability to make decisions is dependent on other entities (such as other levels of government, or private industry) which is more consistent in a centralized structure. To illustrate, one participant remarked:

> given the structure of the framework that is out there right now for First Nation's…the way it is set up it does appear to be coming from the outside in" and when asked "Who is the outside or what is the outside?" the response was, the Government, Indian Affairs or all the policy makers.

This statement supports two concepts: first, the perception that change is centrally driven in First Nations, and second that the relationship between government and the community is strong as ever. Within the same thread, there were references to how change(s) were often contingent on other factors such as the availability of resources, political mandates (both locally and externally) or the governance structure itself as indicated by:

> I always believe that there was enough funding to do the most important things, there always is with government but it comes to the question of what's important and who believes what's important and how do you convey the importance of the matter.

There was little doubt by members of the group that communities have ideas about the kinds of changes they would like to see and what capacities are required to implement them; however, comments were made that referred to the conflicting governance jurisdictions (i.e. provincial versus federal) as factors that influence/prevent change, which all support the perception that change is centrally driven.

The relevance of centrally driven versus community driven decision making models is essential to understanding how communities are introduced to change. From a First Nation perspective, changes to the community were traditionally a collaborative process or what Gurstein describes as a "bottom up" approach to change. However, for better or worse the decision making process has evolved into a more centralized approach. By doing so, change is introduced through a central point and is delivered top-down. While this approach works well in cases such as those described in the municipal example, this approach is often contrary to how traditional communities would have managed change.

Effective Use and Community Capacity

The second focus to be explored was Gurstein's concept of effective use of ICT and the role ICT can play in communities. Participants were asked "What would you describe as being an effective use of technology?". Within this theme, Gurstein

distinguishes between the hardware (tools that make it possible access to internet i.e. computers, telephone lines etc) and capacity (a skill base within the community to support ICT), whereby; the attention is directed towards community capacity and what elements support the development of an ICT network. This would include a social structure that promotes ICT use.

These are significant conditions for any community to develop and these conditions require time and effort in order to be effective. Gurstein emphasizes the importance of planning in the development of a community driven ICT strategy which is often overlooked. This lack of planning (in ICT as in any aspect of management) often leads to ineffective use of time, resources, and outcomes. Whereas the opposite (visioning, planning, and defined deliverables) is required in order to have a successful transition.

The intent of the question was to develop a sense of whether or not First Nation communities are integrating technology to aid in problem solving. This could include: community consultation, risk management or the use of Information Management tools. The objective was to understand how community challenges were being met and if those strategies promote an ICT environment. This question was designed with Gurstein's attention to how "access is provided" which looks at the features that define an enabling environment. For instance, soliciting community input into what they feel is important versus decision making based on maximizing resources.

The foci of the participants shifted to "community voice(s)" as the central theme. There was a clear consensus that most participants felt there was a lack of input by

communities in determining their own future. As the discussion evolved, two sub themes also emerged: 1) community priorities and 2) relationships.

The community priority sub theme was highlighted as local priority setting plays an important role in creating an enabling environment. Political pressures, capacity issues, and social issues all impact the setting of community priorities. Often times, the attention is on the immediate outcomes rather than supporting community priorities by developing initiatives based on long term solutions. To illustrate, one of the participants noted that:

> From a structure for communities and capacity building (perspective), it's far beyond technology … there's all these wonderful things that, for what ever reason, First Nation's can't access them and we could go through them and spend lots of time why things *don't* work. But you want to concentrate on what *will* work. You need some fundamental foundation programs that *work with communities in the communities*.

The participants identified other factors that influence community priority setting such as; demographics (unbalanced representation of age groups), geography (remoteness to the internet), and governance (election terms of two years being insufficient). Other members of the group noted how First Nation communities are struggling with more pressing issues such as housing, health and poverty, which puts the community in conflict as to what they can do. The point was raised:

> My reserve is Cornwall which is just outside of Ottawa and we are pretty much encompassed in the city so access is not so much of a problem but

> North I could see a big problem…it may not necessarily be a priority for a community that is unhealthy as they have other issues they are currently addressing.

The other sub theme under effective use and capacity building was the difficulty of comprehending the impact of years of external influences on both the readiness to be self-determining in their decisions (compromising effective use of internal skill sets and on-reserve capacity building) and their trust in external relationships. Some of these external influences include: inconsistent relationships with government, private companies, and consultants. These relationships were identified as being counter-productive to developing sustainable programs. Comments focused on how programming may have been a priority with one leadership (be it with the Federal, Provincial, municipal, or local), but may be over looked by another government; thereby negating any progress. This lack of consistency has promoted dissolution within communities as to what can be done. As one participant remarked:

> The person (working) at the First Nation level isn't connecting to the community and is not connecting to other programs, other people and other roles within the community because they'd rather not get involved… because as soon as you get involved it's going to take them away from their primary responsibility which they see as satisfying the larger bureaucracy.

The formal day to day contact First Nation communities have with external organizations is fairly limited (especially in remote communities). Other than service providers such as teachers, health professionals, and other contractors, their contact is

limited to those who have business with the community. Therefore when programs are introduced, it is critical to have a commitment to see the program come to fruition. When asked how they felt about consistency in project completion, participants expressed a sense of disappointment with the service providers (in general). One participant stated:

> What makes this important and I'm talking about: ownership, values, the trust issue, its all very fundamental…(First Nation communities have been bombarded with positive and negative outcomes)… all this coming at them for years and there's, a real history there. It takes a couple of years to get to know a community or an individual.

The notion of introducing community-wide consultation to identify what is considered important is becoming more common in First Nation communities, especially with regard to health services and community planning. The concept of community consultation is also applicable when developing an ICT strategy. Community consultation may manifest benefits relating to: (1) the identification of perceived threats and opportunities to the community as a result of implementing an ICT strategy, and (2) developing early intervention strategies by the community in an effort to support the implementation of the ICT initiative.

CI for Development

Next, participants explored the relationships between Gurstein's theory of Community Informatics (CI) and ICT for development (ICT4D). Gurstein emphasizes that both theories have as their goal increasing life choices within communities who lack socio-economic opportunities as well as a focus on community development. The only

significant difference, for the purposes of this study, is how each of the aforementioned approaches focuses on the primary method of delivery. CI uses a grassroots approach, meaning that community partners (i.e. an assortment of private and public sector developers) collaborate directly with the community to identify the community issues and makes technology adapt to local needs. In contrast, in ICT4D, the focus is on integrating technology to the needs of the community with little or no consultation. The idea in ICT4D is to have technicians (for example, volunteers, and non-government organizations) come to the community; teach directly to the community with the assumption that the community has some background in ICT. There is an expectation that these skills will then be adopted.

Participants were asked "What strategies would you suggest that may engage the community in these discussions?" as a way to identify more appropriate alternatives to engage communities by exploring whether the participants have had experience with either of these two strategies (CI or ICT4D) as a means instituting change. The intent was to examine which strategy was practiced within First Nations and what the outcomes were using either method. Gurstein advocates for the design of strategies that address a deficiency in knowledge transfer, either through partnerships or training. Effective strategies for knowledge transfer result in the development of the local capacity in a way that promotes self determination. Without this development, communities remain dependent on service providers for essential services.

Based on the focus group member's responses, the ICT4D method of delivery is identified as being more often the choice of delivery. However, this endeavour towards integration was also identified as not having been successful. In cases where

communities have relied on external expertise in areas such as economic development, education or new programming that requires guidance for implementation, the question remains whether First Nations have benefited from any skill transfer or witnessed any direct improvements in their community. In any case, observable, positive impacts at the community level (community development) or the lack thereof has become a concern for communities.

The participants continually expressed frustration with the lack of progress being made in areas of community development, but were also supportive of the idea of bringing a mentor to aid in future development. The participants suggested that the development of a pilot project would be a solid place to begin, one that encompasses areas of collaboration, community needs and specific outcomes. To illustrate this point, one participant remarked

> It takes expertise and it takes commitment and desire…somebody has to put it forward (the notion of an ICT strategy)…and if the community is expected to do so, it should have happened by now and it hasn't, so obviously they need somebody showing them what this new universe is and I think there would be an interest in it.

Participants' comments suggest that trainers and service providers do not come to the communities with the intent of promoting community development whereby; those delivering the training have a function; they provide a service and move on. Years of using this approach has proven ineffective to this point for First Nation communities, and

without the intent to transfer their knowledge, there are few (if any) activities that result in community development.

During this part of the discussion, examples of projects that generate success surfaced in an effort to identify successful strategies. The participants' discussed mentorship, and how capacity development is often overlooked when utilizing outside services. The participants at this point were beginning to explore other alternatives to ensuring the transfer of knowledge. To overcome this obstacle to retaining skills transfer one participant remarked:

> It seems that there's always one First Nation that's is a bit more progressive or aggressive about learning and adapting so maybe one strategy might be to have one community learn from another community which is the fundamental way our people learn.

Social Capital and Sustainability

Finally, participants were asked "Assuming we can build interest and consensus, then what?" in order to consolidate the feedback from the whole discussion into a summary of recommendations or strategies that address the complex issue of sustainability. Gurstein provides some examples of social capital as it applies to ICT including: utilizing local expertise in the transfer of skills between members, community volunteer contributions (i.e. training, management or maintenance) and connections that arise as members unite towards common goals.

Gurstein discusses some of the critical factors that impact the sustainability of a community network. Sustainability in this case could be the security of the network;

keeping pace with constant innovation; maintaining sufficient data storage, and consistent funding resources to maintain a network. It is in this context that Gurstein outlines how the benefits of a community driven approach to the design, maintenance and funding of the local networks is superior to non-collaborative initiatives. Gurstein also discusses how this connection between social capital and sustainability can complement and even mitigate the numerous challenges associated with such a complex initiative.

During this discussion, participants shared their ideas on ICT adoption based on their experiences of successful initiatives. According to the participants, sustainability was highly dependent on community "buy in" which requires planning in terms of designing the process from the grassroots up and ensuring input from members who are committed to the community. During the discussion on sustainability, two themes emerged, relevancy and community participation.

Throughout the discussion, it was clear the participants agreed that, in order to effectively engage a First Nation community, the initiative has to have some relevance and application to the daily lives of the community members. For instance, the introduction of online education would represent a significant improvement to the way education is delivered and would have an impact on a large portion of the community. The potential for ICT to improve health care delivery to First Nations was another example that was raised. Both of these represent improvements on service delivery and, in terms of their relevancy to members, represent significant shifts to traditional models of service delivery. This discussion on relevancy led to comments on the importance of effective communication and how this can promote buy in from the members or as one participant remarked "translating needs into a rational plan that speaks to the people".

Other comments focused on introducing a plan that is relevant to the community's youth either through the education system or through recreational programming.

From the onset of this question, the participants felt any strategy intended to bring about change (such as introducing ICT) requires community participation; reaching out to those with commitment to the community for their input, most notably the community members who have lived most of their lives within the community and have a strong sense of the dynamics of its membership. Their input could benefit any strategy in terms of planning (knowing which members would be strong candidates for recruiting), communications (translating the needs of the community into an action plan), and reliability (persons who are dedicated to the welfare of the community) by providing the information that could only come from those with intimate knowledge of the community. As the discussion concluded, there was definite consensus among the participants, that when communities are the intended focus of a strategy, it is critical that community members have input to events that will impact their lives.

Conclusion

The potential for ICT to transform communities is endless and this research was intended to highlight just that. In doing so, every attempt was made to provide the best possible explanation of what the information age is and the importance of engaging in it. Each section was developed based on the assumption that the reader has a mild- to mid-level understanding of ICT. It is important to note that the purpose was to provide readers with enough information to understand ICT and the possible impacts of ICT adoption. In the case of First Nation communities, it was hoped that the research would also provide a basis for making informed decisions about ICT adoption.

Considerable effort was put into the history of ICT (more than was originally anticipated) as one discovery lead to another and so on. Crowley and Heyer's (2003) research on the history of communication was an invaluable tool, a reminder of the importance of considering the past when exploring current contexts of ICT. Their book provided extensive insights and information on the development of each medium and the impact each technological advance had on society. Although each development in communications was a stunning achievement, it was difficult to condense to fit within this project, this historical look was critical to understanding the historical context of in relation to the emergence of the information age (the first research objective).

While researching communities that have engaged in ICT, two projects stood out. The K-Net initiative and the Sunchild E-learning Community exemplify First Nations communities' direct input in and control over the development, operations and content of ICT. It was important to document the fact that First Nation communities *are* engaged in ICT and that their remarkable accomplishments are the result of successful strategies in the face of barriers. Their success is evidence of two facts: 1) when the community is involved the likelihood of success increases substantially; and 2) once the network is established, getting others to participate is easy. However, taking a community approach is difficult; it is time consuming and, for that reason, is likely to discourage active participation by multiple stakeholders. The upside is that investing in time and grass root processes creates the foundation for success and sustainability. The research was not intended to paint all or any First Nations as lacking capacity. In fact, as the research evolved, it became apparent that the conditions for adopting ICT (cited in work by Gurstein and Stewart and many others) have application to any marginalized community,

Native or non-Native. These concepts are universal and were explored within the First Nations' context because of a desire to do action research and the potential to have a positive impact on the current conditions for ICT adoption in local First Nations communities. Gurstein and associates have conducted hands on research in communities all over the world, and their findings provided a framework for documenting the inconsistencies between existing conditions in First Nations communities and necessary conditions as defined by Dr. Michael Gurstein (the third research objective)

Marshall Stewart, in his book *Using Community Informatics to Transform Regions*, cautions that the benefits of ICT can be realized only after *a significant amount of community consultation*. The forth, and final, research objective was to propose strategies for improving ICT uptake in First Nation communities. ICT has the potential to positively impact future education strategies, economic and social development; and community well being. In order to do so, this research has shown that there are conditions that must be met and essential processes that, if followed, are likely to ensure successful ICT adoption and sustainability. The following strategies represent the findings of this research and are intended to highlight strategies that may be feasible within the scope of local communities. Start with a community vision that begins with dialogue with the community. From the dialogue, consider how technology could have a positive impact on issues of concern and develop a strategy based on the desired outcomes. Develop the strategy utilizing community members (to ensure that the skills of the community are recognized and included and that there is, at the very least, the potential for skill transfer and skill retention in the community). Finally, share ideas,

expertise and goals freely, as they represent social capital and benefit the community as a whole.

This research shows that the necessary conditions in First Nations communities (and in many marginalized communities throughout the world) are, as yet, not met. Two of the most common deficiencies include access and capacity. The most widespread problem facing rural First Nation communities is access to the internet. The problem of access is becoming less of a critical factor as technology that allows access by other means is improving (i.e. wireless and satellite); however these benefits are offset by the lack of Internet Service Providers (ISP) due the high cost of providing service to remote communities. Additionally, the capacity to function in an ICT environment, which is linked to the transfer of skills to local members, is another common challenge. Unless strategies for transferring skills to the community are implemented, the realization of capacity development will continue to be a challenge.

This research also confirms four critical aspects of ICT adoption identified in the work of Michael Gurstein. Successful ICT adoption and sustainability are highly dependent on: decision making that is place-based (bottom up versus centralized), effective use of technology in the community (creating an enabling environment), CI for development (community participation and skills transfer), and social capital and sustainability (united approach to community development). In one form or another, First Nation communities have demonstrated a desire to proceed with ICT adoption and implementation. However these four processes are, for the most part, non-existent in current strategies for ICT adoption in First Nations communities. That is not to say that it is not possible to see these processes embedded in future strategies for ICT adoption, but

that they have not been given the priority they deserve in past ICT strategies. This research confirms the importance of community-led, community-owned and community-driven strategies that draw on the capacity of the community and have built-in, intentional skill transfer for sustainability.

The benefits of ICT will not be realized without challenges and will not come to fruition quickly. Understanding and discussing ICT issues before adoption are central to the successful implementation. For instance there are extensive benefits to utilizing ICT; however there are a number of threats that should be taken into consideration. threats such as security (computer viruses, data vulnerability, identity theft) may be mitigated by creating awareness and promoting preventative measures. New users, connecting to a world where the internet has not been regulated, pose one of the biggest risks *if* they are not made aware of what is out there. Discussions of the benefits *and* threats will prepare individuals and the community to make an informed decision on whether ICT – Internet access is appropriate for and beneficial to the community.

Additional research is required in this under-represented field of study. This paper is not intended to be the final word on community ICT; rather it's intended to encourage others to take up the challenge and contribute to our understanding of ICT from a First Nations perspective. As more First Nation students continue in post secondary education, ideally some will continue exploring relevant question regarding ICT and ICT adoption in First Nations communities. To those communities considering engaging in ICT; I conclude with the following advice from Marshall Stewart: "Be prepared for slow successes, not all strategies work flawlessly" and "Be persistent, this initiative requires community support to succeed" (2003 p.10).

References:

Reference:

Abbate., J. (2003). Popularizing the Internet. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Aboriginal Voices Report. (2006). Aboriginal Voice National Recommendations-From Digital Divide to Digital Opportunity (Volume 4) [Data file].

Adria., M. (2009). Citizen Panel presentation. www.edmonton.ca/citizenpanel

Afele., J., S. (2002). *Digital Bridges: Developing Countries in the Knowledge Economy.* Hershey, PA, USA: Idea Group Inc. http://site.ebrary.com/lib/albertaac/Doc?id=10019194&ppg=34

Ament., P. (2007). Jacquard Loom. The Great Idea finder. Retrieved March 15, 2009 from http://www.ideafinder.com/history/inventions/jacquard.htm

Anonymous, 2005). Creating an Enabling Environment Toward the Millennium Development Goals. United Nations Information, Communications, and Technology Task Force. (2005).

Anonymous. (2006). Spanning the Digital Divide. Understanding and Tackling the Issues. Retrieved March 10, 2008 from http://www.bridges.org/publications/65

Beaton., B. (2004). The K-Net Story: Community ICT Development Work. The Journal of Community Informatics, Vol. 1, Issue 1, pp. 5-6.

Bellis., M. (2009). The History of the Telephone - Alexander Graham Bell. Retrieved March 10, 2009 from http://inventors.about.com/od/bstartinventors/a/telephone.htm

Bellis., M. (2009). The Art of Photography - Timeline of Photography, Film, and Cameras. Retrieved March 12, 2009 from http://inventors.about.com/od/pstartinventions/a/Photography.htm

Beniger., J. (2007). The Control Revolution. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Berg, B. (1998). Qualitative Research Methods for the Social Sciences. Allyn and Bacon; Needham Heights, MA.

Bolter., D., J., Gursin., R. (2007). The World Wide Web. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Bourque., N. (2004). Community Updates. ATC Core Agreement. Retrieved from http://www.sccyber.net/www/images/events/2004_%20ATC.pdf

Boddy, W. (2003). Television Begins. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Brito, L. (2005) Creating an Enabling Environment Toward the Millennium Goals. Enabling Environment, ICT for development and the Millennium Goals.

Burke, J. (2007). Communication in the Middle Ages. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Carter, T., F. (2007). Paper and Block Printing – From China to Europe. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Crossing Boundaries National Council-The Crossing Boundaries Papers: 2006-Aboriginal Voice National Recommendations-From Digital Divide to Digital Opportunity (Volume 4) [Data file].

Cohen., I. B. & Welch., G., W. (1999). Makin' Numbers: Howard Aiken & the Computer. Retrieved March 10, 2009 from http://site.ebrary.com/lib/albertaac/Doc?id=2001023&ppg=60

Crowley, D. & Heyer, P. (Eds.). (2003). *Communication in history: technology, culture, society* (4th ed.). Pearson Education, Inc.

Czitrom., D. (2003). Early Motion Pictures. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

De Paola., P. (2007). History – A New Look at Education. Retrieved from http://www.sccyber.net/www/history.php December 2, 2009

Digital Divide. (2009). In *Wikipedia, The Free Encyclopedia*. Retrieved March 12, 2009 from http://en.wikipedia.org/wiki/Digital_divide

Douglas., S. (2007). Early Radio. Television Begins. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Drucker., J. (2003). The Alphabet. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Dunn., J. (2005) *Historical Papyrus*. InterCity Oz, Inc. Retrieved December 09 from http://www.touregypt.net/featurestories/papyrus.htm

Fisher., C. (2007). The Telephone Takes Control. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Fowles., J. (2003). Mass Media and the Star System. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Graff., H., J. (2003). Early Modern Illiteracies. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Griffin., S. (2000). Internet Pioneers. Retrieved March 20, 2009 from http://www.ibiblio.org/pioneers/index.html

Greenall., D. (2005) Formative Evaluation of the Sunchild E-Learning Community. The Conference Board of Canada. Retrieved March 20, 2009 from http://www.sccyber.net/www/Conference%20Board%20of%20Canada%20Study%202005.pdf

Gurstein., M. (2004). The Journal of Community Informatics, Vol. 1, Issue 1, pp. 2-4 Retrieved April 10, 2009 from http://www.ci-journal.net/index.php/ciej

Gurstein., M. (2007). What is Community Informatics (and Why Does It Matter). Italy. Volume 2.

Hart., N. (2000). How the Internet will become the Information Superhighway. Retrieved March 19, 2009 from http://www.digitalsuperhighway.com/Future/InfoSuperhighway.html

Haveloc., E. (2007). The Greek Legacy. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Headrick., D. (2007) The Optical Telegraph. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Howe., W. (2007). A Brief History of the Internet. Retrieved March 14, 2009 from http://www.walthowe.com/navnet/history.html

Information Age. (2008, May 24). In *Wikipedia, The Free Encyclopedia*. Retrieved May 26, 2008, from http://en.wikipedia.org/w/index.php?title=Information_Age&oldid=214568352

Johnson, J. (2004) The Millennium Development Goals & Information and Communications Technology (ICT). Measuring, Monitoring and Analyzing ICT Impacts. Retrieved September 4, 2007 from http://www.unesco.org.ec/mdgictimpacts.doc

Keller., U. (2003). Early Photojournalism. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Kern., S. (2003). Wireless World. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Logan., R., K. (2003). Writing and the Alphabet. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Manovich., L. (2007). How Media Became New. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Mclynn, F. (2002, February 11). An invention that changed the world. *New Statesman*, 693, 51-52.

Mumford., L. (2003). The Invention of Printing. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Newby., J. (1997) *Inside Broadcasting.* Retrieved January 15, 2009, from http://site.ebrary.com/lib/albertaac/Doc?id=5004394&ppg=58

Ong., W. (2003). Orality, Literacy, and Modern Media. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Qualitative Methods. (2009). In *Wikipedia, The Free Encyclopedia*. Retrieved May 26, 2008, from http://en.wikipedia.org/wiki/Qualitative_research

Ramírez., R. Aitkin., H. Jamieson., R and Richardson., D., 2004) Harnessing ICTs: A Canadian First Nation Experience. Introduction to K-Net. Retrieved from http://smart.knet.ca/flash/eng/pdf/introduction.pdf

Riel, M. (2007). Understanding Action Research, Center For Collaborative Action Research. http://cadres.pepperdine.edu/ccar/define.html

Standage, T. (2003) Telegraphy - The Victorian Internet. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

Sawyer, John F. *Sacred Languages and Sacred Texts.* London, UK: Routledge, 1999. http://site.ebrary.com/lib/albertaac/Doc?id=10054893&ppg=55

Stewart., M. (2003). *Using Community Informatics to Transform Regions.* Hershey, PA, USA: Idea Group Inc., Retrieved October 15, 2008 from http://site.ebrary.com/lib/albertaac/Doc?id=10044323&ppg=18

Silverman, D. (2005). Doing Qualitative Research (2nd Ed.). California: Sage

Smithsonian Institution, (1995). Information Age: People, Information and Technology National Museum of American History. Retrieved January 11, 2009 from http://photo2.si.edu/infoage/infoage.html

Sontag., S. (2003). On Photography. In D. Crowley & P. Heyer (Eds.), *Communication in history: technology, culture, society* (5th ed). Pearson Education, Inc.

2007 UNICEF Report Card on Child Well-Being. Child poverty in perspective: An overview of child well-being in rich countries. Retrieved January 8, 2008 from http://www.unicef.ca/portal/SmartDefault.aspx?at=1981

Walmark,. B. (2008). The power of Partnerships: "We're not remote anymore". Retrieved from http://research.knet.ca/?q=node/216 December 2, 2009

Watson, R. *Film and Television in Education.* London, UK: RoutledgeFalmer, 1990. p 13. http://site.ebrary.com/lib/albertaac/Doc?id=10060908&ppg=26

Winston, B. (1998). Introduction: A storm from paradise – technological innovation, diffusion and suppression. *Media, technology and society: A history from the telegraph to the Internet.* New York: Routledge, 1-14.

Appendix

Research Question:
What are the challenges and strategies for implementing ICT in First Nations Communities?
The purpose of the proposed research is to explore potential strategies for improving ICT uptake in First Nation communities

CI Theory	Research Question/purpose	Focus Group Que
Place-based Community Informatics: page 22	**Challenges for ICT uptake (consensus building and social activism)**	**Does change within communities come de-centralized (fro community inward centralized (central structure).** **How do these condi make it difficult to consensus on ICT (uptake)?**
Effective Use and Community Capacity: pg 47	**Strategies that support self determination**	**What would you as being an effecti technology?** **For instance, high the economic valu community benefi**
CI for Development (bottom up strategies): pg 65	**Strategies for ICT adoption**	**What strategies wo suggest that may en community in these discussions?** **Where should this begin?**
Social Capital and Sustainability: pg 74	**Strategies**	**Assuming we can b interest and consen what?**

1 Does change within FN communities come from a de-centralized (from the community inward or centralized (central structure).

How do these conditions make it difficult to reach consensus on ICT (use and uptake)?

2 What would you describe as being an effective use of technology? For instance, highlighting the economic value or community benefits?

3 What strategies would you suggest that may engage the community in these discussions?

Where should this discussion begin?

4 Assuming we can build interest and consensus, then what?