Digital Diversity: Broadband and Indigenous Populations in Alaska

Heather E. Hudson
Institute of Social and Economic Research
University of Alaska Anchorage

"We went from house to house taking care of the sick….We had no phones… but used the school's [HF] radio to report [on] our patients. There was no nonsense about confidentiality."   -- Paula Ayunerak, Alaska native health aide in the 1960's

Abstract

Alaska Natives comprise several cultural and linguistic groups including Inupiat, Yupik, Athabascan, Aleut, Tlingit and Haida, organized into some 226 tribes. Approximately two-thirds of the indigenous population live in more than 200 rural villages, most of which are remote settlements with fewer than 200 people and no road access.

Since the late 1970's, all communities with at least 25 permanent residents have had telephone service, but broadband connectivity remains limited. The major mechanism for extending Internet access to rural Alaska has been federal universal service funds, specifically the E-rate program that subsidizes Internet access for schools and libraries, and the Rural Health program that subsidizes connectivity for rural health clinics and hospitals. Under the federal Stimulus program, Alaska has also recently received funding for infrastructure to extend broadband in southwest Alaska, for improved connectivity for rural libraries, and for training and support for rural public computer centers.

These initiatives primarily support improvements in Internet and broadband availability for rural Alaska. However, this paper proposes a more rigorous framework including not only *availability,* but more broadly *access*, and also *adoption,* and examines how these concepts apply to Alaska natives. The paper also examines other elements of digital diversity, including *innovation* in applications and content, ICT *entrepreneurship*, and participation in telecommunications *policy-making*.

1. The Alaska Context: Indigenous Populations and Isolated Communities

Alaska is the largest state in the U.S. (571,951 square miles or more than twice the size of Texas), but with the nation's lowest population density, of only 1.2 persons per square mile. Total population now exceeds 710,000, of which 14.8 percent are Alaska natives (nationwide, indigenous Americans are only one percent of the total U.S. population).[1] Alaska natives include several cultural and linguistic groups including Inupiat, Yupik, Athabascan, Aleut, Tlingit and Haida, comprising some 226 tribes. Approximately two-thirds of the indigenous population lives in more than 200 rural villages, most of which are remote settlements with fewer than 200 people and no road access.

All Alaska communities with at least 25 permanent residents have telephone service as a result of a state regulatory mandate in the 1970s. The State also provided $5 million to procure satellite earth stations for communities that had no phone service.[2] In the 1980s, the State supported a program called LearnAlaska that transmitted a channel of educational film and video programs to supplement instructional materials in village schools without science labs or specialized teachers. Radio stations were established in several native communities; they became part of a statewide public network that now includes 25 stations, sharing the costs and benefits of a coordinated statewide news, public affairs and satellite distribution system. These initiatives resulted in what might be called the era of analog diversity or analog inclusion.

In the 1990s, dial-up email and then Internet access to be offered in rural Alaska. With the introduction of the E-rate subsidy program resulting from the 1996 Telecommunications Act (see below), rural schools and libraries were able to lease bandwidth so that school students and other community residents could use their facilities to go online. This was the first major step toward digital inclusion for rural Alaska native communities.

2. Digital Diversity: Parameters for Alaska

Access and Adoption

Availability of telecommunications from the providers' perspective can be defined in terms of houses passed (for wireline technologies such as optical fiber, coaxial cable, and copper) and coverage for wireless technologies. Availability from a users' perspective requires a different lens. FCC data are reported by household: percentage of households with telephones, with broadband subscriptions, etc. However, availability at local sites such as libraries, community centers, and schools is also an important indicator for Alaska, especially for broadband. And as mobile phones and increasingly smartphones and portable devices proliferate, individual or personal access should also be considered.

However, access involves more than availability. Therefore, an analytical framework for rural Alaska should include *availability, access*, and *adoption.* Factors that could influence native adoption at the household or personal level include price, availability of computer or other device, availability of electricity, skills, and perceived relevance of content or services. Adoption through shared usage at community locations could be influenced by skill levels, availability of training and/or mentoring, schedule of availability, perceived relevance and value.

Several recent studies have examined broadband adoption and reasons cited for nonadoption among U.S. residents, with some data disaggregated by various demographic and ethnic criteria (age, education level, urban/rural, gender, ethnicity, etc.) The Federal Communications Commission (FCC) carried out a study in 2009 to examine broadband adoption and use; the top reason given by non-users for not using the Internet was affordability. [3] The 2010 report *Exploring the Digital Nation* by the National Telecommunications and Information Administration (NTIA), states that "persons with low incomes, seniors, minorities, the less-educated, non-family households, and the nonemployed tend to lag behind other groups in home broadband use." It provides detailed analysis of broadband adoption gaps: for 26 percent of non-broadband users, the main reason for non-adoption was that home broadband Internet was too

expensive. Among those who did not use the Internet at all, price and perceived relevance were cited as key considerations. [4],[5] While helpful in increasing our understanding of barriers to adoption among various groups including minorities, these studies do not have samples of Alaska natives large enough to provide any valid findings.

Innovation and Entrepreneurship

Yet digital diversity may involve more than use of available content or facilities – it may include various forms of *innovation,* for example:
- In adapting content and applications to local conditions;
- In developing new content and applications (involving local languages, cultures, development priorities, etc.);
- Entrepreneurship: in starting new commercial or public service activities taking advantage of broadband.

Services Provided for Native Communities

Another element of Alaska digital diversity involves Alaska natives as beneficiaries of telecommunications-delivered or –supported services, particularly health care and education. Health care in remote communities is provided by native health aides who rely on telecommunications for consultation with doctors are regional hospitals and for transmission of patient data. The telemedicine facilities are also used for training and continuing education.

All Alaska communities with at least 10 students must have schools offering K-12 instruction. Teachers in small schools teach several grades, and teacher turnover is high. Internet access plus other audiovisual instructional materials are important supplements to classroom instruction; advanced placement and other courses such as languages are available only online. Post secondary courses for college credit, training for jobs available in rural Alaska, and continuing education are also offered online. Thus, these services should be considered as components of digital diversity, as they are a means of providing services for remote indigenous communities that would not otherwise be available, and education and training to enhance skills of native residents.

Participation in the Communications Sector: Policy and Services

An analysis of digital diversity in Alaska should also include the role of Alaska natives in developing policies for communications services for native populations, and in owning and/or operating communications carriers and other service providers.

3. Extending Access: Broadband Stimulus Projects for Alaska

In 2009, the U.S. American Recovery and Reinvestment Act (Recovery Act or ARRA) appropriated $7.2 billion "to begin the process of significantly expanding the reach and quality of broadband services." [6] The Recovery Act allocated $2.5 billion for rural infrastructure projects to the Rural Utilities Service (RUS), which administers these funds through the Broadband Infrastructure Program (BIP). Alaska received more than $117 million for BIP rural

infrastructure projects. The largest project, TERRA (Terrestrial for Every Region of Rural Alaska), will provide terrestrial connectivity through an optical fiber hybrid optical fiber and microwave network to 65 native Yupik villages in Bristol Bay and the Yukon-Kuskokwim regions, an area the approximate size of North Dakota.

Another project, SABRE (Southwest Alaska Broadband Rural Expansion), is intended to provide wireless 4th generation (4G) broadband service to southwest Alaska through a partnership between a telecommunications company and a subsidiary of Sea Lion Corporation, the Alaska Native Village Corporation for Hooper Bay. A third funded project offers free satellite equipment and installation plus discounted service to residents who do not have other options to access broadband.[7]

The Broadband Telecommunications Opportunities Program (BTOP), established by NTIA to administer its $4.7 billion allocated under the Recovery Act, has funded two Alaska projects (in addition to state broadband mapping). OWL (Online with Libraries) will upgrade connectivity for 65 rural libraries, almost all of which are in indigenous communities. Facilities will include videoconferencing and webconferencing, so that the libraries can serve as public computing centers. It will also provide training and support in digital literacy to benefit community residents without broadband at home such as school students and adults taking online university and continuing education courses. Beneficiaries are intended to be remote library users where computer home ownership and Internet subscriptions are lowest, K-12 students to obtain homework help, adults undertaking university and vocational courses, and public service agencies serving the rural communities.[8]

Another project, Bridging the e-Skills Gap in Alaska, will provide computer skills and broadband awareness training to promote broadband adoption, particularly targeting Alaska native villages. The project brings together 21 partner organizations throughout rural Alaska to increase technology literacy. It intends to generate up to 88,000 new broadband users and providing training to over 84,000 Alaskans, and to create 88 new jobs in isolated, primarily indigenous, communities. It also plans to create a statewide Multi-Sector Digital Inclusion Council "as a forum for the discussion and sharing of best practices and the elimination of redundancy through sharing of partner-developed content." [9]

Additional broadband funding for rural Alaska has been provided by the Rural Utilities Service (RUS) through the state regulator, the Regulatory Commission of Alaska. RCA's Rural Alaska Broadband Internet Access Grant Program is intended to facilitate long-term affordable broadband Internet services in rural Alaska communities where these services do not currently exist. Eligible communities must have a population of less than 20,000, a "not-employed rate" of more than 19.5 percent. Broadband speed is defined as 768 kbps (the old FCC definition) and the access refers to individual households. Funding is available to telecommunications carriers, which can receive up to 75 percent of construction costs, and must commit to keeping rates comparable to those in Anchorage, Fairbanks, and Juneau for at least 2 years.[10]

All of these projects are intended to increase broadband access and adoption in rural Alaska, and particularly among Alaska natives. It will be important to evaluate their impact, in terms of

number and demographics of new users, types of usage, and resulting benefits for individuals and their communities.

4. Universal Service Policies: Increasing Access for Indigenous Populations

Sustainability for providers and affordability for users are typically addressed through universal service policies. In Alaska, they may be considered two sides of the same coin. Without federal subsidies, Alaska's vastness and low population density would make telecommunications prohibitively costly for rural communities and unattractive for private sector investment, thus severely limiting the potential for digital diversity.

Alaska has been a major beneficiary of the FCC's universal service programs, both in absolute funding and in funding per capita:

- *Voice Services:* From the High Cost Fund, Alaska telecommunications carriers serving rural areas received $168m in 2009;
- *Internet for Schools and Libraries (E-Rate)*: Alaska received $25.5m in 2009; $155m from 1998 through 2009, the highest per capita of any state;
- *Rural Telemedicine:* Alaska receives the largest amount of any state: $29m in 2009;
- *Low Income Subscribers:* Lifeline and Linkup: Alaska low income subscribers received subsidies totaling $24.5m in 2009.[11]

The FCC has begun the process of reviewing universal service support programs as a key strategy to implementing the National Broadband Plan, and intends to replace some existing support funds with a Connect America Fund.[12][13] The first steps are underway through a series of FCC Notices of Inquiry (NOIs) and Notices of Proposed Rule-Making (NPRMs)[14] on universal service topics including:
- High cost operator support mechanisms
- Low income customer support mechanisms (Lifeline and Link-Up programs)
- Subsidies for schools and libraries (the E-Rate program)
- Rural Health Care connectivity.

All of these are critical to provision of affordable communications, including broadband, to indigenous residents of rural Alaska.

The E-rate support for schools and libraries was retained in the FCC's Sixth Report and Order on Schools and Libraries Universal Service Support Mechanism in September 2010.[15] The High Cost Fund component of universal service is currently under review.[16] The $168m in high cost subsidies for Alaska carriers in 2009 has helped to keep prices for telecommunications services for rural indigenous residents "reasonably comparable" to urban rates, as mandated by the Telecommunications Act of 1996. Alaska telecommunications carriers, ranging from statewide operators to small cooperatives and "mom and pop" companies, are strong proponents of retaining most elements of the existing High Cost Fund, which they perceive as threatened by the transition to the Connect America Fund. They argue that their customers, many of whom are native residents of small, isolated communities, would be severely disadvantaged if subsidies for rural services disappeared.

However, the Federal-State Joint Board on Universal Service states that it "supports deployment and maintenance of broadband services in areas that are now unserved or underserved, although it remains important to continue support for existing voice networks." It also recommends consideration of the extension of universal service support to broadband as part of the broader universal service reform.[17]

The E-Rate: Support for Community Access in Rural Alaska

The E-rate (short for "education rate") created by the Telecommunications Act of 1996 provides discounts on a wide variety of telecommunications, Internet access and internal connections for schools and libraries. The applicable discount rate is based on a school's economic need and whether it is located in an urban or rural area. Rural Alaska qualifies for a 90 percent discount; i.e. only 10 percent of connectivity costs must be provided from local or state sources.[18] Approved schools and libraries post their requirements online, where they are open for competitive bids.

In Alaska, the E-Rate subsidy had brought Internet access to most indigenous village schools. The schools also have become "anchor tenants," major long-term customers that can help to justify infrastructure investments that can be used to serve other village customers. Despite the small size and isolation of many of the schools and libraries, carriers have competed in many rural areas of the state for the E-rate support. One of the competitive providers determined that the school subsidy was critical to its business case to bring broadband to the villages (primarily by satellite), and subsequently installed broadband wireless to cover the villages, with price for individual access not to exceed the price in Anchorage, the largest city.[19]

All Alaska communities with at least 10 students must have schools offering K-12 instruction. Teachers typically cover several grades, and lab facilities are very limited. Students use the Internet for coursework; they may also take advanced placement classes and foreign languages online. Community residents use connected library computers to search for jobs and to participate in training programs and continuing education classes.

Rural Telemedicine

Alaska's rural health care delivery problems are similar to those faced in many developing countries. Alaska ranks 48th among the states in "doctors to residents" ratio, and 65 percent of Alaska physicians are located in Anchorage. There is also an ongoing shortage of medical specialists. Some 59 percent of Alaskans live in "medically underserved areas," and many of these are indigenous residents.[20] Physicians serving rural indigenous communities are located at regional hospitals. Health care in native villages is provided by health aides, community residents with high school or less formal education and six weeks of training in primary medical care.

Telecommunications has been an integral component of health care delivery for Alaska natives since the days of HF radio. In the 1970's, NASA's ATS-1 experimental satellite showed that reliable voice communications between village health aides and regional doctors (as opposed to the often unreliable links via HF) could improve diagnosis and treatment of Alaska natives in

isolated villages, and could also be used for continuing education.[21] Today, AFHCAN (the Alaska Federal Health Care Access Network) connects about 250 sites including links between more than 150 village clinics and regional hospitals. AFHCAN handles about 22,000 cases per year, and has documented significant benefits in terms of reduced wait times for consultations, patient travel savings, and high provider and patient satisfaction.[22]

The viability of AFHCAN is highly dependent on the FCC's Rural Health Care fund, which subsidizes the difference between the price of connectivity in urban vs. rural areas. In Alaska, because of the isolation and dependence on satellite circuits, the subsidy can amount to 90 percent of charges from telecommunications providers.[23] As part of its universal service policies reform, it appears that the FCC intends to retain this subsidy program.[24]

5. Innovation and Entrepreneurship

Some Alaska entrepreneurial activities that benefit the indigenous economy such as ecotourism and the Iditarod[25] dogsled race from Anchorage to Nome use websites to attract visitors. Others that offer native handicrafts have used a web presence to extend their reach beyond tourists who visit their shops in Anchorage or Juneau. For example, Oomingmak Musk Ox Producers' Co-operative whose members knit clothing from muskox wool (much warmer than sheep's wool) states that they have generated significant sales from their website.[26]

Native Alaskans are also using the Internet to preserve their culture and history. A native language map first produced at the University of Alaska Fairbanks in the 1970s has now been updated to included traditional and modern place names, with links to a GIS database. The map data will be available online so that others may add demographic, scientific, or historical information about locations on the map. A group of native leaders and volunteers is using the web to preserve and share materials about the Alaska Native Claims Settlement Act (ANCSA) during the 40th anniversary year of its signing in 2001.[27] The Alaska Native Cultural Center also provides historical and cultural materials on its website.[28] The Inuit Circumpolar Conference includes Inuit in Alaska, the Canadian Arctic, and Siberia, and uses a variety of media to share cultural materials and to organize its membership to address shared issues such as climate change, ocean resources, and natural resource exploitation.[29]

Alaska natives in the far North have also been entrepreneurial in providing telecommunications services. OTZ, the first native telephone cooperative in the U.S., provides fixed and wireless voice and data services to the Inupiat regional hub of Kotzebue and ten Inupiat villages plus the native-owned Red Dog mine in northwest Alaska on the Bering Sea. The Arctic Slope Telephone Cooperative serves Barrow and seven Inupiat villages on the North Slope and in the Brooks Range plus the oil pipeline service center of Deadhorse/Prudhoe Bay. Both received funding to install and upgrade their networks from the Rural Utilities Service. An RUS-funded stimulus project to provide wireless 4G services in southwest Alaska involves a partnership between a telecommunications company and a subsidiary of Sea Lion Corporation, the Alaska Native Village Corporation for Hooper Bay.

6. Involvement in Communications Policy-Making

The Federal Communications Commission recently established a Native Nations Broadband Task Force, as part of its implementation process for the National Broadband Plan. Of the nineteen appointed members, two are Alaska natives, from Kawerak, the native association serving Bering Straits Inupiat communities based in Nome, and from the Tanana Chiefs Conference based in Fairbanks.[30] The FCC has also issued two notices in 2011 on broadband matters specifically related to native populations and native lands.[31] These notices provide an opportunity for native Alaskans to comment on requirements for broadband and demographic and geographical conditions that need to be addressed in implementing the Connect America Fund and other FCC initiatives or rule-makings. However, to take advantage of these opportunities, native representatives will likely require training and mentoring about both the specific issues and procedures to participate in FCC proceedings.

Funding from NTIA for broadband planning and mapping should also include both participation and employment opportunities. A recently-established state broadband task force with members appointed by the governor includes one Alaska native, but more should be added. The FCC native task force members could be asked to join to provide a bridge between federal and state activities, as well as more knowledge of native concerns and communications issues. Alaska native organizations with expertise in field research and community relations should be involved in the data collection and outreach required for the NTIA projects.

7. Steps to Enhance Digital Diversity in Rural Alaska

The framework proposed in this paper to analyze digital diversity among indigenous populations in rural Alaska includes several parameters:
- Access: availability and affordability
- Adoption
- Innovation: in applications and content; in providing ICT services
- Beneficiaries: of ICT-delivered or –facilitated services
- Policies that affect access and adoption: e.g. universal service support, broadband planning
- Participation in policy making.

From Access to Adoption

Several initiatives are underway to extend availability of broadband to Alaska native villages. Next steps should include verifying broadband map data for rural Alaska and identifying communities that still do not have broadband available. The current draft map appears to have inaccuracies for several rural regions. Also, data reported from a telephone survey conducted by Connected Nation appear to overrepresent computer ownership and broadband usage in rural Alaska.[32] A follow-up survey with a larger sample and pretested questions specifically designed for rural Alaska is required.

Concerning adoption, national data for the US show lower levels of broadband adoption among lower income, rural, and some minority populations. Among non-adopters, lack of

relevance is cited as main reason for not having broadband at home.[33] However, as noted above, the Alaska samples are not large enough to identify barriers for rural Alaskans or Alaska Natives. Research is needed in Alaska to increase understanding of reasons for nonadoption, to develop strategies to encourage adoption, and to identify or develop relevant applications for users with limited ICT or language skills.

Evaluation

Government investments in infrastructure and support for broadband services are based on the premise that use of broadband can contribute to goals such as social, cultural, and economic development, improved or extended delivery of public services, and support for various sectors and other priorities. Broadband initiatives should therefore be evaluated not only to determine whether the funds resulted in the intended broadband deployment, but to assess impacts of increased access on availability and effectiveness of health services, education and training, government programs and services, and new or increased economic activities.

More than $140 million in Stimulus funds has been awarded to projects intended to extend broadband and increase Internet and broadband usage in Alaska, primarily in rural indigenous communities. Stimulus projects are typically intended to create jobs quickly – and to support projects that are "shovel ready." Yet these may be no more than short term construction and installation jobs. Long term employment and economic impact requires more time, an understanding of the economic needs and goals of the region, and training to impart necessary ICT skills.

The infrastructure projects, which are in Yupik regions of southwest Alaska, are intended to increase broadband availability. However, as noted above, adoption by native Alaskans may depend on additional factors such as price, computer ownership and skills, and perceived relevance of content. Given the lack of data on barriers to adoption in rural Alaska, a pre-installation study should be carried out to determine the extent of current Internet use, and perceived demand as well as concerns that might impact adoption. A strategy could then be developed to integrate the infrastructure investments from RUS with the skills training and applications development projects supported by NTIA.

Further, evaluation of these projects would be useful to determine increase in usage, barriers to usage, and to identify social and economic impacts. These results would be useful for further broadband planning and analysis for rural Alaska.

Innovation and Participation in Policy-Making

Alaska natives have begun to use broadband and online tools for cultural preservation, access to health and education services, and economic development. However, additional training could help them to develop more applications and content, and to obtain the skills needed for IT jobs in their communities.

Also, as outlined above, there are also new opportunities for Alaska natives to participate in broadband and other communications policy and planning activities for Alaska. Proposed universal service reforms could significantly affect the availability and affordability of

communications services including broadband in rural Alaska. Again, training and mentoring will be needed to enable a new generation of native leaders to help shape Alaska's communications future.

NOTES:

[1] 2010 census data for Alaska at http://live.laborstats.alaska.gov/cen/ . An additional 51,875 identified themselves as racially composed of two or more races; a significant percentage of these are likely to be partly Alaska native.

[2] Hudson, Heather E. *Communication Satellites: Their Development and Impact*. New York: Free Press, 1990.

[3] Horrigan, John. "Broadband Adoption and Use in America." *The FCC Omnibus Broadband Initiative (OBI) Working Paper Series.* Washington, DC: Federal Communications Commission, 2009.

[4] National Telecommunications and Information Administration. *Digital Nation: 21st Century America's Progress Toward Universal Broadband Internet Access*. Washington, DC, February 2010.

[5] Economics and Statistics Administration and the National Telecommunications and Information Administration, *Exploring the Digital Nation: Home Broadband Internet Adoption in the United States.* Washington, DC:, November 2010.

[6] American Recovery and Reinvestment Act of 2009, (Pub. Law. 111-5). See www.recovery.gov.

[7] See www.rurdev.usda.gov/UTP_BIPResources.html.

[8] See www2.ntia.doc. gov/Alaska.

[9] See www2.ntia.doc.gov/Alaska.

[10] Regulatory Commission of Alaska. "Rural Alaska Broadband Internet Access Grant Program Round Five Grant Application Guide(2010)." See www.rca.alaska.gov.

[11] Derived from data posted at www.usac.org .

[12] Federal Communications Commission. *Connecting America: The National Broadband Plan*. Washington, DC, March 2010.

[13] Federal Communications Commission. Notice of Inquiry and Proposed Rulemaking: "In the Matter of Connect America Fund; A National Broadband Plan for Our Future; High-Cost Universal Service Support." Washington, DC, April 21, 2010.

[14] For example, Connect America Fund and High Cost Support: FCC Notice of Inquiry and Proposed Rulemaking: Adopted April 21, 2010; Upgrading E-Rate for the 21st Century: FCC 6th Report and Order: Adopted Sept 23, 2010; Review of Lifeline and Linkup Programs: Federal State Joint Board Recommended Decision: adopted Nov. 3, 2010**;** FCC Notice of Proposed Rulemaking. In the Matter of Rural Health Care Support Mechanism, WC Docket No. 02-60, adopted July 15, 2010.

[15] Federal Communications Commission. "In the Matter of Schools and Libraries Universal Service Support Mechanism: A National Broadband Plan For Our Future." Sixth Report and Order. Adopted September 23, 2010.

[16] Federal Communications Commission. In the Matter of Connect America Fund, A National Broadband Plan for Our Future, Establishing Just and Reasonable Rates for Local Exchange Carriers,

High-Cost Universal Service Support, Developing an Unified Intercarrier Compensation Regime, Federal-State Joint Board on Universal Service, Lifeline and Link-Up. Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking, Adopted February 8, 2011.

[17] Federal Communications Commission." In the Matter of Federal-State Joint Board on Universal Service Lifeline and Link Up: Recommended Decision." Released November 4, 2010.

[18] Hudson, Heather E. "The Future of the E-Rate: U.S. Universal Service Fund Support for Public Access and Social Services" in Schejter, Amit, ed., *... and Communications for All: An Agenda for a New Administration.* Lanham, MD: Lexington Books, 2009.

[19] Hudson, Heather E. *From Rural Village to Global Village*. New York: Routledge, 2006.

[20] . Ferguson, Stewart, and John Kokesh. " What Works: Outcomes Data from AFHCAN and ANTHC Telehealth: An 8 Year Retrospective." Anchorage: Alaska Native Tribal Health Consortium, 2011.

[21] Hudson, Heather E. and Edwin B. Parker "Medical Communication in Alaska by Satellite." *New England Journal of Medicine*, December 20, 1973.

[22] See www.afhcan.org and Hudson, Heather E. *From Rural Village to Global Village*. New York: Routledge, 2006.

[23] Personal interviews, Yukon Kuskokwim Health Center, Bethel, Alaska, March 2011.

[24] Federal Communications Commission. In the Matter of Rural Health Care Support Mechanism WC Docket No. 02-60 Notice of Proposed Rulemaking Adopted: July 15, 2010

[25] See, for example, www.iditarod.com and Alaska Wilderness and Recreation Tourism Association , www.awrta.org .

[26] Personal communication. Also see www.qiviut.com.

[27] See www.ancsaat40.com.

[28] See www.alaskanative.net.

[29] See www.inuit.org and www.iccalaska.org.

[30] Federal Communications Commission. "Chairman Genachowski names Members to The FCC-Native Nations Broadband Task Force." Press Release, March 3, 2011.

[31] Federal Communications Commission. *Improving Communications Services for Native Nations*, CG Docket No. 11-41, Notice of Inquiry, 26 FCC Rcd 2672 (2011); Federal Communications Commission, In the Matter of Improving Communications Services for Native Nations by Promoting Greater Utilization of Spectrum over Tribal Lands, WT Docket No. 11-40, Notice of Proposed Rulemaking, March 3, 2011.

[32] See www.connectak.org.

[33] Federal Communications Commission. Presentation at September Commission Meeting, September 29, 2009. See http://reboot.fcc.gov/open-meetings/2009/september.