



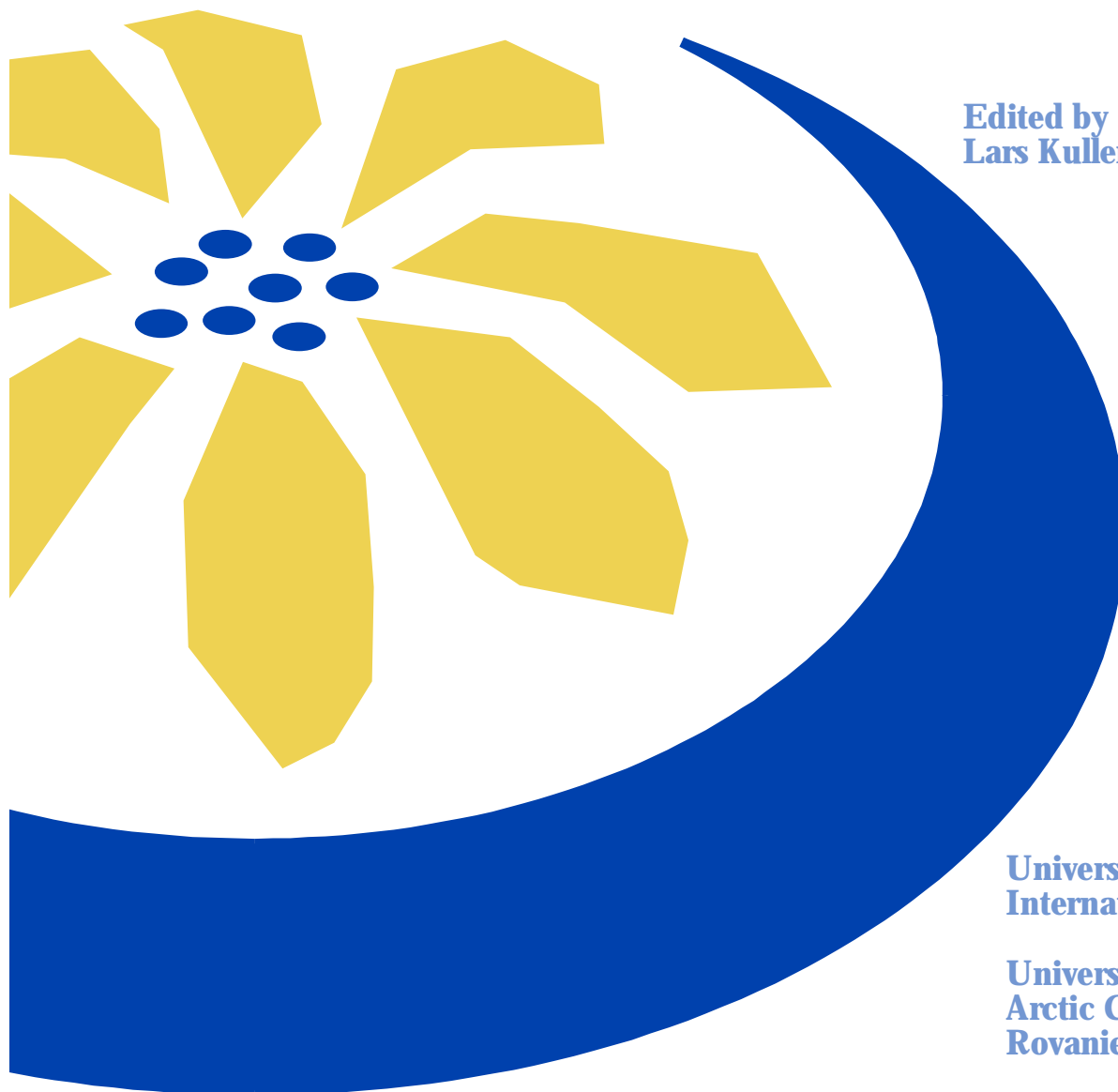
UNIVERSITY OF THE ARCTIC

**Information and Communication Technology in the Arctic:
Opportunities and Obstacles for
Sustainable Development, Education and Telemedicine**

**Background Paper prepared for
an International Conference of the Arctic Council**

Akureyri, Iceland, 20–21 October, 2003

**Edited by
Lars Kullerud and Outi Snellin**



**University of the Arctic
International Secretariat**

**University of Lapland,
Arctic Centre
Rovaniemi, Finland**

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PREFACE /FOREWORD

Information and Communication Technology (ICT) as a tool for development in the Arctic is one of the key priorities of Iceland as the Chair of the Arctic Council. To address this issue Iceland is organising an Arctic ICT Conference on October 20-21, 2003 in Akureyri, Iceland. The conference has three focus areas: infrastructure, distance education, and telemedicine.

The organisers contacted the University of the Arctic (UArctic) to assist with the preparation of a short background paper on the status of ICT in the Arctic. UArctic approached this task as a series of independent processes for each of the fields (infrastructure, education and telemedicine), as they require expert input in quite different areas. This report contains the summary recommendations for each of the three areas.

The Circumpolar Infrastructure Task Force (CITF) agreed to work with UArctic to develop a background paper on ICT infrastructure in the Arctic. The CITF and the Institute of the North sponsored a workshop on September 3-5, 2003 in Alaska, gathering 10 experts who developed the enclosed report and recommendations.

To address ICT in higher education, UArctic and SCOPE (South-African Finnish Co-Operation in the Education Sector) organized a workshop on "Bridging the Digital Divide: Sharing Best Practices for Developing ICT in the Rural Areas of the North and South". This workshop clearly demonstrated that the populations of remote areas worldwide share many problems related to ICT and higher education. The report of the workshop is available at the ICT conference. A comprehensive book containing a collection of invited papers on ICT in higher education in the Arctic will build on the workshop report. The book includes information on ICT use in northern higher education institutions and an overview of ICT-based learning strategies in the Arctic countries. Early drafts of the papers that will be included in this book are also available at the ICT conference.

The Telemedicine Project report, completed for the Arctic Council in 2000, gave a thorough overview of ICT in Arctic medicine. A survey of the authors and other experts demonstrated that the report is generally still relevant, even if details on activities are somewhat outdated. As a follow-up, the University of the Arctic organised a small workshop in Tromsø, Norway, where authors of the Telemedicine report from 2000 and selected other experts were invited to participate. The purpose of this meeting was to assess the current relevance of the recommendations in the Arctic Telemedicine report, and to identify immediate and concrete actions for future Arctic cooperation in the field of telemedicine. The outcome of this meeting is summarized in this report.

We would like to thank the Nordic Council of Ministers and the Icelandic organizers for supporting this work, and wish the participants of the ICT workshop in Akureyri a successful meeting. We expect that the workshop will generate concrete recommendations that will elicit responses from the Arctic Council and its governments.

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White Paper

Closing the Digital Abyss: Options for Arctic Telecom

*Workshop Report to the Arctic Council Information and Communication
Technology (ICT) Conference Akureyri, Iceland, October 2003*

Written by: Hillary Pesanti, Senior Research Analyst for the Institute of the North

“With the emerging digital economy becoming a major driving force of our nation’s economic well-being, we must ensure that all Americans [and the rest of the world] have the information and tools and skills that are critical to their participation. Access to such tools is an important step to ensure that our economy grows strongly and that in the future no one is left behind.”

– Secretary William M. Daley, Department of Commerce

Overview

The purpose of the Circumpolar Infrastructure Task Force (CITF) workshop held in Anchorage, Alaska, September 3 - 5, 2003, was to evaluate the state of telecommunications infrastructure and service availability throughout the eight Arctic nations. Participants from the United States, Greenland, Russia and Norway discussed options for international cooperation to expand Arctic telecom capability and to focus on technical and “human” infrastructure. The group identified barriers within their own countries and collectively proposed solutions to bridge the digital divide.

Most rural Arctic communities in the circumpolar region are underserved. The lack of basic services does not allow these regions to remain active and competitive in the global market. Service is often only available to rural areas if government subsidies are available. CITF’s vision of a “connected Arctic” would build sustainable communities capable of affording high bandwidth data, secure voice communication, mobile communication and mass media, which may be able to reduce these subsidies and lower service cost. Assets are needed to support distance learning, improved health care and sustainable economic development. Higher capability at lower costs is feasible with cooperation across national borders.

Populations range from 56,000 to over 2,000,000 people in each of the eight Arctic nations. With the exception of the Nordic countries (Norway, Finland and Sweden), approximately 1,500 communities are located off road and rail systems in the United States, Canada, Russia, Greenland and Iceland.

Current Status

Far East Russia, Northern Russia and Siberia experience poor phone service. Russia lacks appropriate federal policy for infrastructure in local communities. The Universal Access legislation was passed in 2003 to guarantee one telephone line and one web access line in each community in Russia. Today, 40,000 communities in Russia still do not have telephone access. Land mobile service is poor in all countries with the exception of the Nordic Arctic and Iceland.

Broadband data is not available in Northern Russia, Far East Russia or Siberia, and is spotty in Greenland [in December 2003 Tele Greenland started to offer broadband in one town], Northern Canada and Alaska. One percent of Finnish schools are connected with modems, but have limited use. Thirty to forty percent of Finnish homes are connected to the Internet, but most are slow modem lines. Russia's radio and television access is limited. In order to run their video TV for movie demonstrations, they have to use special power sources such as gasoline-powered generators and sun batteries.

Video-based telemedicine is used frequently and successfully throughout the Nordic countries and the United States. It is spotty throughout Canada and is non-existent in Russia. Public access to simple, reliable Internet is not available to Arctic Russia. They have no means of utilizing E-commerce or connecting with the outside world that heavily relies on Internet to run their businesses and manage their daily lives. Public access is insufficient in small communities in the United States and Canada. Greenland has a monopoly over telecommunication components, which causes prices to remain high and gives no opportunity for other companies to enter the market.

Basic infrastructure could serve as a platform for telemedicine, distance education, science and environmental monitoring, resource development, aviation safety and protection of cultural heritage. The integration of Arctic communities in the global economy can be obtained with the right information and communication technology. Three telephone lines and three television channels have been extended to 50 small villages in the Chukotka Autonomous Okrug in the last two years. Dial up net access is available in Anadyr and the eight regional centers: Anadyr, Beringosky, Bilibino, Zgnekinof, Providenya, Cape Schmidt, Pevek and Lavrentia. Wireless is available in Anadyr, the capital. Service is provided on two satellites of the Satellite Communications Corporation of Russia. There is not enough capacity on these two satellites to provide more service than identified above.

AT&T Alascom provides service to Anadyr for more service than identified above. A&T Alascom provides service to Anadyr for the Air Traffic Control network via one of their

satellites, which is a great model of international communication sharing. There are three telephone companies in Sakhalin to serve a population of 600,000 people. Out of 200 communities, 51 are reported to not have telephone service. The present oil boom will generate more satellite capacity and extension of fiber optic cable networks to serve the industry and present a larger international network-sharing opportunity.

Some parts of the existing telecommunications infrastructure serve as models of international cooperation. They include: Anadyr/ATT; Globalstar Pilot Project; bilateral links at international gateways; U.S./Canada microwave; and the Pacific Transit Agreement. Aggregate demand throughout the eight Arctic nations reflect strong need for a low-latency satellite network. How can we achieve this?

Opportunities

There are many opportunities to close the digital divide in the Arctic. International joint planning of fiber networks and joint investment is necessary for deployment of CITF's vision. Installing more fiber creates less stress on satellite systems yielding a low latency system. Satellites would cover areas fiber couldn't reach. A proposal has been put forth by the University of Cincinnati and the University of Alaska to implement an international Information Communication Technology (ICT) test bed. This test bed would be appropriate for testing new Arctic technologies. Companies such as @CONTACT are in the final stages of approval of permission to use Ka band and Middle Earth Orbit (MEO) satellite networks. This constellation is capable of providing 45 megabits per second of bandwidth anywhere in the world and serve as the backbone for long-line, data and mobile service throughout the Arctic.

Participation from the Arctic Council, Northern Forum, federal regulatory representatives, international space agencies (NASA, RSA, ESA, JSA, etc.) and the aerospace industry (TRW, Raytheon, Boeing, Lockheed Martin, @CONTACT, etc.) would create a strong foundation in which to serve the eight Arctic nations. The vision needs to be defined and distributed to ensure proponents reach national leaders and commercial interests with one voice.

Possible funding sources include International Financing Institutions (IFI), European Bank for Reconstruction and Development, World Bank, Global Environmental Fund (GEF), International Monetary Fund (IMF), European Inter-regional Fund (EIF), Barents Cooperation Fund (BCF), Nordic Atlantic Co-operation (NORA) and donor countries.

New infrastructure creates its own demand. Economic benefits to carriers are plentiful. Risk decreases through international cooperation and multiple government subsidies. The aggregate demand includes important anchor tenants such as the government, military, extractive industries, education and medical facilities. Broadband will increase current customer usage and stimulate a new customer base. International participation will reduce

fixed costs and allow new businesses to enter the open market. There are multiple physical, human and governmental infrastructure opportunities available to aid the world in bridging digital gaps.

Potential barriers include cost of bringing quality service into low population density areas. It is important for political leadership to understand the Arctic's situation and the value of connecting them to the rest of the world to improve quality of life, build sustainable communities and improve economic potential for the entire country. The deficiency of uniform standards, lack of competition, possibility of providers arguing over areas of responsibility and international political leadership issues need to be resolved.

After identification of a common goal, a call for convocation of Arctic telecom companies and regulatory authorities must implement the vision. The establishment of a test bed would be beneficial in the pretrial period while a specific goal is set to implement the strategies. Planning for joint infrastructure will require consultation between providers and authorities as new infrastructure is permitted and constructed with potential to advance the circumpolar vision.

The CITF was created September 2000, to identify opportunities of international cooperation to advance circumpolar infrastructure including aviation, maritime, land and telecommunication linkages. CITF is a program of the Northern Forum and the Arctic Council, with secretariat at the Institute of the North and Alaska Pacific University (APU). CITF is financed by the United States Department of Transportation (DOT), the Northern Forum and the United States Arctic Research Commission.

ICT in Arctic Higher Education Priorities Recommendations and Proposed Actions

Background

The Arctic Council (www.arctic-council.org) is hosting an Arctic ICT Conference in Iceland, on October 20-21, 2003. The organizers approached the University of the Arctic (UArctic) to develop a background paper on the status of ICT in the Arctic. There are three focus areas for the conference: infrastructure, education, and telemedicine.

The University of the Arctic addresses ICT in higher education in our Arctic Learning Environment (ALE) program. The ALE program focuses on finding ways to allow northerners to overcome distance to learn in the North, including finding new and innovative means to overcome cultural barriers and physical distance. The program also seeks to identify relevant and new approaches to learning processes, especially pedagogy and information technologies that support the delivery of content across the great distances of the region. Preparations for the ICT workshop in Iceland focused on a very basic question: *what, if anything, is special about ICT in higher education in the Arctic?*

The first step was a workshop on “Bridging the Digital Divide: Sharing Best Practices for Developing ICT in the Rural Areas of the North and South”, which demonstrated clearly that populations in remote areas worldwide share many problems related to ICT and higher education. The report from this workshop is available as a separate publication to the workshop participants.

To further document the situation and share experiences, the University of the Arctic is preparing a comprehensive book on ICT in higher education in the Arctic. The book will contain fifteen academic papers; including status information on ICT use in Northern Higher Education institutions, an overview of ICT-based learning strategies in the Arctic countries, and documentation on the various approaches to ICT-based education. The book will be finished by the end of the year, and early drafts of the papers will be available at the ICT conference in Akureyri.

The editorial team of the book gathered at the University of Highlands and Islands’ campus in Stornoway for a first discussion of the papers in the book and to initiate the work on a reflections and outlook section to the book. As a part of this work, the editorial team developed the following recommendations on ICT in higher education in the Arctic. We hope these recommendations will stimulate discussion at the ICT conference in Iceland.

Higher Education Recommendations

1. Enhanced Information and Communication Technology

(The purpose of this recommendation is identical to the Telemedicine recommendation no.1)

To effectively deliver education to learners throughout the Arctic Information and Communication Technology should be in place. If systems are in place, affordable, and reliable, they will be utilized to deliver high quality education to the Arctic. Joint solutions are necessary to implement the affordable ICT services necessary to support education, medicine, governance, and business opportunities for northerners.

Possible follow up: Progress in infrastructure requires action outside the education and research community. Collective experience has shown that:

- The cost of access to infrastructure in urban and rural areas must be equal.
- There are existing examples of national programs and regulations that could inspire practical solutions for other parts of the Arctic.
- Arctic infrastructure must support a mix of technologies, from e-mail courses, to web based, video, and broadband solutions to suit the various interactions that take place.
- Support for Arctic languages should exist in multilingual technologies, including translation software.
- Distance education and research projects should continue as front-line projects to motivate and display regional ICT infrastructure development. Collaborating in this way would greatly benefit the progress of distance education in the north, and provide resources for future advancement.
- A mechanism to share knowledge on solutions to affordable ICT solutions in Arctic areas is necessary for future progress.

2. Develop Relevant Pedagogies for Arctic ICT- based Learning

To effectively deliver content across the great distances of the region, it is necessary to develop relevant and new approaches to learning processes that overcome cultural barriers and physical distance. Pedagogies and information technologies must be identified that support these goals.

Possible follow up:

- Identify the needs of the northern learner and the UArctic members, review evaluations of existing programs, and determine a way to learn from indigenous and non-indigenous northerners about learning preferences.
- Facilitate the generation (construction) of knowledge, specifically how to involve the learners/students.

- Provide a mechanism (develop a technology?) for the sharing of experiences including examples of best practices and a series of UArctic seminars on learning processes and ICT with an Arctic focus.
- To support the most underserved regions in the Arctic, it is important to develop new concepts for ICT supported learning where users are less dependent on high bandwidth Internet connections.
- The great similarities between northern periphery and reality in developing countries are a good basis for new types of cooperation.

3. Education and Training

Human connections inside and outside higher education institutions and organisations are the main driving force for the successful use of ICT in higher education. Communication between students and tutors, students and other students, tutors and other tutors must be supported. Training tailored to the unique education methodologies and information and communication technologies issues in Arctic regions is an important aspect in the use of ICT in northern education, and has applications on regional and cross-regional levels.

Possible follow up:

- Universities throughout the Arctic should use the University of the Arctic structure to support staff networking and training. This collaboration will secure program development on a cross-regional level, put local programs into a circumpolar context, and encourage partnership on joint or over-lapping projects.
- Networking amongst institutions should include cooperation in e-mentoring, tutoring, assessing, and developing high quality learning material.
- The network should develop concrete solutions for sharing training techniques, manuals, and best practices related specialized distance education for remote areas.
- Circumpolar training programs should be delivered on regional levels (e.g. the BVU for the Barents region). This will provide distant professionals with an opportunity to become familiar with other distance education projects in their region, and encourage further collaborative efforts.
- There is a need for regional and circumpolar cooperation to train locally recruited personnel at learning centres throughout the Arctic. The focus should be on higher education pedagogy, research, and adaptation to new technology. These training programs will also provide opportunities to let persons with local knowledge and delivery experience take part in the development of relevant delivery models for ICT supported education and training.
- Student mobility, course transferability, and pedagogic approaches will greatly benefit from shared or harmonized solutions for administrative activities, libraries, learning management and credit management solutions.
- Higher education institutions in the Arctic would benefit from sharing Information and Learning Technology (ILT) Strategies. The ILT strategy declares how technology is used in teaching and learning in the institution and across the partnership and builds on the preferred pedagogic model and the wanted instructional outcomes.

4. Ownership

As Arctic residents learn about the possibilities for expanded access to higher education, they may desire to select services from a variety of sources, both within and outside the Arctic. Standardized mass education programs utilising education delivery means may not be the most appropriate or desired. Indigenous and other northern people may prefer education solutions provided by institutions with a cultural background similar to their own. As local and regional ownership is necessary to sustain local education institutions, the future may also bring threats to locally adapted ICT-based learning support systems.

Possible follow up:

- Local level: Communities should take an active role in the development and marketing of their own learning centres. Working on a joint community learning strategy and widening access ensures that the curriculum is relevant to its stakeholders and that the local population benefits from the educational provision. It also facilitates recognition of the qualifications and employability of graduates in the local job market albeit that graduate jobs may need to be created in the area.
- Regional level: Joint education centres should be created where several small communities are located close together. The centres would ensure regular use of the equipment and be able to provide sufficient training for the staff located there. This approach will serve remote and under-served communities at a lower cost.
- Cross-regional: Active use of UArctic’s Arctic Learning Environment program as a tool to develop increase knowledge of adapted ICT based education initiatives throughout the Arctic.
- Outside of the University sector: Policy makers, ICT providers, and other experts would benefit from learning more about Arctic education challenges and opportunities. Local, regional, and national administrators need knowledge and ownership to make informed decisions and create action plans for Arctic ICT in education and government. The Arctic Council will be a good forum to share such information on an overarching level.
- UN: The University of the Arctic should ensure that northern education become a part of the UNESCO agenda.
- Business sector: The Arctic may form opportunities for competition between companies to develop different ICT infrastructure, and adapted learning support systems made specially for remote regions.
- Development sector: Experiences from northern periphery should be utilised when assisting with education solutions for peripheries in developing countries.

5. Fierpmadat, Advanced Education Network in the Arctic

One, out of several possible paths, is to stimulate development in advanced ICT-based education in the circumpolar north. A joint circumpolar “Fierpmadat¹” – a broadband network connecting northern communities to each other and to the south. Initially, each

¹ Fierpmadat, Saami word for network. The word has its roots in ancient words for fishing net.

country could endeavour to connect one or more communities by extending their southern networks northward, thus utilizing the southern backbone networks to effect intra- and international north-to-north connectivity. Later this should be expanded by direct link over the pole.

Possible follow up:

- Creation of a Northern Network Knowledge Repository: A system for benchmarking and tracking all factors relevant to network deployment in the Arctic.
- Participation in workshops or other tools to share economic models for broadband services among northern communities: These meetings would focus on cost avoidance resulting from network services, creation of new value, skills retention, sustainability of skilled human resources, and synergy with regional development policies.
- Establishment of an Arctic Technical Advisory Committee: Building on already advanced northern education institutions and additional multidisciplinary and northern community representation from each of the circumpolar member states to define the applications and technical requirements for the establishment of the “Fierpmadat”.

6. Cooperation with other Arctic Programs

Arctic programs should make use of the ICT-based education and training capabilities developed by University of the Arctic member institutions. Many programs of the Arctic Council as well as the projects in the sciences community have concrete training and capacity building needs. The network of northern higher education institutions is a perfect instrument to implement many such initiatives. The cost of developing good pedagogical and technological frameworks will then be utilised to a maximum mutual benefit.

Possible follow up:

- The University of the Arctic Open Learning Program and Arctic Learning Environment must have the capacity and overview to advertise new initiatives to the relevant groups of northern education institutions.
- A small incubation fund with sufficient resources to bring concrete ideas into full project proposals for funding should be developed by University of the Arctic.
- University of the Arctic should ensure collaboration also outside the University sector, in particular the Arctic Council working groups, the Arctic telemedicine and health sector, and regional Arctic cooperation initiatives (i.e. Barents etc.).
- The Arctic Council Sustainable Development Program is the natural choice for responsibility to following up within Arctic Council.

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Arctic Telemedicine Priorities Recommendations and Proposed Actions

Background

The Arctic Council (www.arctic-council.org) is hosting an Arctic ICT Conference in Iceland, on October 20-21, 2003. The University of the Arctic was approached to develop a background paper on the status of ICT in the Arctic. There are three focus areas for the conference: infrastructure, education, and telemedicine.

The Arctic Telemedicine Project report, completed for the Arctic Council in 2000, is still relevant today and should serve as a background document for the telemedicine discussions at the Icelandic ICT workshop. The Arctic Telemedicine Report can be obtained at www.ichs.uaa.alaska.edu/ichs/previous-projects/telemed.htm online as a PDF document.

As a follow-up, University of the Arctic organised a small workshop in Tromsø, Norway, and authors of the Telemedicine report from 2000 and selected other experts were invited to participate. The purpose of this meeting was to assess the current relevance of the recommendations in the Arctic Telemedicine report, and to identify immediate and concrete actions for future Arctic cooperation in the field of telemedicine. The outcome of this meeting is summarized in this report, and will provide input for the ICT conference in Iceland in October.

Below are the seven recommendations from the 2000 Arctic Telemedicine report, as well as proposed new recommendations and tangible action items.

Recommendations

1. Enhanced Information and Telecommunication Technology (The purpose of this recommendation is identical to the Higher Education recommendation No.1)

Telecommunications in the Arctic should be in place to support efforts for telemedicine. If systems are in place, affordable, and reliable they will be utilized for health care delivery. Reports for the past thirty years have anticipated enhanced telecommunications in the arctic as a significant step toward improving the delivery of healthcare and the training and retention of staff. Supporting expanded telecommunications for northern communities improves healthcare delivery and expands the abilities of the tele-community.

Review of the recommendation:

The need for accessible, affordable, and reliable telecommunications is highlighted, and although improvements have been made, this need still exists today. In particular, access to ICT (information communications technology) infrastructure in small communities is still low. The recommendation is still valid.

Possible follow up:

Responsibility for progress in infrastructure lies outside the telemedicine community. The participants made the following observations and suggestions based on experiences from the telemedicine area:

The cost of access to telecommunications in urban and rural areas must be balanced. There are existing examples of national programs, or regulations, that could inspire practical solutions for most of the Arctic.

- Telemedicine projects should continue to be used as front-line projects to motivate and display regional ICT infrastructure development. Collaborating in this way would greatly benefit the progress of telemedicine in the north, and provide resources for future advancement.
- A mechanism to share telecommunications solutions in Arctic areas should be implemented.

2. Local Training

Health professionals working in the Arctic need to be trained to fully utilize the telemedicine tools, which are (or will be) available to them in the community they serve.

As technology is implemented in remote health clinics, staff must be able to fully utilize these tools. Personnel in the field must be trained to make use of the latest equipment. As new healthcare professionals are trained, they should have the experience to use technology that will be waiting for them at their remote work sites.

Telemedicine provides information in two directions. Remote healthcare providers can maintain skills through consultations in regional centres, and cultural and local contact can be maintained with patients who have had to leave their community for health care. Regional providers must therefore also be trained to fully utilize the potentials of telemedicine.

Review of the recommendation:

Training for health professionals working in remote regions is essential to the success of telemedicine projects. Health professionals must be able to use the tools and technology available to them, and be able to work independently in remote communities. Training tailored to the unique health and telecommunications issues in Arctic regions is an important aspect of the development of telemedicine, and can be expanded on both a regional and cross-regional level. This recommendation is still very relevant.

Possible follow up:

- Develop standardized training programs and/or credit systems for the certification of telehealth workers would aid regional and cross-regional training opportunities.
- Establish funding networks to encourage sharing of training techniques, manuals, best practices, and program development on a cross-regional level. This puts local programs into a global context and encourages partnership on joint or over-lapping projects.

- Develop a web site of available telemedicine training programs relevant to the Arctic that are offered by distance education would be a valuable resource.
- Share knowledge in specialized health fields in remote areas to expand available resources. Initially, areas where this is most needed should be identified.
- Deliver circumpolar training programs on regional levels (e.g. Nordic countries, North America, Barents region and East Russia) in order to provide health professionals with an opportunity to become familiar with other telemedicine projects in their region, and encourage further collaborative efforts.

3. Prioritise the Most Remote and Under-served Users

New endeavours in the field of telemedicine in the Arctic should place a priority on the 'front end' users in the most remote and under-served communities.

Although larger communities have received advanced health services, the most remote clinics are often the last to participate in upgraded technology. Every effort should be made to foster improvements at the most remote sites. In addition to the new technology, training efforts should be expanded to bring staff up to the level of proficiency required for the new interface. It is also important to assure that these remote sites are maintained and supported so the telemedicine system is complete and operational at all levels.

Review of the recommendation:

The most remote and under-served communities should be the priority for receiving new technology. The outcomes of this collaboration would not only benefit Arctic telemedicine projects, but also have implications in other regions of the world where telemedicine programs struggle with community access and mobility. Providing advanced health services to under-served areas, in spite of being complicated and potentially expensive to implement, is still a very important recommendation.

Possible follow up:

- Mobile telemedicine teams are one possible solution to this priority. A circumpolar program should be initiated to identify and demonstrate practical solutions to the many challenges faced by telemedicine teams, including access, mobility, and transportation of fragile instruments.
- A catalogue of mobility solutions for specific medical fields should be developed for remote communities.
- Investigate the possibility of creating 'telemedicine district centres' where several small communities are located close together. The centres would ensure regular use of the equipment and be able to provide sufficient training for the staff located there.
- Methods and practices to implement solutions that are tailored to the local needs of remote users should be shared and improved

4. Public Awareness

Efforts to inform the Arctic public on telemedicine programs and services should be initiated to gain greater acceptance for the values of quality distance delivered health care. In addition, this effort should raise the awareness of the health care system administrators and managers of the various telemedicine tools available to meet their identified service needs. These efforts should also incorporate local and cultural practices.

With new technology comes the need to make informed decisions on what tools will best address community health needs. Local politicians and healthcare administrators must have access to current assessments of workloads and practices. In addition, community members must have a level of comfort in the distant delivery of healthcare through the newly developing telemedicine system. These processes bring community education and the experience of receiving regular and reliable healthcare close to home.

As Arctic residents learn about the possibilities for expanded access to healthcare, they may desire to select services from practitioners from a variety of sources. Existing structures of health delivery may not be the most appropriate or desired source of care. Indigenous people may consult health professionals from their own cultural background, albeit residing in other nations or distant states. Innovative programs that utilize customary and traditional practices can be shared with ease.

Review of the recommendation:

Communicating developments in telemedicine is still a very strong priority, as noted in the 2000 report. Health professionals, decision-makers, doctors and patients all need to be aware and educated in the issues of telemedicine in the Arctic.

Possible follow up:

- Local level: Patients are encouraged to take an active role in their health care, and sharing information about telemedicine on a local level will help with the advancement of the use of the technology in remote communities, as well as encourage interaction and communication between patients and health-care providers.
- Cross-regional: Awareness of telemedicine projects that are being developed in other Arctic regions will aid under-funded areas in their telemedicine initiatives. Collaboration on this level also helps to identify possible areas for joint research and training.
- Outside of the health field: Policy makers, ICT providers, and other experts would benefit from learning more about Arctic telemedicine. It may form opportunities for competition between companies to develop ICT infrastructure in remote regions, or potentially influence local, regional, and national administrators in making informed decisions and creating action plans for Arctic health and ICT in government.
- Promoting telemedicine in any of these three areas would be an ideal area for circumpolar cooperation.

5. Interoperability

Telemedicine systems used in the Arctic should be spatially and temporally interoperable, and based on guidelines established in various existing international forums (such as the International Medical Informatics Association).

Since other international efforts are establishing interoperability guidelines, there is no need for the Arctic nations to establish their own. Encouragement should be given to the collaborative efforts that target concerns on how to share health information over both space and time. In addition, there should be a commitment to utilize these guidelines wherever possible within the Arctic.

Review of the recommendation:

The standardization of terminology, technology, and software on a local level remains an issue in telemedicine.

Possible follow up:

- Arctic telemedicine activities should follow international work on the standardization of the terminology used between telemedicine centres, programs, and projects. It may reveal a need for a review of Arctic-specific terminology and concepts.

6. Program Communication

Arctic programs should make use of the virtual meeting place provided through existing technologies, thus reducing the need for physical travel. Virtual conferencing can be utilized to identify needs, develop programmatic strategies, plan discussions, and organize structures. As technology improves and telecommunications systems cover a broader area of the Arctic, the opportunity for reducing travel increases. The electronic production of Arctic reports, as well as the ability to hold interactive discussions via web based virtual meetings, increases the efficiency and effectiveness of northern professional staff. The use of the virtual meeting place is another aspect of building the overall tele-community. Arctic communities are well positioned to become leaders in the use of virtual meeting technology due to similar regional concerns, but lack the ability to have convenient physical gatherings.

The Arctic Council can promote the use of virtual meeting places through their programmatic activities at all levels of interaction. Not all of the twelve key Arctic contacts for telemedicine met face to face during the process of preparing this report. Most did attend one workshop that was hosted by the US Department of State. The bulk of the work – of collecting, discussing, synthesizing, and compiling the ideas that form this document—have been shared around the arctic via some electronic format. This model is cost effective and can be replicated.

Review of the recommendation:

Programs and projects involving activities in the Arctic, regardless of location, are often confronted by similar challenges regarding funding, regional and/or national support, and other elements of project development. Arctic programs must communicate their efforts to

each other in order to maximize the quality of their implementation and delivery. Program communication not only refers to consultation between telemedicine projects, but also between other health and ICT-related projects. The recommendation is still valid.

Possible follow up:

- An existing international/northern body with a parallel telecommunications and health focus would be ideal to oversee the coordination of communication between national-level telemedicine centres and other Arctic organizations. Ideally, such a body would provide an opportunity for the exchange of ideas, information, proposals, and data. Few existing organisations could possibly take on this responsibility.
- The body proposed above, in cooperation with Arctic Council working groups, should ensure collaboration outside of the telemedicine and health field.

7. EPPR Working Group

Arctic Telemedicine should be closely linked to the efforts of the Emergency, Prevention, Preparedness, and Response (EPPR) Working Group of the Arctic Council.

The sustainability of programs is tied to the quality of the foundations upon which they are built. Specifically, telemedicine is linked to the efforts of other existing entities and structures that are at work in the Arctic. These include the existing telecommunications systems, emergency frequency agreements, and working guidelines established among the EPPR participants. Making use of these networks of expertise and existing national programs will foster the continued dialogue required to sustain the sharing of information on the advancement of healthcare delivery in remote Arctic communities. These linkages need to be investigated to see how well they would address the requirements of sustaining Arctic Telemedicine.

Review of the recommendation:

It was recommended in the 2000 report to the Arctic Council that Arctic telemedicine become a part of the Emergency, Prevention, Preparedness, and Response Arctic Council working group. Arctic telemedicine has since been identified as relevant to the Sustainable Development Working Group (SDWG) portfolio. The meeting concluded that the Arctic Council must decide where Arctic Telemedicine belongs in its structure. National-level telemedicine organizations can and will assist the Arctic Council in their endeavours, and will work together on collaborative workshops, conferences, and studies.

Possible follow up:

- Telecommunications and telemedicine groups in the Arctic can take a lead role in advancing the recommendations put forward in this report, and the responsibility for follow-up and communication can be joint or shared between regions.
- The Norwegian Centre for Telemedicine’s annual Tromsø Telemedicine Conference is an ideal venue to host a small Arctic-focused coordination meeting to discuss some of these recommendations.

8. Evaluation

New recommendation:

Arctic Telemedicine projects have been growing with increasing speed and enthusiasm in the circumpolar world. Telemedicine centres need to work together to evaluate the many aspects of telehealth in the Arctic.

Possible follow up:

- A study should be undertaken to evaluate the efficacy and impacts of telemedicine in the Arctic, and all circumpolar telemedicine centres should be encouraged to participate. Evaluation on this level can be instrumental in aiding future development in Arctic telemedicine.
- A compendium of literature that includes reports, data and statistics from the telemedicine projects that have taken place in northern regions would greatly benefit telemedicine centres, and it is hoped that reports could be translated to aid the efforts of sharing information. From project development to equipment to training methods, this collection of reports would be an asset to the further developments of telehealth in the Arctic.

Appendix B:

Participants in Arctic Telemedicine Discussion, September 17, 2003 - Tromsø, Norway

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Appendix C : Additional Current Contact Information and Resources

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Appendix D:

***Report on the ICT Arctic Conference to the Senior Arctic Officials of the Arctic Council
drafted by the Chair of the Conference Task Force, Thorsteinn Gunnarsson, Rector***

23/10/03

Background

Information and Communication Technology (ICT) as a tool for development in the Arctic is one of the key priorities of Iceland as the Chair of the Arctic Council. To address this issue Iceland organized a conference on ICT in the Arctic on October 20-21, 2003 in Akureyri, Iceland. Many organizations supported the Conference in various ways, among them the Northern Forum that seconded an expert to Akureyri who worked with the Icelandic Chairmanship in preparing the conference and the Nordic Council of Ministers, which organized a Media seminar in conjunction with the conference. This important professional contribution of these organizations and others is greatly appreciated. The conference focused on three areas: ICT infrastructure, distance education, and telemedicine. This report is based on the background document prepared for the conference by the University of the Arctic, as well as presentations and discussions during the conference itself.

This conference was a tangible outcome of the prominence of the information society and human resources in the Program for the Icelandic Chair of the Arctic Council 2002 – 2004. The use of information and communications technology is seen a means of contributing in a significant way to the future sustainability of Arctic communities. The pervasiveness of the Arctic's geography – small communities separated by vast distances – means that access to communications is vital to the economic and social viability. At the same time, it also means that often there is a limited “business case” for developing necessary services and infrastructure in the region because of the lack of a critical population mass.

Mission

An ICT-strategy in the Arctic can hardly be divorced from larger economic, social and cultural strategy and a vision of the future of Arctic residents. One of the promising assets of ICT, whether it involves education, health or other fields, is to give people a practical and real chance to live where they want to live and stay in their traditional home settings. Distance education, for example, has limited relevance to people if it does not correspond to their cultural, social and economic realities; once educated the ir day to day realities must give them opportunities to make use of their skills and learning.

Goals

Among the suggestions made at the Conference were the following goals:

- Provide all Arctic residents with equal access to reliable, affordable and sustainable information and communications infrastructure.
- Give Arctic residents effective control over technology, services, and content.
- Build human capacity by enabling Arctic residents' possibility to produce and share knowledge and content.
- Ensure cooperation among states and stakeholders to remove national boundary, legal and other demarcations as obstacles to collaborate between countries, regions and businesses to achieve the mission.

Suggested Actions

To initiate the implementation of the above mission and goals, the following actions are suggested:

Arctic States

- The Arctic states should ensure that international regulatory agreements do not represent obstacles to fair access to ICT services (and networks) for the north.
- The Arctic Council member states shall encourage the implementation of the new EU Northern Dimension action plan to ensure its support of the above goals.
- The Arctic states should give Arctic residents effective control and ownership over technology, services, and content. Local users must have a say in decision-making and a tangible interest in the resources (including intellectual property rights) to ensure they are meaningful and sustainable.
- Support the establishment of the Arctic Virtual Library to support Arctic people and science.
- The Arctic states should ensure that any ICT tools used by the governments support small Arctic languages.

Arctic Council

- The Arctic governments and the Permanent Participants should develop an Arctic ICT Strategy based inter alia on the outcomes of this conference.
- The Arctic governments should regularly report to the Arctic council on how remote and peripheral northern communities' access to ICT infrastructure and services are addressed in current national development plans.
- Support increased cooperation between regional telemedicine initiatives to encourage transfer of knowledge and technology between existing telemedicine networks.

- Support the development of curriculum, learning methods, and technologies for distance learning that are relevant to the realities of the Arctic region: large distances, small communities, multitude of time zones and languages, multicultural diversity including indigenous peoples, and strong connections to place and the environment. These pedagogies should take into account traditional means of learning and knowledge transfer.
- The Arctic Council should establish an Information and Communications Technology Task Force, building on the CITE, the Arctic Telemedicine community, the UArctic, and working groups existing at the Barents and Nordic levels, with strong representation of user interests. This group should be tasked with planning and coordination of ICT activities, developing programs, and ensuring practical collaboration between relevant Arctic Council working groups and other stakeholders.

Arctic ICT Task Force

- The Arctic ICT Task Force should implement a circumpolar community demonstration network project where northern communities in all Arctic states are connected in an Arctic Village. That will allow circumpolar partnership activities between a multitude of community activities including, for example, day care, schools, youth clubs, health cares, culture exchange, libraries and administrative services.
- The Arctic ICT task force should maintain an Arctic ICT clearing- house, to share information of best practices and promote public and governmental awareness of existing Arctic ICT initiatives in all fields, including education and telemedicine.
- The Arctic ICT task force should organize annual ICT conferences, alternating between selected ICT themes at suitable locations and an Arctic Telemedicine meeting in conjunction with the Tromsø Telemedicine Conference.
- The Arctic ICT task force should organize an annual Arctic ICT prize to the best project demonstrating active and creative use of ICT in supporting sustainable development in northern communities.

