



Expanding and Accelerating the Adoption & Use of Broadband Throughout the Economy

A REPORT OF THE ADOPTION AND USE WORKING GROUP

US BROADBAND COALITION

Policy Options to the Federal Communications Commission

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Attached is the report of the Adoption and Use Working Group of the US Broadband Coalition. The Coalition includes more than 160 organizations, including large and small communications providers of all kinds, high technology companies, manufacturers, labor unions, educational institutions, utilities, consumer groups, public interest organizations, units of state and local government, and many other stakeholders committed to advancing America's broadband future.

On December 2, 2008, in an unprecedented display of consensus, the Coalition released a "Call to Action for a National Broadband Strategy." The Call to Action stressed that the United States urgently needs a comprehensive national broadband strategy, and it set forth a framework for developing such a strategy. That day, the Coalition also formed six working groups to address key issues and policy priorities. One of these was the Working Group on Adoption and Use.

The mission of the Adoption and Use Group was to investigate why residential, commercial, and institutional users do or do not use the Internet; to examine how broadband connections to the Internet can facilitate, expand, and improve such use; and to develop as much agreement as possible on promising approaches to increase adoption and use of broadband connectivity.

Two months after the Coalition issued its Call to Action, Congress and President Obama enacted the American Recovery and Reinvestment Act of 2009, providing for federal support of the development, adoption, and use of broadband infrastructure and requiring the Federal Communications Commission to develop a National Broadband Plan by February 17, 2010. In response, the Coalition focused on making its work as helpful as possible to the Commission.

On September 24, 2009, the Coalition issued an umbrella report summarizing the dozens of ideas and policy options that the Coalition had developed as of that date. The report indicated that the Adoption and Use Group would issue a more extensive report by November 1, 2009.

The accompanying report of the Adoption and Use Group is the product of an intense 10-month effort by a wide range of organizations, informed by experts in many of the areas covered by the report. While there was substantial consensus among members of the Group and the Coalition as a whole on many the major concepts reflected in the report, the report does not purport to reflect consensus on all of the details. Instead, the report offers a cornucopia of thoughtful ideas and policy options, many of them original. We hope that the report will be an asset to the Commission, Congress, and everyone else who is interested in this critically important topic.

Jim Baller, President, US Broadband Coalition
Kenneth Peres, Vice President, US Broadband Coalition

Expanding and Accelerating the Adoption & Use of Broadband Throughout the Economy

FORWARD

The goal of our working group was to create a document that would enhance efforts to expand the adoption and use of broadband throughout our nation. In the report that follows, the Working Group on Adoption and Use has:

- Identified barriers to the adoption and use of broadband connections – especially among un-served and underserved groups. Such barriers include price, performance and availability of broadband connections to the Internet, ignorance of actual and potential benefits of bandwidth-intensive applications, lack of access to computers and other Internet devices, insufficient training in use of current computer complexity in operating systems and applications and lack of accessibility for people with disabilities to evolving high speed broadband technologies and applications,.
- Identified opportunities to accelerate the adoption and use of broadband connections in order to stimulate economic development and job creation, make healthcare more affordable, expand educational opportunities and distance learning, promote energy and environmental sustainability, enhance public safety and homeland security, and promote democracy and civic engagement.
- Identified short-term and long-term policy options to stimulate adoption and use of broadband connections.

We hope that the policy options will be useful for policy makers at all levels – especially the Administration, Congress, Federal Communication Commission, State Governors and Legislatures and Civic leaders around the country who are taking a proactive stance on broadband policies and programs. The policy options seek to promote the following principles.

Inclusion – The value of the Internet as a whole and of any specific Internet-enabled service increases as more people and devices are connected to and utilize the Internet. Conversely, as more functions in our society move online, the cost of digital exclusion continues to escalate.

Integration – Broadband technology and Internet-based applications can no longer be managed as separate technology “silos.” Information and Communications Technology is integral to social services, education, health care, safety, civic rights and civic engagement, and all other sectors of the economy. ICT investment and policy must be incorporated into other federal and state programs as considerations, polices and line-item investments.

Interoperability – While broadband development to-date is founded on the “natural” inter-operability of Internet Protocol, more inter-operability at the application level is needed to accelerate development across ‘silos” such as healthcare and public safety. This is a place where policy and standardization can drive additional deployment and innovation.

Investment – Strategic investments such as those made through the ARRA Broadband Funding, Universal Service Funds, and USDA Rural Health programs are critical to filling gaps in the market in terms of access, adoption and applications.

Innovation – The hallmark of the Internet age has been innovation. Such innovation must continue to be encouraged at all levels of the economy and the market.

We sincerely thank the authors and contributors who were engaged in shaping the report’s scope, developing content and reviewing concepts and policy options. Our consensus is in the nature of the overall report and the principles outlined in the summary and not in any specific policy option. The policy options are presented for

consideration and further development, both as part of the FCC's work on National Broadband Policy and more broadly for those states, cities and communities who are or want to engage in efforts to leverage technology for the greater good.

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Expanding and Accelerating the Adoption & Use of Broadband Throughout the Economy

Summary

As computers and the Internet become more critical to daily life and work, America will benefit greatly from expanding the geographic reach and capacity of broadband networks and from increasing the adoption and use of information and communications technology (ICT). Digital literacy and broadband access are not merely an individual or household concern. The lack of access and technical literacy for some impacts quality of life, economic development and job creations, health care and wellness, educational methods and outcomes, energy conservation and environmental sustainability, public safety and security, and democracy and civic engagement for all U.S. communities. Even among households, businesses and institutions that are connected, increasing the intensity of use by simplifying application interfaces, removing barriers to interoperability and encouraging innovation will dramatically increase the value that broadband investment brings to the society as a whole.

The federal government, in collaboration with state and local governments and the private sector, must play an active role in stimulating adoption and use of advanced broadband connections. All Americans must have access to computers and the knowledge to use broadband technology effectively. Federal and state support should include programs, grants, subsidies, and other measures that foster broadband connectivity, computer access, education, and training and that address barriers to effective use of broadband. Policy options for broadband adoption and use focus both on the broadband infrastructure and on the applications and adoption issues that create value from that infrastructure. These concepts fall into five major areas:

- Bridging the Digital Divide
- Addressing the Broadband Adoption Gap for People with Disabilities
- Increasing the Intensity Of Broadband Use In Core Sectors of Our Economy
- Raising the Bar on Skills and Ease of Use
- Accelerating Innovation

Bridging the Digital Divide

Research shows that approximately half of those on the wrong side of the Digital Divide are already motivated to become connected and are simply looking for help navigating the issues around access, devices and training.¹ For others, broadband is not (yet) part of their social network on personal experience. This is likely to change as

¹ J. Horrigan, "Home Broadband 2008," July 2, 2008, Pew Center for Internet and American Life, at <http://www.pewinternet.org/Reports/2008/Home-Broadband-2008.aspx>.

broadband applications continue to expand into all facets of our lives and economy. There are a number of barriers preventing the U.S. from reaching truly universal, ubiquitous use of broadband networks and services.

- **Relevance:** While many avid broadband subscribers readily see high speed access as a high value life utility, about half of nonsubscribers do not feel that broadband access is personally relevant.
- **Literacy:** For people with low literacy levels or those for whom English is a second language, a lack of accessible content can be a barrier to broadband adoption and use.
- **Training and skills:** Users must be comfortable with devices and applications in order to be comfortable accessing the Internet. Perhaps more importantly, these individuals need a social infrastructure that supports their learning and growth
- **Access:** Many Americans live in areas where broadband networks have not yet been fully deployed.
- **Affordability:** For many nonsubscribers, it is the monthly, reoccurring cost of broadband services that creates a barrier to entry and prevents them from subscribing.
- **Computers** and other devices: A large segment of the population still does not own computers and may not feel comfortable using them.
- **Accessibility:** Many Americans, including increasing numbers of older Americans, cannot use the standard broadband technologies and content today because they require vision, hearing, fine motor skills, or ability to handle complexity that they do not have.

Specific policy options include:

- Invest in digital inclusion and digital literacy programs that directly serve population segments that traditionally underutilize broadband connectivity: those in rural areas, seniors, those with less education, people with disabilities, some minorities and those with low incomes.
- Develop a “digital ecosystem” in communities where broadband access is made available at public institutions (e.g., libraries, schools, park districts, hospitals) and in the home.
- Encourage a range of investment models that increase broadband options – starting first by reinforcing commercial markets that have invested billions to wire and unwire America and also supporting municipal and nonprofit models.
- Develop and advocate policies that commission government agencies to allocate funding for community access, broadband services and computers and training as part of their key programs.
- At a national level, foster evergreen funding sources to support community efforts needed to help nonsubscribers become confident and effective technology users.
- Give all Internet service providers -- including traditional wireline and wireless providers, cable providers, municipal and nonprofit providers -- an equal opportunity and responsibility to provide transport-based community benefits as part of the continued use of public rights-of-way.
- Promote a digital democracy agenda that solicits, responds and acknowledges the voice of the people.
- Converge the Internet with the various forms of broadcast media and wireless technologies to allow for a seamless flow of ideas, opinions, and actions that can improve the vitality of our country.
- Conduct cost/benefit analyses that measure the cost of digital exclusion and the cost/benefit of connecting people to applications in health, energy, education, and social services; measure cost savings or increased outcomes achieved through moving services online.
- Reward and spotlight innovative inclusion programs and look to further expand and replicate those programs. This should include commercial, nonprofit and government models.

- Give serious consideration to the growing refurbished PCs industry in the United States as a source of high quality computers. Refurbished computers are environmentally friendly, cost effective, and create local green jobs.

Addressing the Broadband Adoption Gap for People with Disabilities

When people with disabilities (17-20 percent of U.S. adults) are unable to access broadband services, they are prevented from having the tools that they need to improve their productivity and self-sufficiency. Unfortunately, the generally high costs of broadband access, hardware and software needed to make computers and broadband service accessible to people with disabilities can be prohibitive – and create barriers to entry for use of these services.

To reduce the Digital Divide experienced by people with disabilities, the National Broadband Plan should include policy options to:

- Conduct research to better identify the problem.
- Promote broadband access by people with disabilities through universal design by addressing barriers faced by people with disabilities in the design of basic broadband infrastructure and technologies.
- Ensure that people with disabilities have full access to broadband services, hardware and required equipment, and broadband content, in accordance with the ADA and other federal nondiscrimination laws.
- Create alternate discount rate schemes and other financial incentives for consumers to use broadband services for specific population groups.
- Create business incentives to incorporate accessibility and affordability within broadband products and services.
- Foster and fund collaborative efforts for marketing, consumer education, training and broadband learning initiatives.

Increasing the Intensity of Broadband Use in Core Sectors of Our Economy

While there may be no “killer app” for the nation, there are definitive applications that ignite interest in individuals and even in whole communities. These include reading local news online, viewing photos of grandchildren, instantaneously receiving a PTA newsletter, uploading a family video, being able to telecommute or work anywhere, making connections with friends through social networking sites, conducting research or enrolling on an online course, obtaining accurate health information, comparing prices or shopping online, and creating or downloading music.

Broadband connectivity is becoming increasingly important in every corner of American life. This important growth engine for the American economy is predicated upon near ubiquitous adoption and every sector taking maximum advantage of the benefits that robust broadband connectivity provides. To illustrate this point, the Adoption and Use Group explores the challenges and benefits of accelerating adoption and use of high-capacity broadband connectivity in six sectors or “verticals” – economic development and job creation, health care and wellness, education and distance learning, energy and the environment, public safety and homeland security, and democracy and civic engagement. Rather than focusing only on adoption and utilization measures that get everyone to a basic level, broadband policy and measurements must focus on increasing the intensity of utilization to drive gains for all our national priorities.

A sample of concepts that leverage broadband infrastructure to increase value in core industry and community segments includes:

- Put issues of digital transformation at the forefront of economic policy, coordinating multi-disciplinary approaches that make information and communications technology a core element of everything that the nation does to meet its great challenges. This could include supporting tele-centers or broadband-connected business incubators, directly targeting grants for Internet innovation to small businesses, and including robust connectivity and access considerations in all investments, policies and projects.
- Support online and in-person workforce development initiatives and especially those that increase technology literacy and IT proficiency throughout the workforce. Provide training and programs to address the employment dislocations that can result from digital transformation.
- Reinforce local economic development initiatives with policies that encourage communities to invest in and leveraging broadband solutions as part of plans for strategic reinvestment and growth, including state policies that make the state a facilitator and partner in community strategy development.
- Encourage collaboration among local, state and federal health agencies, members of the healthcare community, and information service industry to deploy electronic health and telemedicine services, connecting patients and their data with medical knowledge. Invest in standards and shared services that enable interoperable sharing of medical information.
- Promote learning communities that lead the use of technology in education, including libraries, job training sites and community centers. Promote collaborative learning, content creation, constructivist thinking and critical evaluation of the myriad of data sources that confront each of us.
- Emphasize 21st-century skills proficiency in schools, workforce training and retraining programs, libraries, museums and other educational and vocational resources. Increase standards for skills and ensure that our schools are preparing students for a world that increasingly relies on technology and information. Increase focus on STEM (Science, Technology, Engineering and Math) at all levels of the curriculum and culture.
- Increase funding for the Schools and Libraries Program (known as the E-Rate), which is focused on providing greater broadband connectivity in schools and libraries, to better meet increasing demand and keep pace with inflation. Review policies related to these funds to ensure that those policies are forward looking and designed to create the greatest amount of value.
- Deploy next-generation emergency information and communications technology, starting with broadband access for all 9-1-1 and emergency response agencies, provisioning broadband backbone networks to connect them with shared services and applications for interoperable information sharing.
- Promote the use of web-based services and devices in energy conservation and transportation efficiency such as Smart Grids, Smart Roads and automated processes. Leverage US spectrum and rights of way to support both expanded utility networks and expanded commercial multi-use network services.
- Provide recommendations and assistance to all agency heads on ways to maximize voluntary telework without diminishing employee performance or agency operations, as well as ways to educate federal workers about the personal and social benefits of telework, including reduced energy usage, a healthier environment, and improved employee morale.
- Establish and implement telework "best practices" for federal employees that will also serve as a model for adoption by state and local governments and the private sector.
- Consider broadband and technology implications and opportunities in ALL areas of investment – from roads to military to energy and healthcare – and use the full power of government policy and investment to increase broadband utilization broadly across all sectors of the economy.

- Protect consumer safety and privacy while ensuring markets are as open as possible to entry and online competition.

Raising the Bar on Skills and Ease of Use

Basic computer knowledge and digital literacy remain adoption barriers for many, while gaps in media and information literacy skills prevent some existing users from using broadband technology effectively in their work and lives. Some people and organizations lack the financial, educational, and technical resources to manage and maintain hardware and software, particularly computer set-up, networking and combating viruses and spam. Among the core skills needed for adoption and use of broadband connectivity are basic and advanced lessons in computer safety, privacy, and fraud as well as training in information literacy – including conducting proper searches, validating information content and sources, and citing sources.

Accelerating Internet learning requires innovation and improvement in usability, including developing more natural and robust interfaces and making networks easier to set up and maintain. This will support a wider spectrum of users and reduce training needs and costs. Creating applications and interfaces that are natural and intuitive, that are flexible and adaptive to specific uses and users, and that are robust and fault-tolerant will not only contribute substantially to bridging the Digital Divide, but will also improve productivity and enhance value for all users. These principles are as relevant to new users learning basic computing as they are to physicians accessing electronic medical records; to activists finding ways to mobilize people in support of a cause; and to artists collaborating across the globe on new work. Raising the bar on skills and increasing ease of use benefits everyone.

Policy options discussed to achieve these goals include the following:

- Ensure that information and computer literacy standards are part of standard curriculum for all students. These are the standards that help people discern the validity of sources and to manage intellectual property appropriately.
- Explore ways that technology can facilitate skill development in affordable and scalable ways by enabling both computer-based and peer-based skill development programs in computer literacy.
- Mobilize school and public libraries along with community technology and media centers to take leadership roles in raising the bar on media and information literacy skills.
- Leverage the collaborative aspects of the web to create government applications that further civic discourse and a participatory democracy.
- Develop policy and investment plans that promote collaborative applications among sectors and create incentives for commercial and private investment in next generation applications.
- Reward and showcase best-in-class applications that use collaborative broadband tools to solve challenges in healthcare, public safety, education, energy or other core segments.

Accelerating Innovation

A rapidly growing segment of the U.S. economy is tied directly or indirectly to information and communications technologies. This includes industries that develop, deploy, finance, operate, and maintain communications networks and the equipment that runs them; industries that focus on devices that interconnect with the communications networks, including computers, netbooks and PDAs; process-based industries that use broadband to speed transportation, strengthen supply chains or improve energy efficiencies, network-based applications and businesses that run over the networks, including Google, Amazon, Flickr, Facebook or eBay, etc.; and state and local governmental services that are transformed by the applications available, and so on.

Given the massive change in these markets in the past five years, it is difficult to predict possibilities for the future. Policies must focus not on protecting any status quo but on fostering a fertile environment for U.S.-based innovation, expansion, adoption and use. Policy options that encourage innovation could include:

- Expand investment in Internet-aligned technology incubators.
- Encourage cross-sector synergies, investments in applications that use broadband to bring shared benefits in education, healthcare and public safety, projects that invest in e-government services, roads and fiber, etc.
- Promote innovations that increase ease of use for broadband applications – both by people and by systems, through standards and interoperability.
- Build on successful models/best practices of new broadband applications developed with American Recovery and Reinvestment Act funding.
- Invest in Internet-based innovation through the National Science Foundation, health policy, transportation policy and every other segment of governmental programs.
- Directly address interoperability standards that hinder broader deployment and innovation in healthcare and public safety.
- Invest in common tools and components that can facilitate development of special interfaces for those who face barriers due to literacy, disability or aging and can also reduce the efforts needed by mainstream IT and content developers to maintain accessibility as they innovate.
- Review all policy recommendations in light of a robust evolving market where the critical Internet drivers in the next ten years are barely on the horizon today. Plan not to regulate what is, but to create the policy foundation that will enable even greater innovation in the future.
- Continue to focus on policies that protect privacy and enhance personal, system and corporate security as these two core issues underpin the confidence and creativity of the web.

Document Guide

This document starts with a Table of Contents and list of authors, contributors and leaders. The strength of this work is grounded in the wisdom shared by each person, the broad range of supporting organizations and the nature of truly collaborative process employed. The document includes a table of contents, introduction, sections on digital Inclusion, universal access and then a series of sections intended to address increasing the intensity of use in vertical sectors such as economic development, healthcare, education, energy and sustainability, public safety and democracy and civic engagement. Last is a discussion on engagement and advocacy designed specifically to address rural communities but relevant to all communities. A broader list of authors and contributors with contact information is included as the final section of this document. While this summary covers the basic concepts of adoption and use opportunities and policy options, the beauty of this report resides in the detailed sections outlining the opportunities, challenges and specific policy options. Please select the topic of interest within this report and promote those policy options most likely to expand and accelerate adoption and use of broadband throughout the economy.



Expanding and Accelerating the Adoption & Use of Broadband Throughout the Economy

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Expanding and Accelerating the Adoption & Use of Broadband Throughout the Economy

1. Introduction

While policies must be in place to ensure that our national broadband infrastructure is ubiquitous, affordable, accessible and progressive, policies that promote Adoption and Use of that infrastructure are equally as important as those that promote goals for availability and speed.

The US Broadband Coalition has identified policy options in each of the following areas:

- Achieving universal broadband adoption, by bringing digital opportunity to unserved and underserved populations² and addressing the many barriers preventing the U.S. from reaching truly universal, ubiquitous use of broadband networks and services.
- Ensuring access for all through universal design by specifically addressing the barriers faced by people with disabilities and by directly addressing hearing and vision loss issues that affect many seniors who, while not considering themselves disabled in the cultural sense, require accommodations for digital access.
- Creating greater value for America and Americans by accelerating broadband use in core sectors or “verticals” such as economic development and job creation, healthcare, public safety, education, efficient energy utilization, the environment, safety and homeland security, and democracy and civic engagement. This includes applications used by people and applications where devices use broadband technology to automate processes, for example to save energy, regulate traffic, and provide basic health monitoring.
- Promoting general awareness of value and costs associated with broadband adoption and use, through professional and grassroots campaigns.
- Stimulating integrative applications that can provide links between core sectors (e.g. between public safety and healthcare) and maximizing the integration of and synergies between particular users and applications.

2 REACHING UNIVERSAL ADOPTION & USE – CLOSING THE DIGITAL DIVIDE

2.1 Opportunity

² For the purpose of this report, we define “un-served populations” as people or household without either fixed or mobile broadband services. “Under-served populations” are people or households lacking the broadband capacity to effectively use the Internet in their daily lives. This could include people using dial-up access or schools that cannot use new peer-to-peer applications and rich media collaborations because of insufficient bandwidth and the initial cost of reliable equipment.

Even with the strong growth in broadband adoption and use since the nascent years of the Internet in the late 1980s and early 1990s, there remains a persistent Digital Divide in America – that is, a gap between those who are enjoying effective use of information and communications technology (ICT) and those who are not. While the numbers change over time, statistics from the Pew Center for Internet and American Life, Mediamark Research and Intelligence Survey of the American Consumer, and other sources indicate that between 37%³ and 47%⁴ of adult American still do not have at-home broadband connections. The fault lines of connectivity divide along educational attainment level, ability or disability, age, race and income level, and geography with those least likely to have access generally being:

- Those without high school degrees and those with lower educational attainment
- People with disabilities
- Senior citizens
- First generation immigrants from non-English speaking countries
- Households with lower income levels
- People of color, specifically African Americans and Latinos
- People in rural America

A study from the Pat Brown Institute of Public Affairs determined that lack of access among at risk populations further isolated these groups from the services and tools needed to succeed and thrive in society.⁵

While digital inclusion has traditionally been viewed as an individual or household concern, recent reports suggest that inclusion profoundly affects community, systems and collective outcomes. Authors of “Innovating for Inclusion” noted that “as computers and the Internet become more central to everything we do, the cost of leaving 20-50% of the population on the wrong side of the Digital Divide becomes a significant issue for communities. Digital literacy and broadband access is not simply an individual or household concern. The lack of access and technical savvy for some impacts educational methods and outcomes, civic engagement, community networking, and economic development for the community as a whole.”⁶ Metcalf’s Law “states that the value of a telecommunications network is proportional to the square of the number of connected users of the system (n^2),” or that the network effects from connected users or devices profoundly impact the system value of the whole.⁷ This has proven true with email, social networks, text messaging and video and picture sharing applications. So in many senses, universal access is the foundation for broader adoption and use across all sectors of the economy including in healthcare, economic development, education, energy and sustainability, public safety and most importantly in democracy and civic engagement.

2.2 Current State of Adoption and Use – Barriers

While the Digital Divide has often been described in binary terms - people have Internet-connected computers or they do not – current thinking provides a more nuanced view of both the barriers to adoption and the very definition of connectivity and use. The perceived Digital Divide is a multi-dimensional chasm that includes:

³ Mediamark Research and Intelligence Survey of the American Consumer, 2008 data, made available August 2009 through subscription from Demographics Now, <http://www.demographicsnow.com/>.

⁴ J. Horigan, Home Broadband Adoption 2009, Pew Internet and American Life Project, June 17, 2009, at <http://www.pewinternet.org/Reports/2009/10-Home-Broadband-Adoption-2009.aspx>.

⁵ Modarres, Ali and Bill Pitkin. (2006). “Technology and the Geography of Inequality in Los Angeles”. Edmund G. “Pat” Brown Institute of Public Affairs, at http://www.patbrowninstitute.org/publications/documents/CTF_Report.pdf.

⁶ M. Wynne, K.A. Perry, L.F. Cooper, “Innovating for Inclusion: A Digital Inclusion Guide for Those Leading the Way,” Microsoft, at <http://www.microsoft.com/industry/government/digitalinclusion.msp>.

⁷ Wikipedia, http://en.wikipedia.org/wiki/Metcalf%27s_law

- Training and support
- Device availability
- Relevance

Additionally evolving definitions of what constitutes connection and use⁸ continues to shape and reshape our collective view of the Digital Divide, and Digital Inclusion and Opportunity.

Therefore policy changes to bridge the Digital Divide or promote digital inclusion and digital opportunity must address each of these barriers and must also be sensitive to the fact that where the line is drawn in mapping the divide may shift depending on how connectivity and connectivity sufficiency is defined.

Training and Support

Basic computer knowledge and digital literacy remains an adoption barrier for many users; gaps in media and information literacy skills prevent even existing users of ICT from more fully leveraging technology effectively in their life and work. Some people and organizations lack the financial and technical resources to maintain and manage hardware and software issues, particularly related to computer set-up and networking, Internet safety, and combating viruses and spam. Among the core skills needed for adoption and use of ICT are basic and advanced lessons in computer safety, privacy, and fraud. Many users, even if they have some experience, require further training in information literacy – citing sources, conducting proper searches, and validating information content and sources.

Device Availability

While the view of an Internet-capable device has evolved from the desktop PC to the laptop to a PDA and smart phone, the availability of an Internet-capable device remains a fundamental barrier to adoption for many consumers, workers and business-owners. In framing options that encourage broader adoption of Internet-capable devices, policies must match the device to the need and opportunity rather than a specific affordability level. While affordability remains a core issue, PC adoption is also inhibited by lack of knowledge on making a sound purchase decision and limited financing options. Measures of device availability must encourage intense use models by considering devices per person rather than per household.

Relevance

While there may be no “killer app” for the nation, experience from digital inclusion nonprofits confirm that there are ICT applications that ignite interest in individuals and can even mobilize community. Individual value propositions are varied and diverse. They include reading local news online, playing online games, emailing friends and family members, enjoying photos of friends, family, and especially grandchildren, receiving a PTA newsletter, uploading videos, being able to work anywhere via telecommuting, conducting research or learning via a web-based online class, communicating with the “digital generation” using instant messaging, social networks, and email, searching for jobs, and accessing government resources that are online. Research indicates that approximately half of those on the wrong side of the Digital Divide are already motivated to get connected and are simply looking for help navigating the issues around access, devices and training challenges.⁹ Others have not yet found a personal reason to invest in broadband. For those individuals who have not discovered their own value proposition to motivate them to connect to the Internet, this lack of knowledge and education creates a barrier to adoption.

⁸ Pew, Mobile Access to Data and Information, March 2008.

⁹ Horrigan, “Home Broadband 2008,” July 2, 2008, Pew Center for Internet and American Life, at <http://www.pewinternet.org/Reports/2008/Home-Broadband-2008.aspx>.

2.3 Accelerators

Programs that successfully sustain broadband adoption and use:

- Promote and assist affordable home computer and Internet access.
- Are embedded in established community social and institutional networks.
- Are “High-touch” – based on personal interactions and relationships.
- Provide continuing formal as well as peer support to the new adopter through several critical stages of the “adoption curve”: engage, train, equip and support.
- Integrate basic broadband adoption with other strongly motivating opportunities, e.g. employment, education, public safety, healthcare needs, civic and neighborhood improvement.

Evolving Definitions of Connectivity

Historically, many people have started using broadband at work, often gaining skills and interests that expand beyond the workplace. Some people find this access sufficient but many build on Internet introductions in the workplace as a gateway to home connections. In 2008, seventy-seven million Americans indicated they have broadband access available at work.¹⁰ While many indicate that using those connections on their lunch hours meets their high-speed needs, others find that workplace restrictions are personally limiting and that home access is needed to support broader personal and family goals.

As important as it is to measure home broadband adoption, those measures often fail to fully account for wireless Internet access. Mobile broadband access is growing in prevalence and popularity, both as a primary and as secondary for of Internet access. Recent research shows that African Americans and Hispanics are much more active in using wireless devices to connect to the Internet and data services than others. While there is general consensus that some applications and services are better suited to mobile broadband connectivity and other are better suited fixed connections and larger devices, there is little study to assess the merits of using mobile broadband devices and connections as a primary vehicle for digital inclusion populations.

2.4 Policy Options

Digital inclusion must be a national priority and have the highest urgency, because in the 21st Century, those that are not “net literate” are disadvantaged and uncompetitive as were people who were illiterate during the 20th Century.

The following policy options are offered to help close the Digital Divide:

Fund

- Encourage a range of investment models that increase broadband options – including reinforcing commercial markets that have invested billions to wire and unwire America and also supporting municipal and nonprofit models.
- Develop and advocate policies that commission other government agencies to allocate funding for community access, broadband services and computers and training as part of their key programs. This could include requiring the Department of Housing and Urban Development to fund computer technology centers including ongoing operations; requiring the Labor Department to include digital literacy training in all workforce skills programs and to include computer access at OneStop Centers; requiring libraries to

¹⁰ Scott Wallsten, “The Good News About U.S. Broadband”, Technology Policy Institute, June 12, 2008.

budget for ongoing operations and expansion of public access center in the libraries; and requiring Health and Human Services to include home and community access bundles as part of certain social services where justified by cost/benefit analysis aligned with their programs.

- At a national level, foster evergreen funding sources to support community efforts needed to help nonsubscribers become confident and effective technology users. The need for this is demonstrated by the huge response to broadband stimulus Round 1 funding opportunities for Community Technology Centers and Sustainable Broadband Adoption programs, which has evidenced capacity and interest across the country in bridging the Digital Divide and improving adoption and use. Encourage states to adopt policies and strategies that facilitate and support the building of community-based broadband access and adoption programs.
- Encourage local initiatives and local funding to support community-based broadband access and adoption programs. As an example, most municipalities charge cable and telecommunication operators' franchise fees for the use of right-of-ways to deliver video, broadband, and other services. Many municipalities allocate the franchise fees to replenish the general fund or for programs not related to video, broadband, or digital inclusion. Municipalities charging franchise fees could be encouraged to allocate portions of these fees to increase local digital inclusion efforts via government matching or other incentive programs.
- Give all Internet service providers -- including traditional wireline and wireless providers, cable providers, municipal and nonprofit providers -- an equal opportunity and responsibility to provide transport-based community benefits as part of the continued use of public rights-of-way.

Engage

- Conduct marketing and grass roots awareness campaigns – including campaigns that promote personal and business investment in connectivity – to reinforce the value of being connected.
- Perform neighborhood outreach and support to engage nonsubscribers. Grass roots programs that engage students, Americorps volunteers, and community nonprofits all promote adoption.¹¹ Continued investment in volunteer programs, especially through direct stipends and benefits, benefit both the volunteers and the community served.
- Ensure that programs addressing sustainable broadband adoption customize outreach and training for each underserved market segment/demographic. This includes specific communication programs for people for whom English is not their primary language, people with low literacy levels, people with disabilities, and seniors.
- Create marketing material resources by market segment for use by all digital inclusion stakeholders to efficiently increase non-adopter awareness of broadband's value proposition.
- On a national and coordinated basis, encourage Public, Education, and Government Channels (PEG) to include content and programming explaining the value proposition of broadband to multichannel video customers customized on a by market segment basis.
- On a national basis and coordinated basis, encourage all broadcasters and multichannel video providers with infrastructure capable of providing Public Service Announcements (PSAs) to carry PSAs reinforcing the value proposition of broadband by market segment.

Train

¹¹ D. Kent, D. McClure, "Digital Inclusion: Bringing the Rest of America online with Broadband. June 8, 2009, US Internet Industry, at http://www.usiia.org/pubs/Digital_Inclusion.doc.

- Support digital inclusion and digital literacy training programs directly serve those populations that traditionally underutilize broadband connectivity: those in rural areas, seniors, people with disabilities, those with less education, some minorities and those with low incomes.
- Develop a menu of training best practices to ensure that new broadband users have the resources to utilize applications and resources for high priority value proposition (e.g., how to access government resources online), safely access the Internet, and meet other requirements of populations that traditionally underutilize broadband.
- Include high quality “how to” or Internet help services as part of government portals when new applications or services are introduced.
- Support and market open source training services.
- Include digital literacy curriculum standards in all education – from K-12 to high education, military training, and civil service training. Training programs should be developed to meet the requirements of different populations, including the disabled and those that use English as a second language.
- Integrate basic broadband and technology adoption with other strongly motivating opportunities such as employment, healthcare, public safety, social services, and civic/neighborhood improvement.

Equip

- Develop a “digital ecosystem” in communities where increased broadband access is made available at public institutions (e.g., libraries, schools, park districts, hospitals) and in the home. Increase the availability of public access computers and applications.
- Foster the growing refurbished PCs industry in the U.S. through, for example, tax credits for computer donations and standards-based certification for PC recyclers. This industry provides a source of high quality computers that are environmentally friendly, cost effective, and that can create local green jobs.
- Have the President revisit and revise Executive Order 12999 to more strongly encourage computer recycling, increase the availability of computer equipment for schools, and decrease waste.
- Whenever possible, subsidize broadband installation costs for qualified non-profits (including faith-based, community centers, and senior centers) that are willing and capable of creating public computing centers that are available to populations not limited to the organizations’ own memberships.
- Provide incentives for broadband providers to increase their broadband footprint and improve broadband penetration in targeted market segments.
- Modernize the Lifeline and Link-up programs to subsidize the installation of broadband services and the purchase of related hardware for individuals below income targeted income levels.
- By Executive Order, have the President mandate free or subsidized in-home broadband connections in federally-subsidized housing.
- Establish a pilot program should to study the provision of subsidized broadband, computers, related hardware and applications toe families with K-12 students that are on free or assisted lunches so that student success is not impacted by a lack access to computer and broadband in students’ homes. The success of programs, such as the United Kingdom’s Home Access program (Becta¹²) should be reviewed to learn from other countries’ experiences.

Measure

¹² As an example, the United Kingdom’s Home Access Program (Becta)
<http://collaboration.becta.org.uk/community/homeaccess;jsessionid=8679F955EC8B9AC077ACCF2020CBDEEo.nodeo>

- Measurement is lacking. Additional in-depth study is needed to understand and articulate the key points on the continuum from non-use to full adoption, the factors that enable successful achievement of each stage, and strategies for implementation of successful programs.
- Ensure that consumers, including government entities, have access to accurate and reliable data and other information necessary to make informed choices in a competitive marketplace. Opinions vary on the form and amount of information necessary to achieve these ends.
- Conduct cost/benefit analyses that measure the cost to connect people to applications in health, energy, education, social services versus the cost savings or increased outcomes achieved through moving services online. This should include rigorous study the correlations between Internet and computing access and social advancements, measuring the costs and benefits of the digital divide and of inclusion.
- Implement a study to determine the efficacy of mobile broadband connections accessed via handheld devices as a primary tool for supporting unserved populations.
- Analyze the practices and results of other countries digital inclusion programs¹³ and consider modifying, implementing, or testing those with proven track records and are appropriate to US non-adopters.

Expand

- Reward and spotlight innovative inclusion programs and look to further expand and replicate those programs. This should include commercial, nonprofit and government models.
- Convene a national conference and website to coordinate community efforts and share “best practice” solutions so that communities can identify digital inclusion options that best meet their local requirements. On a national basis, the major stakeholders of this initiative should be included in a working group that includes the public, private, and nonprofit sectors. Specifically, trade associations, nonprofits, federal, state and local government, schools, and especially digital inclusion nonprofits that have experience providing the multiple components necessary to reduce digital inclusion should be included in an ongoing dialog made available through an annual national conference.

3 REACHING UNIVERSAL ADOPTION & USE – ENSURING ACCESS BY PEOPLE WITH DISABILITIES

3.1 Opportunity

Both Congress and the Commission consistently have affirmed the need to ensure that individuals with disabilities have the same opportunities to benefit from new and innovative communications technologies that are enjoyed by the rest of the American public. Notwithstanding this expressed federal policy, Internet use by people with disabilities remains much lower than that of the general population. When people with disabilities are cut off from broadband services, they are prevented from having the tools they need to improve their productivity and self-sufficiency: job and educational opportunities are limited; they cannot engage in Internet commerce; and they may not be able to exercise their civic duties. When children do not have access to broadband services, they are denied an equal opportunity to the same educational and recreational benefits that are available to their peers without disabilities.

¹³ As an example, the European Union’s Commission on Digital Inclusion ([http://ec.europa.eu/information_society/europe/i2010/benchmarking/index_en.htm#Digital_Literacy_Review -
Public_policies_and_stakeholders_initiatives_in_support_of_Digital_Literacy](http://ec.europa.eu/information_society/europe/i2010/benchmarking/index_en.htm#Digital_Literacy_Review_-_Public_policies_and_stakeholders_initiatives_in_support_of_Digital_Literacy))

The need to ensure that broadband is available, affordable, and accessible to people with disabilities has a greater urgency and importance when considering the rapidly expanding size of this population and the increasing pace at which our nation is aging. According to a 2006 National Health Interview Survey, in the United States:

- the number of adults who experience difficulty hearing is 37.2 million (17% of all adults);
- the number of adults who experience difficulty seeing, even with corrective lenses is 21.2 million (9.6% of all adults);
- the number of adults who find it difficult or who are unable to walk a quarter mile is 15.7 million (7% of all adults); and
- the number of adults with any physical functioning difficulty is 32.3 million (15% of all adults).¹⁴

A Cornell University study conducted in 2007 further revealed the extent to which the prevalence of disability increases with age. While only 6.3% of persons ages 5 to 15 were deemed to have a disability, this figure increased to 29.7% for persons ages 65 to 74, and a significant 52.9% for persons ages 75 and older.¹⁵

High speed Internet access can assist older Americans to continue leading independent and productive lives well into their advanced years. Moreover, as our economy falters and greater numbers of Americans continue working into their senior years, the need to ensure broadband access intensifies. For these individuals – who need to remain gainfully employed – a failure to implement disability safeguards is simply not an option. In the 21st century, individuals who are without access to broadband will be severely disadvantaged, in terms of their ability to become or continue being gainfully employed, as well as their ability to remain independent and self-sufficient.

3.2 Current State of Adoption and Use

Unfortunately, over the past decade, broadband access has not been as available to people with disabilities as it has been for the mainstream public. For example, a 2003 study showed that fewer than 30% of people with disabilities over the age of 15 had access to the Internet, compared to more than 60% of people without disabilities. Also, people with disabilities in both metropolitan and non-metropolitan areas historically have had lower rates of Internet use than their geographic counterparts with no disability, with non-metropolitan people with disabilities having the lowest rate of Internet use. For example, in one study, only 26.7% of people with disabilities in non-metropolitan areas had Internet access.¹⁶ While recent years have witnessed some increases in the penetration rates for this population, such increases are always at a far lower level and a slower pace than for people without disabilities. The federal government itself has recognized these discrepancies. For example, in its Second Report on broadband access, the FCC identified persons with disabilities as a category of Americans “who are particularly vulnerable to not having access to advanced services.”¹⁷ In its Third Report

¹⁴ “Center for Disease Control Noninstitutionalized Adults, in Summary Health Statistics for U.S. Adults, National Health Interview Survey, 2006, Tables 11, 12, 18 and 19, at <http://www.cdc.gov/nchs/fastats/disable.htm>.

¹⁵Erickson, W., & Lee, C. (2008). *2007 Disability Status Report: United States*. Ithaca, NY: Cornell University Rehabilitation Research and Training Center on Disability Demographics and Statistics, at <http://www.ilr.cornell.edu/edi/DisabilityStatistics/>.

¹⁶ Enders, Alexandra. “Ruralfacts: Disability and the Digital Divide: Comparing Surveys with Disability Data.” Research and Training Center on Disability in Rural Communities, The University of Montana Rural Institute, Missoula, MT. June 2006, at <http://rtc.ruralinstitute.umt.edu/TelCom/Divide.htm>. See also Dobransky, Kerry and Hargittai, Eszter. “The Disability Divide in Internet Access and Use.” *Information, Communication and Society*. 9(3):313-334. June 2006 at <http://eszter.com/research/a18-disabilitydivide.html>.

¹⁷ *Deployment of Advanced Telecommunications Capability to all Americans in a Reasonable and Timely Fashion, Second Report*, CC Dkt. No. 98-146, 15 FCC Rcd 20913 (2000) at ¶234.

assessing the deployment of high speed services, the Commission again acknowledged that individuals with disabilities may face “significant impediments” with respect to gaining access to broadband services.¹⁸

3.3 Barriers and Obstacles

There are a number of causes attributable to the discrepancy in Internet use between the general population and people with disabilities. These are:

Greater Unemployment and Lower Incomes

Recent Bureau of Labor statistics show that in February 2009, the unemployment rate of individuals with disabilities was 14%, compared with 8.7% for persons with no disability.¹⁹ Other research shows that people with disabilities who work full-time earn less than their counterparts. In 2007, the median annual earnings of full-time working-aged Americans with disabilities was approximately \$34,000, compared to \$41,000 for people without disabilities. A 2004 survey also revealed that the number of people with hearing aids who were not employed increased by 33% since 2000.²⁰ In addition, the poverty rate is much higher for working aged people with disabilities: 24.7% for people with disabilities, compared to 9% for people without disabilities, a difference of almost 16%.²¹

In addition to the generally high costs of broadband access, hardware and software needed to make computers and broadband service accessible to people with disabilities can be prohibitive – and most definitely enough to turn people away from these services. For instance, JAWS or Window Eyes, the two most common screen readers used to enable a person with a vision disability to hear the text or underlying content on a web page, each costs over \$1,000. Installation, maintenance and upkeep add to this cost. Individuals who are unemployed or earning meager salaries simply do not have the financial wherewithal to afford broadband service or the specialized equipment needed to access that service. For people who are both deaf and blind, the costs of specialized equipment are even greater – reaching as high as \$10,000 for a refreshable Braille display that allows one to use a tactile method to read information carried on the Internet.

Lower Levels of Education

It is likely that reduced levels of educational attainment among people with disabilities are also a contributing factor to the failure of this population to have Internet access. In 2007, the percentage of working-aged individuals with disabilities with only a high school diploma (or equivalent) was 35.3%, compared to people without disabilities at 28.1%. Individuals with sensory disabilities, such as blindness or deafness, were the least likely to have such diplomas (only 34.1%),²² and it is arguable that this group would most benefit from having access to broadband.

Lack of Accessibility Features in the Virtual World

In addition to the above income and education-related barriers, there are a number of physical accessibility barriers that have prevented people with disabilities from accessing broadband services. For example, broadband equipment and multi-media applications often require vision and/or hearing to manipulate functions and controls without providing redundancy in modes, creating barriers for people who do not have one or both of

¹⁸ *Deployment of Advanced Telecommunications Capability to all Americans in a Reasonable and Timely Fashion*, CC Dkt. No. 98-146, Third Report, FCC 02-33 (2002) at ¶103.

¹⁹ Bureau of Labor Statistics, March 6, 2009, at <http://www.bls.gov/cps/cpsdisability.htm>.

²⁰ See Kochkin, S. Ph.D., “MarkeTrak VII: Hearing Loss Population Tops 31 Million People,” The Hearing Review, 16-29 (July 2005).

²¹ Erickson & Lee, *supra*, n.2.

²² *Id.*

these senses. Additionally, the proliferation of graphical interfaces and web content that are not accessible to screen readers has created problems for people who are blind or vision impaired. Similarly, website designs that fail to incorporate accepted web accessibility standards can pose difficulties for people with restricted mobility. Finally, uncaptioned videos posted on the web remain inaccessible to people who are deaf and hard of hearing.

For individuals who do not have computers in their own homes, finding accessible public computers can also be problematic. Notwithstanding the ADA's accessibility mandates for places of public accommodation, libraries, community centers, and other locations that provide public Internet access are not always accessible to people with disabilities. Sometimes the buildings themselves lack ramps or elevators that lead to the computer terminals. And even when there is a physically accessible path to the broadband service, these facilities often lack qualified staff, assistive technology and/or customized configurations required by people with disabilities.²³

3.4 Accelerators: Broadband Benefits

Although broadband may not be as available to people with disabilities as it is to the general population, where it is available, the benefits are extraordinary. The ability to connect to the Internet at high speeds with an always-on connection enables subscribers to send and view content with far less transmission delay and permits the use of highly sophisticated “real-time” services that can transform lives. For the same reason that the vast majority of Internet users access the Internet via broadband rather than dial-up service, people with disabilities that do not have access to broadband will have less efficient, satisfying, and productive online experiences. Affordable and accessible broadband service helps to level the playing field for individuals who cannot see, or cannot hear, or have mobility disabilities. When the Internet can be accessed via broadband, these individuals are able to participate in the same activities and access the same information as everyone else in the general population. Consequently, if the devices, applications, and hardware that they are using are accessible, this population will no longer be set apart from the rest of society.

The following are several examples of how broadband services can uniquely impact and provide significant advantages for people with disabilities:

- Shorter download waiting times that result in increased productivity, especially during employment searches and while pursuing an online education, and broadband speeds that reduce frustration for individuals with some types of intellectual, physical, and mental disabilities.
- An “always on” connection that allows individuals to receive information and obtain support effectively from innumerable sources at any time of the day. The ability to easily access broadband services, news, and information from home is especially important for people with severe disabilities, whose mobility limitations may prevent them from traveling or limit their ability to communicate and access other forms of media.
- Flexible systems that allow accessibility to be built into online information. For example, American Sign Language, captioning and video description can be added to video clips.
- Speed and clarity that enable the use of sign language over video communications. These now permit people who are deaf and who use signing as their primary mode of communication to communicate more efficiently and naturally, both with each other directly and with hearing people through video relay services (for telephone-like communication) and video remote interpreting services (for communication between people in the same location).

²³ <http://www.netliteracyalliance.org/about-nla/about-net-literacy> describes how one nonprofit was created to fill the gap in the social network because senior citizens who were mobility impaired were unable to take computer and Internet training classes at a public library and no organization existed that could assist people with such disabilities.

- The ability to use other IP-based communication services. These include: (1) IP captioned telephone services, in which people with some hearing loss can both hear and read responses over the Internet from the other party to a telephone call; (2) text-based IP relay services from any portable device that can access the Internet, including cell phones and PDAs; (3) video communication for people with speech disabilities who can augment their communication with visual cues such as facial expressions and gestures; (4) video communication for people with hearing loss who can read lips and gain cues from facial expressions; (5) Internet text chat, used by people with hearing loss, both in the work environment and for regular communications with business colleagues, customers, friends and family members.
- Improved access to public safety information. Public safety officials would have better broadband-supported communication means for delivering timely and important information to special needs communities. At the same time, special needs communities would have a better means for communicating important information to public safety officials. For example, special needs individuals could register on-line to receive public safety alerts and warnings through a broadband-supported communications most appropriate for their particular situation.
- Broadband services and social networking tools allow everyone using those tools to be on a level playing field. Similarly, distance learning conducted via high speed broadband can serve as an equalizer for all students anywhere in the country, regardless of their disability. By enabling people with disabilities to participate in a variety of educational and social opportunities as full and equal partners, broadband helps to combat attitudinal discrimination based on preconceived biases about people with disabilities

3.5 Policy Options

The following are policy approaches that can help reduce the Digital Divide experienced by people with disabilities:

- Conduct research to better identify the problem: Up-to-date research is needed to (1) determine the rate of broadband subscribership among communities of people with disabilities; (2) assess the affordability of broadband services for these persons as well as the affordability of the tools needed to use these services; (3) identify other barriers to broadband subscribership by these consumers; (4) identify applications and services likely to be adopted by people with disabilities (e.g., video telephony for people who are deaf); (5) identify social and economic benefits of providing people with disabilities with broadband services; and (6) identify the extent to which senior citizens fail to adopt or abandon broadband technology as they acquire disabilities, especially usability/accessibility issues that play into these decisions.
- Develop federal and state legislation and practices that promote broadband access by people with disabilities: This would include (1) the elimination of accessibility barriers from all government-sponsored broadband services; (2) requirements for government contractors and recipients of government grants to guarantee the accessibility of their broadband applications and content; and (3) evaluations for accessibility in government audits and other oversight activities conducted on federally distributed broadband grants (e.g., the stimulus grants and public computer center capacity broadband grants); and (4) support for building accessibility directly into the information infrastructure so that basic access features are available at all public computing sites and to consumers regardless of socioeconomic level or community – in a manner that will continue beyond the stimulus funds.
- Adopt federal policies to ensure that people with disabilities have full access to broadband services and equipment, as well as broadband content, in accordance with the ADA and other federal nondiscrimination laws. Such policies should (1) promote the development of universally designed broadband products and services that ensure redundant means of installing, accessing, interfacing with, and operating broadband features and services. [For example, alternatives to touch screens, graphical icons, text, and pointing devices are needed to offer functionally equivalent broadband services to people who are blind or visually impaired.]; (2) ensure compatibility with specialized software and adaptive equipment commonly used by people with disabilities to achieve broadband access (e.g., incorporate the ability to use screen readers and to insert video description into the audio track of web content); and (3) ensure that web content providers use available

standards and guidelines for people with disabilities to access the content that they produce.²⁴ Policies should recognize that accessibility is more easily and cheaply incorporated at design stages. Retrofitting products and services that are already deployed can be burdensome and expensive.

- Create alternate discount rate schemes and other financial incentives for consumers to use broadband services, including the use of low income (e.g., Lifeline and Link-up) discounts or modified requirements in payment plans (e.g., longer payback terms).
- Create business incentives to incorporate accessibility and affordability within broadband products and services, e.g., through tax deductions and credits.
- Foster and fund collaborative efforts with disability advocacy groups and disability-related service providers as partners in marketing, consumer education, training and broadband learning initiatives.

4 CREATING GREATER VALUE BY ACCELERATING BROADBAND USE IN CORE SECTORS OF OUR ECONOMY

4.1 Economic Development and Job Creation

4.1.1 Opportunity

The economic recession of 2008-09 is creating a powerful catalyst for the use of technology to improve productivity and to adopt new business models across a broad set of economic sectors. As a recent White House white paper notes, establishing innovation and investment in broadband and information and communications technology (ICT) at the center of U.S. policy will help stimulate and sustain economic growth while bolstering our ability to continue to compete globally. The applications and value creation that will power the global economy require high capacity and ubiquitous transport that is becoming an entry criterion for doing businesses.

Broadband increasingly underpins business processes and models across all sectors of the economy, private and public. For the information and communications technology (ICT) sector itself, broader use of, and emphasis on, broadband in more economic sectors will mean more jobs and capital growth because each new use of ICT creates opportunities to extend broadband networks, create new applications, and develop new devices. This virtuous circle is necessary to help the U.S. maintain its historic leadership role in the technology sector. But embedding broadband deeper into our economy -- including healthcare and energy which are discussed in separate sections below -- and generating productivity gains from the improving the intensity of broadband use across sectors will be important ingredients in resolving the many policy and budgetary challenges that confront the US.

Research shows that high capacity broadband networks can be considered a form of “super capital” that has a much more significant impact on productivity than some other forms of capital. Investment in high-speed broadband networks will result in higher productivity and enhanced quality of life in the moderate to long term: investment in America’s digital infrastructure will create or retain 1 to 2.5 million jobs in the near term²⁵, depending on the assumptions used, as well as leading to more interesting and better paying jobs.

4.1.2 Current State of Adoption and Use

²⁴ Examples of such standards can be found at <http://www.w3.org/WAI/>, the official site for the World Wide Web Consortium’s (W3C) Web Accessibility Initiative.

²⁵ Robert Crandall, William Lehr and Robert Litan, “The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data,” *Issues in Economic Policy*, The Brookings Institution, July 2007; Robert Atkinson, “The Past and Future of America’s Economy,” (Edward Elgar; UK) 2004.

The most important benefit of the information and communications technology revolution is its impact on economic growth. The diffusion of ICT and broadband has had an impact on worker productivity that is three to five times that of non-IT capital investments such as buildings and roads.²⁶ Canadian-based Strategic Network Group has calculated that "for every dollar invested in broadband, the economy sees a ten-fold return on that investment."²⁷

The digital economy is much broader than the mass-market retail transactions conducted on the Internet, although it certainly includes such e-commerce. The digital economy represents the use of hardware, software, services and broadband wireline and wireless communications in all aspects of the economy, from the internal operations of organizations including the government, businesses and non-profits, to transactions between organizations, transactions between individuals and organizations, and transactions between devices that drive production efficiency, including those that operate without human intervention. The technologies of the digital economy also involve far more than the Internet and personal computers– it's about transforming business processes, adopting new business models, and improving service.

A range of products and devices are capable of digital functionality *and* connectivity, devices such as GPS units, MP3 players, digital cameras, cell phones and smart phones as well as everyday consumer products such as credit cards, cars, some dishwashing machines and other household appliances, and industrial equipment like computer-controlled lasers, robots and machine tools.²⁸ Leveraging broadband to drive economic development is as much about process as it is about product. Broadband-enabled competitiveness requires keeping up with your competitors' ability to leverage broadband – it is not just about having broadband. And finally, the greatest benefits of the new infrastructure derive from its transformation potential (enabling new processes, relationship and products, innovation and cost savings), – again, it is not just about using broadband to do the same things faster.

With respect to business adoption, large- and medium-sized firms have generally completed the first wave of adoption – most are connected to broadband and are using ICT technology to run their businesses. Before us now is an opportunity to use broadband and ICT in new ways to run businesses more effectively.

Different sectors of the economy are at different stages of broadband adoption. Healthcare is often cited as a sector that has not fully integrated ICT; there is general consensus that if the field did so, it would generate savings from the ability to address waste, fraud and medical errors. Manufacturing currently makes heavy use of ICT, but there is room for improvement in using new technologies supporting collaboration in that help bring new and improved products to market in a more timely and efficient way.

Small businesses tend to integrate ICT into their operations less – but this sector can often benefit the most from cost-cutting measures and revenue-generating ideas, such as extending the business presence to the web. These businesses, often operating without a dedicated IT department, need technologies, applications and services that are less expensive and easier to use and maintain.

4.1.3 Obstacles to Adoption

²⁶ Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh, "A Retrospective Look at the U.S. Productivity Growth Resurgence," Federal Reserve Bank of New York, February 2007. Even when the Internet was primarily a dial-up medium, ICT was responsible for two-thirds of total factor growth in productivity between 1995 and 2002 in the U.S., and virtually all of the growth in labor productivity

²⁷ Strategic Network Group's research since 2003 has found significant increases in local economic activity attributable to broadband. SNG's work is referenced in pages 18-19 of the House Report on the American Recovery and Reinvestment Act of 2009.

²⁸ Cohen, Stephen S., J. Bradford DeLong, Steven Weber, and John Zysman. *Tracking a Transformation: E-Commerce and the Terms of Competition in Industries*. BRIE-IGCC E-economy Project Task Force. Washington, DC: Brookings Press, 2001.

Four issues stand out as potential barriers to adoption of broadband by organizations: lack of adequate security, lack of ubiquitous adoption and use, and lack of relevant applications, devices, and ecosystems.²⁹

The U.S. leads the world in cybersecurity – through a strong focus on prosecuting cybercrime, an ongoing commitment to strengthening the defense of government networks, and strong encouragement to enterprises and state & local governments to do the same. Nevertheless, America’s digital infrastructure is not as secure or resilient as it could be. As events have shown, more can be done, and more should be done. Fundamentally, national efforts to address cybercrime must rely on: 1) strong education and “best practices” lessons; 2) ongoing technology innovation in both networks and in edge devices, including deployment of improved solutions; and 3) improvements in physical security. Furthermore, recent research shows that concerns over Internet security and privacy are the most frequently cited barriers for enterprises. This requires government leadership, as administrations both Republican and Democratic have recognized.³⁰

Concerning ubiquity, while the availability of the nation’s broadband infrastructure has accelerated certain parts of the U.S. economy, lack of broadband adoption has slowed growth in certain areas where broadband services are still not prevalent or where services and speeds are out of alignment with the market, undermining the potential efficiencies from implementing online services. For example, the absence of universal broadband use among consumers forces governments and businesses into a dual-mode approach to information and marketing delivery: by paper or phone and via the Internet. As the availability of broadband increases, its integration into business process also increases, but to varying degrees across organizations and sectors. Increasingly, network-based interactions in the supply chain are putting demands on many businesses to interface to customer systems simply to qualify as a supplier. Moreover, with increasing frequency, consumers and workers without broadband connections are disadvantaged in the workplace and the marketplace: for example, hunting for a job successfully in today’s economy without Internet access, for example, is almost unthinkable. The American Recovery and Reinvestment Act jumpstarted efforts to bridge the access gap by appropriating \$7.2 billion and directing the Department of Agriculture’s Rural Utilities Service (RUS) and The Department of Commerce’s National Telecommunications Information Administration (NTIA) to expand broadband access to the estimated six to 10 million unserved and underserved households in communities across the U.S. while directing the Federal Communications Commission to develop a comprehensive plan to extend broadband’s reach and use to include the 45 million or more households that don’t connect even when broadband is available.

Broadband and ICT adoption or improved use in economic sectors depends upon applications and devices that make technology useful and relevant. The US public safety sector, for example, wants a wireless broadband network, but taking advantage of such a physical network would require applications and devices tailored to public safety’s use, applications and devices that may exist today. Similarly, ICTs could become more embedded in the transportation sector over the next few decades, with new uses of wireless technology to improve vehicle and passenger safety, avoid road congestion, and automate collection of road tolls. Each of these elements will require devices and software – in effect these use cases require the development of a transportation ICT ecosystem. Government policy in support of an innovation agenda can help signal to developers what ecosystem opportunities exist. Government funding, whether the broad spending of the Recovery Act or smaller pilot projects and “seed” programs, can also be directed to help fuel the creation of these ecosystems.

Broadband and ICT adoption or improved use in businesses and organizations depends on a supportive ecosystem that raises awareness, encourages adoption, and supports skills in the use of broadband and business processes for any sector of the economy. Government must assure that accurate and reliable data are available in the competitive marketplace to provide customers, including governments, the information necessary to make informed choices. The success, for instance, of any individual health organization that embraces a digital

²⁹ Strategic Network Group, Inc., “Summit County e-Solutions Benchmarking Report,” 2009.

³⁰ Cyberspace Policy Review, The White House, May 2009

business model depends on other health organizations and patients also embracing the digital model. Similar challenges arise in sectors such as transportation, education, real estate, and government

4.1.4 Policy Options

Considering the importance of broadband and technology to our nation's growth, economic policy makers should prioritize digital transformation and place it front and center in economic policy. Consequently, the following tax policy, regulatory reform (including patent and copyright issues), spending, trade policy and government procurement policy, and other policy options are all worthy of consideration, particularly with respect to how they can be used to spur digital transformation.

- **Access:** Invest in tele-centers or broadband-connected business incubators, directly targeting grants to promote adoption of e-solutions and new practices with small- to medium-sized businesses to become more productive, competitive and profitable.
- **Job Training:** Support online and in-person skills development initiatives and especially those that increase technology literacy and ICT proficiency throughout the workforce. Provide training and programs to address the employment dislocations that can result from digital transformation and help individuals take advantage of new opportunities created by the new economy.
- **Federal support of state & local spending:** Reinforce local economic development initiatives with policies that encourage communities to invest in and leveraging broadband solutions as part of plans for strategic reinvestment and growth. Federal grant and loan programs could be retooled to encourage state and local investment in networking technology.
- **Federal Budget:** Consider implications and opportunities enabled by broadband and shared technology platforms in ALL areas of federal spending and investment – from roads to defense to energy to healthcare to education and housing – to realize economies of scale and scope, and use the full power of government policy, spending, and investment to increase broadband utilization and ICT adoption broadly across all sectors of the economy.
- **Tax Policy:** Implement policies that support export development so that local and regional economies in the U.S. can leverage ICT to increase their participation in global market opportunities.
- **Trade Policy:** Reduce barriers to global markets for U.S. ICT products to ensure that consumers can take advantage of economies of scale.
- **Presidential Leadership:** The President should direct all agency and department heads to examine how and ICT can help them improve service and fulfill their missions more effectively and efficiently and to adopt these tools as appropriate.
- **Benchmarking Approach to Economic Development:** Bring a local economic development approach that is action-focused by identifying barriers to adoption, gaps in utilization, local economic drivers. With better intelligence and micro-level data, policy makers can better support local sectors for promotion and development in consultation with community leaders. This involves conducting benchmark studies, developing a strategic growth plan and executing the plan.³¹
- **National Broadband Planning: Focus on Scaling:** There are a tremendous number of broadband and wireless applications available to consumers and businesses, today. But beyond communications and entertainment, many of these applications serve specialized niches and have not achieved scalable adoption by large numbers of people. Small pilots and small scale programs are pervasive; policy changes that directly address replicability and scale are critical to the next round of policy changes.

³¹ Strategic Network Group, Inc., 2009. "Building a Successful e-Community Strategy". See also Connected Nation.

Placing digital transformation at the center of economic policy means that policymakers must be willing to guide and support change – through clear and transparent changes in federal policy, as well as in how federal resources are allocated. While protecting consumer safety, policy makers should ensure markets are as open as possible to new entry and online competition.³² Programs that promote universal broadband adoption and use will generate economic growth, encourage new applications and spur business investment.

4.2 Healthcare

4.2.1 Opportunity

The U.S. is experiencing a healthcare crisis. “National health spending is expected to reach \$2.5 trillion in 2009, accounting for 17.6 percent of the gross domestic product (GDP). By 2018, national health care expenditures are expected to reach \$4.4 trillion—more than double 2007 spending.”³³ The status quo is no longer a viable option and is not sustainable. Digitization and broadband can help increase the efficiency of the healthcare industry and help to resolve an important factor that makes America less competitive in the international arena.

Chronic Disease Management – Providing healthcare access where people live

Demographic analysis suggests that chronic diseases such as diabetes, chronic heart failure, hypertension, obesity, and COPD are growing as the population ages. These diseases significantly contribute to some of the root causes of the explosive growth of healthcare costs in the United States. The existing healthcare system is primarily organized to deliver episodic care, rather than effectively managing chronic diseases. Our nation needs a cost-effective wellness and disease management system, focused on keeping people out of hospitals.

Chronic diseases are non-communicable illnesses that are prolonged in duration, do not resolve spontaneously, and are rarely cured completely. Examples of chronic diseases include heart disease, cancer, stroke, diabetes, and arthritis.

- Chronic diseases cause 7 in 10 deaths each year in the United States.
- About 133 million Americans—nearly 1 in 2 adults—live with at least one chronic illness.
- More than 75% of health care costs are due to chronic conditions.
- Approximately one-fourth of persons living with a chronic illness experience significant limitations in daily activities.
- The percentage of U.S. children and adolescents with a chronic health condition has increased from 1.8% in the 1960s to more than 7% in 2004.

Although chronic diseases are more common among older adults, they affect people of all ages and are now recognized as a leading health concern of the nation. Growing evidence indicates that a comprehensive approach to prevention can save tremendous costs and needless suffering.³⁴

Electronic health services will be a crucial enabler to this emerging remote healthcare system. Effective management of chronic illness is one of the best opportunities to effectively recover the substantial investments being made through the American Recovery and Reinvestment Act (ARRA) in deploying an interoperable system

³² Robert Atkinson, Andrew McKay, “Digital Prosperity,” ITIF, March 2007.

³³ Siska, A, et al, Health Spending Projections Through 2018: Recession Effects Add Uncertainty to The Outlook *Health Affairs*, March/April 2009; 28(2): w346-w357.

2. A Summary of the 2009 Annual Reports, Social Security and Medicare Boards of Trustees, 2009.

³⁴ Ata Glance 2009, CDC publication. [Chronic Diseases- the power to Prevent, The Call to Control](#)

of electronic health records. Reduction of waste and errors will also increase the return on investment of this expenditure.

Emergency Medical Response – Sharing information in real time

Broadband-delivered health services are also for emergency medical response

In emergency medical response that can range from (heart attacks to pandemics and disasters, today's information system is far less intelligent than it must be to maximize health outcomes and maximize efficiency. With the proper application of software services riding on broadband networks, electronic health and care information could be made available to responders starting with 9-1-1, and including EMS, hospitals, trauma centers, and public health facilities. Rather than dealing with patients as blank slates, as we do today, medical professionals could and should know far more about incidents, patients, the protocols to follow, trend lines in vital signs, and the care already given, while creating end to end records including outcomes to recycle and make response better.³⁵

Ultra Broadband Needed for Clinical Services

When we think of clinical services and Electronic Health Records (EHRs) we tend to think in the context of one-one-one patient care. The reality is that our system of health care, individual hospitals and hospital systems deal with thousand of records, multiples of high definition images and thousand of administrative records that pass within the hospital for clinical services daily. As our system of health care passes beyond the wall of the hospital to a systems of services between hospitals, clinics, private practices and to the patient in the home; the system of services and the definition and the availability of broadband changes. Hospitals are already passing 10s of gigabytes through their internal system networks. As they extend these services outside the walls to other hospitals they are already expanding their definition and need for broadband from 10's of megabits and from 1 gigabit per second to greater than 10 gigabits per second to maintain the same level of services between hospitals. As these services extend from the urban systems to our rural hospitals they must forgo the same level of services because of the availability of ultra broadband does not exist or is price prohibitive.

As these services extend to clinics, health centers and medical homes, the same needs for services are constrained by our definition of broadband. These same multi-patient facilities need access to a portfolio of services and often require affiliations with multiple hospitals and their services. As these services become available to them, broadband speeds of 10's of megabits and 1 gigabit per second will become common practice. Even private practices will needs access to 10's of megabits to 100's of megabits over time depending on their clinical specialty.

Our current system and definitions of broadband do not scale to the needs of our public interest and health care institutions.

4.2.2 Current State of Adoption and Use

Chronic Disease Management

Although there have been many successful pilots and small roll-outs of telemedicine offerings through-out the United States, most patients and doctors rarely use comprehensive telemedicine solutions in their day-to-day activities. Many people close to experiments in telemedicine are encouraged by the growth in use of electronic

³⁵ www.comcare.org/video.html is a short video that paints a picture of how emergency medical response could be far more effective with broadband delivered information.

health services but it is crucial to keep the present activities in the context of the magnitude of the chronic disease challenge being faced in terms of capacity requirements of electronic health services. In 2008, the CDC estimated that there are 24 million diabetics in the US. If merely 10% of this population could access electronic home monitoring service, there would be over 2 million people using these services or potentially 6 million readings per day. As of 2009, no deployment of electronic health services has surpassed 100,000 patients. The case manager to patient ratio rarely exceeds 100:1 which is much too low to manage chronic diseases cost effectively early in the disease cycle when they are easiest to manage. However, there is no definition within the multi-carrier broadband environment for quality of service related to remote health care services. Unlike 9-1-1 for emergency response, a remote health care service that may have life and death consequences has no assurance of availability or quality of services. As the health care community begins to rely on remote health monitoring and chronic care management, there will be a need for expanded quality of service definitions, similar to 9-1-1 for voice emergency response for broadband related to health care services.

Emergency Medical Response

We are only at the very front end of making the emergency medical response system informed. As part of the national drive toward use of electronic health records for all purposes, the official American Health Information Community (AHIC) promulgated an emergency medical use case the Emergency Response Electronic Health Record (ER-EHR). A two year effort by the Health Information Technology Standards Panel (HITSP) produced a very detailed roadmap of how this information exchange needs to occur, what standards to use, and where there are remaining gaps. Unfortunately, this area has not received a high priority by the hospital, public health, and non-emergency focused leaders of the EHR efforts. Of note, healthcare applications can benefit extensively from device-based broadband applications that expand patient monitoring through devices and software, tracking much more detailed health histories and alerting medical professionals to anomalies and causes for further attention and care.

4.2.3 Barriers/Obstacles

Chronic Disease Management

Existing remote patient monitoring solutions are closed systems targeting a specific disease group. Early pilots using these systems have demonstrated that these solutions can be comprehensive and effective. They even demonstrate a good ROI for the healthcare payer. But these systems are too parochial and would be cost prohibitive for a healthcare service provider to deploy to address their entire patient populations. For mass market adoption, a radical downward shift of "cost to deploy" of a remote monitoring capability from a healthcare service provider perspective is needed.

The largest market deployments are less than 100,000 patients and most deployments are less than 1,000 patients. Very little attention has been given to developing solutions capable of managing the magnitude of the problem most healthcare provider/insurers face within their populations. Broad based adoption and use requires a massively scalable architecture to manage a large population and their devices. The industry must face the challenge of managing a million glucose monitors paired to cell phones and being used by mostly older people. Six months into this environment, the tech support call center would be six times the size of the nurse call center! Experience with mass market broadband deployments such as DSL have taught the industry important lessons about addressing the operational requirements of these services. Large-scale deployments require standardize tool sets, case management productivity and robust protocols for privacy and security.

Solutions require seamless message routing across variable network environments that will allow clinical specialists to continuously improve "clinical pathways" for diseases and disease clusters. Also required is an object-oriented programming environment that enables clinically focused companies to develop disease

management programs by using a tool kit of devices, gateways and communication tools, so that they can focus on managing diseases rather than creating technology building blocks.

Case manager productivity requires improvement. Initially, there will be humans inside the system and it is important that they be made as productive as is possible. This is an "operator work time (OWT)" problem and it is important to leverage industry experience and create sophisticated contact center environments and collaboration tools to minimize the expert force requirements to deploy these services. Case management can be dramatically enhanced and streamlined with devices that more rigorously monitor blood pressure, insulin levels, and other vital signs – not merely while patients are connected in hospitals but quietly in patients' homes and their daily lives, transmitting updates through wired and wireless connections and alerting professionals while providing detailed health records and histories.

Emergency Medical Response

While robust protocols for privacy and security are necessary, informed consent and a public debate regarding cost/benefit tradeoffs should take place to ensure over-regulating information sharing does not severely inhibit outcomes.

The barriers to information sharing in emergency medical response (i.e. to informed emergency medical response) are nearly same as those discussed in detailed in the safety section of this paper. The ways to overcome them are also the same. Refer to the Section 4.5 on Public Safety and Homeland Security.

The balkanization of emergency medical response means that the systemic costs and benefits of making the end to end process efficient and informed cannot be demonstrated or realized today because there is no "owner" of the entire process. Thus, there is also no party with an incentive today to tie together the various elements (private sector PHR and EHR, 9-1-1, EMS, hospital, public health, research).

An almost complete lack of understanding of HIPAA is a barrier that is unique to emergency medical response. As the authors of HIPAA have made clear on multiple occasions, the purpose and letter of the law were not to preclude information sharing to assist in the care of patients. Indeed, there is a complete exemption within HIPAA for emergency care. But for a variety of reasons, HIPAA has become a favorite excuse not to move forward with information sharing. Lawyers have clearly found it easier to advise clients that "If you don't share information there is no problem." A major re-educational effort needs to be undertaken. It may be that amendments to HIPAA will be needed to enable proper end to end research.

4.2.4 Policy Options

The conjunction of the stimulus bill's focus on both broadband and electronic health records provides a unique opportunity to advance both emergency medical response and telemedicine.

- Encourage expansion of the definition for broadband within the public interest sector, specifically healthcare and emergency response to ensure that the national broadband policies and framework do not artificially create market constraints that prohibit a system of health care that reaches all sectors of our community from the urban hospital to our rural households. A policy that encompasses a complete system of health care facilitates and the availability of services that aligns with the needs of our hospitals in the urban core of our communities and ranges to our rural communities, clinics, medical homes, private practices and patients home. Consider the expansion of the broadband definition to be inclusive of satellite broadband services for rural remote and mobile access.
- Introduce mass market service development practices utilized by the Internet and Telecom industries to electronic health services for the 133 million US citizens with at least one chronic illness:

- Identify and address standards for broadband related to remote health care services similar to 9-1-1 for voice, including the integration of chronic health care with 9-1-1 system for emergency communications/response.
- Encourage collaboration between the healthcare community, telecommunications industry and our homeland security communications framework to ensure a system of care can be maintained and managed in the face of a local, regional or national catastrophe.
- Encourage collaboration among federal health agencies, members of the healthcare community and telecom service industry to develop an electronic health and telemedicine services to connect patient data with medical knowledge.
- Stimulus-funded telemedicine projects should be evaluated against their ability to be operationalized at the scale required to address the large population of chronic disease patients in the US.
- Collaboration between medical device/software vendors and communications vendors will be required to develop an end-to-end system that can be scaled and operated on a large scale basis cost-effectively. Electronic health service stimulus projects should encourage this collaboration.

The open architecture, standards-based approach described in the safety section is equally applicable. for more effective emergency medical response:

- Establish network centric standards where the various endpoints and message brokering systems share standardized core services (e.g. master patient Index, record locator services, directories of network participants like the DNS servers in the Internet; federated access control and identity management).
- Make personal and electronic health records available to responders in emergencies. This will be important incentive in getting doctors to adopt them.
- The Administration should fund a number of large scale field deployments of its Health Information Technology Standards Panel's Emergency Response Electronic Health Record Interoperability Specification (HITSP ISO Number 4) involving private sources of medical information (e.g. Google Health; OnStar), 9-1-1, EMS, hospitals, trauma centers, regional health information networks, and research teams.³⁶

4.3 Education and Distance Learning

4.3.1 Opportunity

The key to learning in the 21st century is the ability to retrieve process and apply information – because our world demands critical thinking adults who are inquisitive, innovative and collaborative in their ability to solve problems and develop new ideas in a global economy. This is not a new concept. Studies, reports and other sources of recommendations have concluded the importance of the ability of our workforce to effectively utilize the Internet to ensure that the U.S. remains competitive. And yet, in the U.S., the shortage of true broadband in education limits the educational opportunities for students, delays Internet-based innovation and allows other countries to assume our traditionally-held position of technological leadership. Education must move beyond this unheeded warning – and promote the rapid adoption of technology and broadband applications to enhance learning in and outside the classroom. Challenges in education must be addressed and subsequent

³⁶ The Next Generation Safety Consortium has proposed exactly this. www.nextgensafety.org.

recommendations implemented. It is unacceptable that Nevada's high school graduation rate is less than 50%³⁷ and that there are urban and rural school districts with graduation rates that are less than 40%.

4.3.2 Current State of Adoption and Use

While some schools have added PCs to classrooms, improving student to computer ratios—generally on the order of 3:1, many of those computers lack broadband connections and in general the ratio of megabit to students adversely impacts the learning process in many public and private schools. While higher education has moved from wired to wireless campuses with Lambda rail connections at larger research institutions, many school districts are supporting 1000 students on a 20 Mb connection. In underfunded K-12 school districts, the statistics are significantly more disconcerting and ratios of 8:1 are not uncommon. The lack of classroom-level access to fast broadband connected PCs results in students lacking full access to the basic tools of our information society. To further exacerbate the problem, teachers often lag in their skills and knowledge of technology integration and information processing. While many educators are using technology innovation to transform learning, far more are under using this resource and also leaving students ill prepared for the more sophisticated information processing, digital collaboration and multi-media content creation challenges that will be the mainstay of their adult working lives.

On the positive side, education is changing and innovation is happening in some places in the U.S. [Edutopia](#) is publishing best practices. Innovators like [Will Richardson](#) are dissolving the walls of classrooms; [Marco Torres](#) is teaching students to communicate with video, music and digital stories. Thousands of teachers come together annually at conferences around the country, such as the [BLC Conference in Boston](#), where Alan November invites educators to Build Learning Communities, to promote critical thinking and information literacy and to become change managers to transform their schools. At Indianapolis Public Schools, [Net Literacy](#) students are using service learning to build websites for nonprofits without an online presence and build student-oriented financial literacy and community centric websites.

For lifelong learning, the recent report from the Institute for Museums and Libraries underscores the importance for all citizens to “build such 21st century skills as information, communications and technology literacy, critical thinking, problem solving, creativity, civic literacy, and global awareness.” The report highlights the roles that museums and libraries can play to support lifelong learning and information access. Additionally their report, “Museums, Libraries, and 21st Century Skills” includes a self assessment for institutions to evaluate their programs and purposes visa vie using digital media and interactive as a foundation to promote these skills throughout the country.³⁸

4.3.3 Barriers/Challenges

The systemic change of the instructional model. Learning can no longer be confined to a room or building. Broadband provides a cost-effective way to make learning more accessible to students and especially to the life-long learner, because the learning can be at times and locations convenient to the learner. Moreover, broadband encourages interactive learning, connecting students to real world experiences and engaging them as producers, rather than just consumers of information. The Internet provides a global reach; the Web 2.0 collaborative tools (which some students have already mastered for their social networking) provide the means to create learning experiences to which they can relate in real world terms. Schools that do not have 21st Century curriculums will be unable to take full advantage of the PCs and bandwidth they currently have available to them.

³⁷ Editorial Projects in Education, Inc., Graduation in the United States, Class of 2005

³⁸ “Museums, Libraries and 21st Century Skills,” Institute of Museum and Library Services, July 2009, <http://www.imls.gov/pdf/21stCenturySkills.pdf>

Education leadership. Administrators at every level are saddled with divergent responsibilities that pull them away from active participation in student learning. Technology too often becomes a line item that is supplementary rather than integral to the “business” of education. No endeavor can attain or maintain success by ignoring critical functions for success. In education, as in business, when revenue is tight and more has to be accomplished with less, technology offers viable solutions – and its value warrants a higher budget priority.

Bandwidth. We know that current available speeds are inadequate to provide the true broadband service required for education today and in the future. While some statistics cite broadband connectivity to schools, once inside the school, the connection is often shared with so many students that the operational capacity does not provide adequate broadband service to the classroom and/or student. Some providers have already discussed “managing or delaying” traffic. Bandwidth limitations also require some school network administrators to completely block access to valuable high-bandwidth services, such as Google Earth. With projections that bandwidth needs will double every 18 months, broadband mapping and increased bandwidth availability to the ultimate end user is the solution to overcoming the bandwidth barrier.

Access. The challenge of access extends to service, equipment and professional development. However, in an educational context, these issues are not confined to disadvantaged areas. According to EDUCAUSE, while many college students enjoy adequate bandwidth to perform their studies while on campus, 85% of college students live off-campus and are dependent on slow and expensive connections to complete assignments, watch webcasts of lectures, collaborate with other students and faculty, and complete research. To participate in distance learning, a prerequisite is a reliable broadband connection. Faculties are pushing to use innovative online applications for teaching, but are restricted by the ability of students to access these applications from their locations off campus. Also, we must not ignore the educational needs of other members of the community who rely on libraries for their Internet connectivity. Libraries must have the same enhanced access as schools, colleges and universities.

Research Funding. The early development of the Internet depended on close collaboration between the federal government and researchers at the university level. Funding for basic research is what brought the Internet to the general public. In subsequent years, the federal government has pulled back from funding such research, leaving it to the private sector. In order for university researchers to remain internationally competitive, and our economy to remain innovative, there must be a renewed level of funding and coordination of basic communications research at the federal level.

4.3.4. Current Accelerators

Most educational entities have access to some type of broadband service, although speeds to the end user vary considerably. In those disadvantaged areas where residents may find computers too expensive to purchase, the libraries and community technology centers are important access points.

Regarding equipment, some post-secondary schools may have close to a 1:1 ratio of students to computers in their classes; those schools constitute a very small number of academic institutions. For K-12, there are far fewer schools that have a 1:1 ratio. Inexpensive computers are only part of the answer because adequate bandwidth is still required. The infrastructure equipment is only as good as the budget.

The most pressing need for most schools remains professional development and a 21st Century curriculum. Teachers should be encouraged to strive for increasing levels of professional and subject expertise and to share their discoveries with their peers to build a community of learners among teachers, which also creates the ideal model for students. Empowering stakeholders that can drive technology requirements from the bottom up will result in faster deployment than imposing them from the top down.

Funding. This recurring problem is certainly prevalent in education, whether K-12 or post-secondary. Even though the cost of technology traditionally goes down over time, the budget necessary to implement and utilize broadband effectively will strain the various formulas of government funding, local taxes and tuition as revenue sources. Additional revenue is necessary to build, update and maintain the infrastructure.

4.3.5. Policy Options

Educational Leadership - The Education Development Center (EDC) believes enhancing human capital in education systems is a central task of leadership, and the full suite of digital tools that have helped transform professional work in other professions (medicine, engineering, business) must be brought to bear, with special emphasis on educational needs. These tools include network technologies to bridge educators in different locales around shared challenges; videos to model and share emerging successful practices; and professional development and coaching relationships that are intensive and ongoing and grounded in practice. The following policy options are offered for consideration:

- Promote the use of technology to the greatest extent possible in every federal education program and initiative.
- Interweave standards for educational uses of technology that facilitate school improvement, such as the National Educational Technology Standards developed by the International Society of Technology in Education (ISTE) into the development of these education policies and standards for 21st Century teaching and learning.
- Increase funding available to the Department of Education to expand the [Enhancing Education Through Technology](#) (EETT) program³⁹ and support the provisions of the New Technology Plan.
- Appropriate funding for the Digital Opportunity Investment Trust, which will advance the high priority of bringing technology into the educational system, emphasizing the creation of educational content and software that incorporates the vast range of technologies available. It will also address the critical need to digitize and bring online the content of America's universities, museums, libraries, and other public institutions.
- Promote learning communities that lead, rather than follow, the use of technology in education. Along these lines, promote collaborative learning, content creation, constructivist thinking and critical evaluation of the myriad of data sources that confront each of us.
- Emphasize 21st-century skills proficiency in schools, workforce training and retraining programs, libraries, and other educational and vocational resources. To this end, increase standards for skills, to ensure that our schools are preparing students for a world that increasingly relies on technology and information. We should also increase focus on STEM (Science, Technology, Engineering and Math) at all levels of the curriculum and culture.
- Strengthen standards for educational uses of technology in the development of education policies and standards.

Bandwidth. Current targeted bandwidth recommendations from educational stakeholders may not be possible today with existing equipment, but whatever is deployed now should be scalable to reach the recommended bandwidth goals of the future. More bandwidth is needed to schools as current capacity throttles applications and learning. The following are minimal requirements of what we should be striving to achieve:

³⁹ U.S. Department of Education, Enhancing Education Through Technology, <http://www.ed.gov/programs/edtech/index.html>

- EDUCAUSE advocates fiber to buildings with speeds of 100 megabits in both upstream and downstream directions, scalable with the eventual target of two-way gigabit per second speed.
- For the next 2-3 years, the State Educational Technology Directors Association (SETDA) recommends an external Internet connection from an Internet Service Provider to the district of 10 Mbps per 1,000 students/staff, with an internal wide area network connection from the district to each school and between schools of at least 100 Mbps per 1,000 students/staff.
- For the next 5-7 years, SETDA recommends an external Internet connection from an Internet Service Provider to the district of 100 Mbps per 1,000 students/staff with an internal wide area network connection from the district to each school and between schools of at least 1 Gbps per 1,000 students/staff.

Wireless broadband cannot match “wired” fiber broadband for total capacity, however it can be deployed quickly, and it offers mobility with lower build-out costs per building reached. Wireless systems extend the classroom to wherever students may be located, whether at school, home, work or traveling.

- Broadband wireless puts the “anywhere” in anytime, anywhere learning. 4G wireless broadband technology is preferred over 3G because it is scalable and should work toward the SETDA recommendation of at least 10 Mbps per 1,000 students/staff.

Access. To capitalize on the power of technology, schools can ensure that all students and adults in educational institutions and community libraries have regular, safe access to the computers and high-speed networks that can deliver this wealth of information. Access includes quality tools for teachers to develop instruction for students with disabilities, who may need assistive devices or services for their teaching/learning needs. Barriers may include location or economic circumstances, but libraries, new network technologies, and smaller, less expensive laptops are among the resources that could allow more equal access by all students.

- Ensure that the broadband stimulus and future funding provides opportunities for both wired and wireless broadband deployment into underserved and underserved areas, whether rural or urban, in a timely fashion.
- In addition, research and development at the university level is dependent on access to gigabit speeds for collaboration, data collection and computation. As part of a national plan to expand the nation’s broadband access for education, we must be cognizant of the need to also grow the networks that service our elite educational research universities.

Funding.

- Funding of the E-Rate program should be expanded from \$2.25B to \$4B, to account for inflation and to cover the current need. Moving forward, the program should be indexed to inflation. This will assist K-12 schools to make ongoing investments in infrastructure, and eventually enable all schools/libraries to afford broadband connectivity.
- The FCC and the Universal Service Administrative Company should streamline the applications process to allow support for broadband deployment and use while maintaining the integrity of the program and while enabling schools to leverage their broadband infrastructure to reach beyond the walls of their schools, into their neighborhoods.
- Fund The New Preparing Teachers for Digital Age Learners at \$100M, under the Higher Education Act.
- When reauthorization of No Child Left Behind begins, support the [ATTAIN Act](#)⁴⁰ to improve the existing Enhancing Education Through Technology (EETT) program and permit the funding of innovative uses of technology under the competitive part of the program.

⁴⁰ ATTAIN Act, H371, <http://www.govtrack.us/congress/record.xpd?id=111-h20090115-27&person=400347>

- At the earliest opportunity, reverse the President's 62% budget reduction of the EETT program and restore EETT at levels higher than the FY2009 appropriation of \$269M. The EETT program spurs innovation and provides teacher training and expertise in the use of technology to improve student achievement. We must value and invest in the creation of successful models that demonstrate applications of new technologies in learning.
- Increase investment in educational leadership directed at superintendents, principals and chief technology officers to help them understand the skills needed to enable 21st century learning environments.

Research. To realize the hope of the Federation of American Scientists "to make learning more compelling, more personal and more productive in our nation's schools," the action plan of the Benton Foundation recommends that funding for the National Center for Research in Advanced Information and Digital Technologies be appropriated because the National Center will support a comprehensive research and development program to explore ways advanced computer and communication technologies can improve all levels of learning.

- Because we need network infrastructure to support collaborative research around ongoing educational test beds (i.e., school systems that are implementing new designs and interventions in sustained ways), the Education Development Center (EDC) advocates the continuation of large-scale reform experiments (e.g., Chicago Consortium for School Research; Boston Plan for Excellence; and the new Research Alliance for New York City Schools).
- Data-intensive research approaches can include Video Collaboratories — research teams working to code records of instructional practice in systematic ways (e.g., using the CLASS observation system) that can be triangulated with other more standard measures; and Assessment-to-Instruction systems – i.e., data systems that link assessments with instructional interventions so that researchers and schools can better determine the efficacy of new content and teaching interventions.
- The EDC also stresses the need to pay attention to the educational growth of all learners — those who interrupt or exit formal schooling early, as well as those who graduate and go on. This is an extension of a concern for equity and democratic participation. While students at the margins of formal education systems will likely be increasingly served by non-traditional education, i.e., online learning, mobile technologies and games and simulations, the need to track and understand such learners across formal and informal learning spaces, and how they develop skills of citizenship and participation, as well as career skills, is as important as traditional learning.
- Finally, the EDC contends researchers can no longer look at school systems and their performance through an exclusively national lens. As student populations and skill sets now move globally at an ever faster rate, infrastructure to track and analyze, communicate with and learn from cross-national educational designs is needed. EDUCAUSE also concludes that research must be funded to support the continued use of technology and learning, but must also fund the networks and equipment needed for basic research of all types taking place in colleges and universities.

4.4 Energy and Environmental Sustainability

4.4.1 Opportunity

Telework

Broadband offers a tremendous opportunity for both businesses and consumers to both save energy and help the environment. One of the biggest shifts in the small business marketplace is in workplace locations, which are rapidly moving into American homes. According to IDC, a national research firm, there are between 34.3 million

and 36.6 million home-office households in the United States alone. At least 18 million are home-based businesses, according to U.S. Census figures. They include Internet-centric businesses, such as the millions of eBay Power Sellers who derive all or most of their income from Internet commerce, service businesses such as website designers, real estate agents, mortgage brokers, and millions of other home-based businesses. The balance are employees of businesses of all sizes or governments at all levels who are telecommuting from home.⁴¹

The environmental benefits of teleworking are enormous. As a result of Virginia Governor Kaine's executive order, on August 3, 2009, 2,286 federal and private sector employees as well as 1,765 state employees participated in Telework Day in Virginia. Those teleworkers saved approximately \$113,000, avoided driving 140,000 miles and removed 75.89 tons of pollutants from the air on one single day. If all eligible Virginia employees teleworked one day per week for a year, teleworkers in the Commonwealth would collectively avoid driving 602 million miles, remove 360,800 tons of pollutants from the air, and save \$807 million in commuting costs. Over the course of a year this would equal a \$1,822 annual raise for every teleworker in Virginia, and save 46 hours a year in commuting. A survey of Virginia's teleworkers also showed that 69 percent felt they accomplished more than a typical day at the office and 91 percent said that they would be more likely to telework again as a result of their experience.

Similar experiments in other states have also showed similar favorable results. The federal government has adopted policies to encourage telecommuting. Today an estimated 7% of federal workers telecommute. If we reduced the average number of daily commuters in Virginia and other state cities and suburbs by 20% (by letting them work at home one day a week), rush hour gridlock would probably end or be substantially reduced in most areas. The pressure on the state transportation infrastructure would thus also be greatly reduced. We need to move from Virginia Governor and DNC Chairman Kaine's worthy experiment to concrete permanent additional teleworking policies to reduce rush hour traffic. The need for transportation infrastructure investments nationwide can be substantially reduced by enacting permanent national policies and incentives such as tax credits for homeowners and their employers to encourage teleworking.

A recent study by TIAX LLC determined that a full time telecommuter who lives 22 miles from his or her workplace would save 320 gallons of gasoline and reduce CO2 emissions by 4.5 to 6 tons per year. At \$3.00+ per gallon gasoline prices, they would also save teleworkers about \$1,000 in cash annually, not including savings in automobile insurance, maintenance costs and depreciation resulting from those trips. Home based business owners avoiding commutes to a separate office at that distance would save the same amount. Since most home based business owners and telecommuters require high speed broadband, they also provide an expanded broadband revenue base that facilitates broadband expansion to rural areas and other underserved markets.

Home-based small business owners and teleworkers are helping the environment and energy efficiency indirectly as well. Since they do not drive to work, they help reduce rush hour traffic jams and defer the need for state and federal transportation infrastructure investment maintenance. The Texas Transportation Institute's 2008 annual traffic congestion study calculated that congestion creates a \$78 billion annual drain on the U.S. economy due to 4.2 million lost hours of productivity and 2.9 billion gallons of wasted gas. By using existing space in their homes for offices and other business functions, telecommuters and home based businesses reduce the need for the construction of new commercial office space, which helps the environment.

⁴¹ The number of U.S. teleworkers is increasing rapidly. A recent survey of members of the American Institute of Architects revealed that home offices are the most popular special function room of home buyers for the third year in a row. American homes are often the breeding ground for giant corporations. Thanks to efforts to encourage teleworking at the federal level, 7% of the federal workforce now telecommutes.

Smart Grids and Buildings

The anticipated penetration of the "Internet of things", sensor networks, or Cyber-Physical Systems (CPS) into the households and commercial spaces also demands for greater broadband-capabilities collectively. Enabled by the widespread availability of broadband access, this penetration is likely to trigger another steep economic-growth similar to the boom owing to "Information Technologies & Telecommunications" in the 90s. Some of the most notable application areas, among many growth opportunities, include energy efficiency (both consumer and commercial); smart grid; building automation; personal healthcare; safety & security (e.g. against natural or man-made disasters). Smart grids, smart building and smart processes will all be aided by distributed devices interconnected by wireless and wireless broadband capacity.

Smart grids are another broadband-centric technology that helps energy efficiency and environmental sustainability. Use of robust two-way communications, advanced sensors, and distributed computing technology will improve the efficiency, reliability and safety of power delivery and use.

Smart grids improve the delivery and quality of electricity by deploying pervasive digital technologies to create near real-time feedback about the operations of the grid, thereby improving efficiency, increasing reliability, and reducing costs to consumers. Such a modernized electricity network is being promoted by many governments as a way of addressing energy independence or global warming issues. President Obama has asked Congress "to act without delay" to pass legislation that includes doubling alternative energy production in the next three years and building a new electricity "smart grid".

A smart grid creates incentives for consumers of electricity to change their behavior around variable electric rates structured to smooth demand cycles. Instead of having to pay flat rates, consumers can benefit from time-of-use pricing. They can adjust their use of electricity to times of the day when the price is low. That reduces peak demand, when the cost of electricity is high. It also helps utilities meet demand, lowering their costs and ensuring reliability. In addition, smart grid enables consumers, and even entire communities, to participate in net metering, whereby they can sell any excess electricity they produce via renewables such as wind turbines or solar panels, back to their local utility. Smart grid enables the utility to efficiently and safely manage the flow of electricity between the grid and these local distributed generation sources.

Smart grids will reduce the amount of spinning reserve that electric utilities have to keep on stand-by, thereby improving their energy efficiency and reducing their costs. Smart grids facilitate the reduction of pollution because they can complement the intermittent nature of most renewable energy sources (sun and the wind), due to sunlight-related and weather cycles. One United States Department of Energy study calculated that internal modernization of US grids with smart grid capabilities would save between 46 and 117 billion dollars over the next 20 years. Smart grid features could expand energy efficiency beyond the grid into the home by coordinating low priority home devices such as water heaters so that their use of power takes advantage of the most desirable energy sources. Smart grids can also coordinate the production of power from large numbers of small power producers such as owners of rooftop solar panels.

Smart buildings (also called home automation, smart homes or domotics) is a field within building automation, specializing in the specific automation requirements of private homes and in the application of automation techniques for the comfort and security of its residents. Automated tasks may include setting the air conditioning to an energy saving setting when the house is unoccupied, and restoring the normal setting when an occupant is about to return. Broadband facilitates the remote management of these systems and taking advantage of smart grids so that intermittent tasks (dishwashing, washing machines), can be programmed for use during times of lowest energy costs.

Broadband technologies also facilitate smart transportation. The use of plug-in hybrid electric vehicles is expected to become widespread in the near future, and have been estimated to potentially reduce carbon emissions by half, as well as reduce our dependence on foreign oil. In order to manage the consumption of

electricity as customers recharge at different times of day and in different locations, there will be a need for a broadband communications network to support the two-way flow of electricity on the grid to and from PHEVs. Also, the use of such environmentally friendly devices as onboard GPSs enables drivers to avoid traffic jams and plan the most efficient travel routes.

Dematerialization, Reuse and Sustainable Culture

Broadband technologies also facilitate electronic communications, which are inherently more environmentally friendly than print media. E-commerce is greatly reducing pressure on the environment and improving energy efficiency. A consumer who buys a product or service on the Internet does not require the physical transportation system to get to the local shopping mall. Instead the product is either delivered electronically or by the postal carrier, FedEx or UPS truck, or other delivery vehicles that travel through our neighborhoods every day anyway.

Reuse has been greatly facilitated by broadband. Many products that previously entered the solid waste stream are now being reused thanks to broadband tools. Websites such as Freecycle and Craigslist's make products with useful remaining lives available to consumers and thereby recycle both the materials and the value of such products. Many of the used products on auction websites like eBay and Amazon as well as Craigslist and other free online sales sites would also enter the solid waste stream were it not for buyers who were looking for unusual products or seeking to save money over the cost of new products.

Rideshares and many other consumer applications that reduce material consumption are also greatly benefitting the environment.

4.4.2 Barriers

- One of the principal barriers to smart grid is the lack of suitable two-way communications to support the various different smart grid applications that are on the grid or in the home or business. Smart grid requires two-way communications to control, as well as monitor, smart grid devices; and currently much of the grid only has access to one-way communications – or none at all. Where there is two-way communications on the grid, much of it is narrowband. In order to enable certain smart grid applications, such as real-time pricing and substation monitoring and control, broadband communications will be required.
- Utilities currently use their own private internal communications systems in order to control grid operations. These systems are highly reliable and extend coverage into remote areas. These systems are often more reliable than commercial systems and provide coverage to areas where commercial services are not available. As utilities build out smart grid systems, they will need to upgrade their internal communications systems and extend their coverage or work with commercial providers to ensure that services levels can be accommodated.
- While fiber and other wireline broadband technologies are used by utilities, those technologies may or may not be cost effective or appropriate for certain smart grid applications depending on the topology and coverage of a given utility's operation. Broadband wireless provides broader coverage and can be deployed more quickly to enable smart grid applications over a wide area, although it may not be the best option for some smart-grid applications in which a hard-wired solution is optimal. Similarly, utilities may use commercial services to support smart grid applications, but commercial services do not always provide sufficient coverage, nor historically have they been as reliable, particularly during power outages and other emergencies, when utilities need reliable communications the most. As such, some utilities believe they lack alternative communications that are cost-effective and appropriate to support *all* of their smart grid applications.

4.4.2 Policy Options

Regarding Smart Grid:

- One option is to provide access to at least 30 MHz of spectrum for broadband wireless communications to support smart grid and other critical infrastructure communications. Recently, the Canadian government has reserved the 1800-1830 MHz band for utility purposes; and making this band available for smart grid and other critical infrastructure communications in the U.S. would provide a harmonized spectrum allocation across the North American interconnected electric grid. In the U.S. the 1800-1830 MHz band is allocated for use by the Federal government. This spectrum could be shared with utilities for smart grid. State and Federal policy makers should not mandate the use of this spectrum for smart grid; instead by making this spectrum available they should enable utilities to choose the technology option that is cost effective and appropriate to support various different smart grid applications. This will encourage investment in smart grid, thereby accelerating deployment. This will in turn promote overarching national policy goals, including energy independence and efficiency, environmental quality, economic recovery and job growth.
- In addition, commercial broadband networks –both access and backbone–can be used to support smart grid applications, as well. Commercial broadband networks are already deployed and may be leveraged to accelerate the deployment of smart grid. Commercial broadband networks have ample capacity for smart grid. Commercial broadband networks cover 95% of the country. Commercial networks also provide enhanced features and functions that may be better than those available on private networks.
- Another means of encouraging the use of commercial networks for smart grid would be to provide priority access for utilities and other critical infrastructure industries. This would be similar to conditions that the FCC has placed on the 700 MHz D Block, which require the commercial licensee to provide Public Safety entities priority access to that spectrum during emergencies. Priority access for utilities could be provided on a negotiated basis, or it could be required by regulation. This would provide an added measure of reliability, which would encourage utilities to use commercial networks. This would be consistent with the FCC's goals to promote multi-purpose broadband networks. While priority access would address one concern about reliability of commercial networks during emergencies (i.e. network unavailability due to traffic congestion, such as during 9-11), additional measures would be needed to assure the availability of service during power outages and after hurricanes and other natural disasters.

Regarding telework:

- Provide recommendations and assistance to all agency heads on ways to maximize voluntary telework without diminishing employee performance or agency operations, as well as ways to educate federal workers about the personal and social benefits of telework, including reduced energy usage, a healthier environment, and improved employee morale;
- Establish and implement telework "best practices" for federal employees that will also serve as a model for adoption by state and local governments and the private sector;
- Prescribe, in coordination with the Office of Management and Budget and the National Institute of Standards and Technology, regulations to ensure the adequacy of information and security protections for information and information systems used in, or otherwise affected by, teleworking; and
- Maintain a central, publicly available telework website to be jointly controlled and funded by the General Services Administration and the Office of Personnel Management to inform federal employees of regulations, best practices, case studies, and other information relating to telework.

Regarding smart transportation and energy use:

- Promote the use of web-based applications and devices in energy conservation and transportation efficiency such as Smart Grids, Smart Roads and automated processes.

4.5 Public Safety and Homeland Security

4.5.1 Opportunity

Today's emergency information and communications technology (ICT) systems should be, but are not, fully connected to broadband, and should be, but are not, pioneers in and drivers of broadband use to keep the public safe. Emergency ICT systems in the public safety and domestic security domain are not keeping pace with rapidly changing technological advances and are facing serious funding shortfalls. 9-1-1 provides an example of the seriousness of this situation.

9-1-1 systems today are incapable of accepting communications in all the forms in which citizens communicate daily: text, video, advanced IP-enabled voice and data services. 9-1-1 and EMS agencies cannot obtain or share critical data on victims (e.g. medications, allergies) from electronic health records. Interoperability and information sharing among emergency responders and the agencies they serve remain a major challenge. Emergency communications and response systems remain largely stuck in the technology and mentality of the 20th Century at a time when 21st Century broadband-enabled technologies are being deployed throughout most other sectors in the U.S. The results are responders without available and useful information, emergency communications systems that are inflexible and insufficiently redundant during major disasters, and overall system inefficiencies. For this reason, a major national emphasis on emergency response agency access to, and use of, broadband, is consistent with the American Recovery and Reinvestment Act (ARRA) of 2009. This Act offers a significant opportunity to improve emergency response in America, and to serve as a beacon for broader community broadband use. There can be no more critical infrastructure and use of broadband than our nation's emergency response systems. At the same time, every community has one or more safety agencies as what NTIA calls "anchor institutions." Getting these anchor institutions to expand to the intensive use of broadband would enable them to provide better service, and would be a significant demand driver, as well, for broader expansion and improvement (especially when combined with solving the same problems in healthcare).

We suggest making our 9-1-1 system the nerve center of modern emergency response. The 9-1-1 system, which was originally established for the sole purpose of receiving emergency voice calls, is well positioned to become the *nerve center* of a smart Internet-protocol, all-hazards, interoperable, and integrated emergency response system. 9-1-1 telecommunicators and other responders could provide a significantly more informed and effective response if they had access to and could share video, text messages, car crash data, key electronic health data, building plans, extrication guides, traffic information, electronic maps, weather and hazmat data. These improvements can be facilitated by ensuring that safety organizations have access to and use new information technologies "riding on" the deployment of broadband systems throughout the U.S.

It is vital that a visionary, yet eminently realizable, effort to deploy next generation emergency ICT that can surely save lives and property, reduce injuries, protect homeland security, and improve emergency medical care be undertaken without delay. In addition to the obvious advantages of such an integrated system, this proposed course of action of turning vision into reality can ultimately save money across a wide array of local, state, and federal public safety, homeland security, and related functions. As the U.S. increases broadband use, the easiest, cheapest and fastest return on investment is sophisticated application-specific software riding on inter-organizational fixed broadband, both for solving the voice interoperability problem, and trafficking information to and from the right organizations at the right times. Most of this information that needed to be moved and shared to improve citizen services exists today in databases and similar data stores. Providing data to the 9-1-1 center or police dispatch "on demand" will be a significant improvement over today's "stovepipe" information infrastructure limitations, and it will create demand for mobile access to the same data. In some cases, we will need broadband to bring large amounts of data from mobile units in the field, which will add to the demand for wireless broadband.

Simultaneously, it must be recognized that putting communications on broadband and making these communications available via TCP/IP, the protocol stack that drives the Internet, does not create a productive degree of interoperability. Repeated comments about how “a national emergency response broadband network will solve the interoperability problem” are exaggerations. Interoperability, and useful management of data of all kinds, will be done with software through services requiring interoperability at the application layer of the TCP/IP stack. This is a given, and how we use Internet services today. Indeed, when many responders are using broadband wireless devices, those users will still have to be made interoperable with the huge legacy base of public safety radios, including the billions of dollars of P-25 radio networks we are constructing today, plus commercial wired and wireless communications.

In these application layer solutions, federal, state, and local government entities must leverage their limited funds and impact. U.S. government deployments, at all levels, must stop focusing on individual agencies and instead address the mission from a process-driven ICT focus, in this case through a focus on the “middle,” the network-centric applications riding on broadband that are needed to enable thousands of organizations to be more informed, interoperable and situationally aware. Rather than trying to upgrade individual agencies, the U.S. focus should be on developing and deploying hosted, managed services (some shared, some replacements for customer premises software) that do not require major capital investment or sophisticated IT staffing by the tens of thousands of (mostly small) safety agencies. Done this way, broadband delivered services promote the common good and can close the Digital Divide in across “have’s” and “have not’s” in the public safety and homeland security areas.

Most emergency response today is local and will remain so, but highly sophisticated emergency ICT applications and networks need to be run from regional, state and/or national levels. A case in point is 9-1-1 Public Service Answer Points (PSAPs), the points to which calls come in and are answered from persons reporting emergencies. Unlike police dispatch centers, PSAPs are good candidates for consolidation. In the private sector, many American companies have dramatically centralized call centers due to the efficiencies and the absence of disadvantages, given today’s advanced telecommunication systems. Government entities too often use today’s technologies and yesterday’s governance processes. Change is needed. Government entities need to use today’s/tomorrow’s governance processes with today’s/ tomorrow’s technologies so advancements occur at appropriate intervals and continuous improvement is facilitated. Since their mission is one of the more important ones, the governmental public safety, homeland security—and emergency health—domains are well suited for reinventing citizen services by improving governance processes to more fully leverage today’s technologies—as the private sector has been doing for over a decade.

4.5.2 Barriers

As broadband is relatively easily accessible to the vast majority of emergency and related agencies, as it is to healthcare agencies, the most challenging issue in safety and healthcare areas is not access; it is enabling use. In other words, the primary barriers to broadband use in these key areas are not transport issues, but application layer issues. While such barriers are substantial, the rewards for successfully addressing these issues are substantially greater than the risks.

More specifically, the barriers lie in the failure to address *safety* as an overall enterprise, and to not focus adequately on the application layer issues “in the middle” that would enable sharing of information between the tens of thousands of organizational participants. Middleware is widely available today that can bridge disparate systems. The Internet is perhaps the best example of what technology can do when smartly applied. We are all vested stakeholders in this safety enterprise, as service providers or as users. But aren’t we cut off from the very resources that provide safety for us, and isn’t there a preciously small degree of information flowing between key service providers and users? Don’t we all see a better solution is needed for us and for our children?

Today, U.S. safety policy is fragmented because decision making, budgets, and grants are all fragmented. Federalism was invented to help protect the American people, not to put them at risk. While our American system of federalism has served us well, it should not be overly restrictive and hold our government back from advancing with new technologies and system. For instance, take a related area, the electronic health record (EHR) area. Earlier in 2009 Sweden implemented a fully functioning EHR system throughout the country. Sweden's government faced federalist challenges as well early on but overcame them for the good of the people, So can the American government. The traditional approach in the United States for many years has been single-purpose profession-by-profession solutions, or solutions focused on limited groupings such as "first responders." This traditional approach ends up creating a lack of interoperability. And a lack of progress,

The FCC tends to act as if spectrum (especially new broadband spectrum) is the central public safety issue, ignoring entirely connecting agencies with the wired broadband that is already ubiquitous. Such an approach is not good public policy. But in its medical spending, the U.S. government focuses entirely on wired networks. In both cases the U.S. government ignores the strategic application layer and the important role of application software. DHS and the states have channeled billions of federal dollars into non-IP first responder radios – in the name of "interoperability." While first responder interoperability is important, funds are short and need to be well invested for the long term. Separately, DHS gives out hundreds of millions of dollars in Fire Grants. Very small amounts of money are spent on data, information, and application programs. HHS funds hospitals and public health IT through two separate programs. New funding of health information technology generally ignores emergency medical response. Department of Justice funding is for law enforcement. DOT funds intelligent transportation systems. All of these should be interoperable, and there could be great efficiencies in sharing network elements – but no one in government at any level is charged with that role, or given a budget for that purpose.

Disparate systems can be connected with existing technologies and valuable information needs to be shared to a greater degree. What good is all that bandwidth we have (and more is on the way) if there are no public service applications to leverage effectively the bandwidth. The safety area is the logical choice for remedying our government out of date governance processes and myopic, or worse, backwards looking technology public policy.

The Government has also tended to focus on individual forms of transmission, e.g. wireless broadband, rather than an overall view of transport (e.g. wired, wireless; fixed, mobile). Again, this ends up creating stovepipes. The Nation does not need more stovepipes. The Nation needs process-driven, next-generation wide-pipe application solutions that are widely available today in the private sector.

As a result, we have a series of barriers to cross vertical (and within vertical) information sharing that must be overcome:

- Lack of an articulated common architecture and vision
- Lack of cross vertical standards of all kinds: vocabulary, messages, core services
- Lack of interoperability-enabling, shared applications
 - A directory of organizations
 - An application for recording their rights to send and receive data
 - Other shared security
- ICT solutions for small, understaffed, under budgeted agencies, e.g. hosting
- Lack of understanding by government leaders of the costs of not solving these problems, and of the benefits of integrated approaches based on TCP/IP applications, IP-routed, and broadband-based solutions

4.5.3 Accelerators

A broad, multi-dimensional effort to deploy next generation emergency broadband technology starts with broadband access for all 9-1-1 and emergency response agencies, includes backbone networks connecting these constituents, and, most importantly, strengthens key shared services and applications to create interoperable information. We can foster the transition to an IP-based Next Generation emergency information and communications system by doing the following:

(1) integrate 9-1-1 and all other key emergency response functions into planning, deployment and operation of interoperable emergency information and communications policies, programs, and systems;

(2) take full advantage of voice, data, video, and other information available over broadband networks and IP platforms to make emergency response far more informed. This will also allow people with hearing or vision disabilities to communicate in the emergency mode that best suits their emergency needs. To this end, federal regulations should also specify for the purposes of emergency response functions the video and real-time text formats that must be supported where devices or systems connect to the devices or systems of other companies so that interoperability is facilitated;

(3) foster public/private collaboration and coordination between organizations at the local, state and national level; and

(4) adopt a network-centric open architecture approach recognizing the diversity of our federalist system, and making that a strength through resilience, rather than the weakness it is today.

This progress will require a concerted and coordinated effort. The most important priority for federal and state governments is to appoint leadership with the charge to approach next-generation emergency information and communications technologies (NG EICT) as a single, albeit virtual enterprise. There is no one at the federal or state levels with this responsibility today. Only with central, overall leadership will we treat the multitude of public, private and non-governmental organizations (NGOs) in the “safety space,” public and private safety organizations, as a cohesive “virtual safety enterprise,” and plan for all hazards, including car crashes, bio-disasters, terrorism, pandemics, natural disasters, and other known threats.

There are great efficiencies and advances in response to be had, but only if we have an overall architecture for NG EICT, replacing the traditional single, domain-specific solutions. The solution needs to focus on delivering overall and start-to-finish efficiencies and systemic outcome improvements for the public (as opposed to merely improving the functioning of single agencies or single professions). Similarly, we need to seek and determine estimates of the total cost of ownership for all agencies and government levels, as if the virtual enterprise were in fact a single one. Given the tens of thousands of emergency agencies, this new perspective will force a focus on network-centric solutions, rather than perpetuating the current approach of upgrading each individual agency.

4.5.4 Policy Options

With strong leadership from the White House, and particularly from state governors, the various government agencies, funding plans and standards/regulations can be more productively coordinated to ensure that every agency involved in emergency response has appropriate broadband connectivity, ideally to state and regional backbone networks. Additional supporting accomplish should include the following:

- Establish shared state and regional backbone emergency service IP networks
- Promote regulations and/or standards for achieving maximum state and regional interoperability

- Establish a national “internetwork” backbone to provide the (mostly application layer) connections between these state and regional backbone networks
- Enable the provision of a series of managed/hosted software services on a subscription basis to any agency with high speed broadband. These will vault small, suburban and rural agencies into the future. Next Generation IP-based call management for 9-1-1, Computer Aided Dispatch, and records management are examples. IP-based networks running smart applications at the application layer will allow any person (including persons with disabilities) to access emergency services with any publicly used communications technology (routinely available today in the private sector).
- Enable integrated all hazards, all levels of government public alert and warning systems.
- Enable the development of shared information service prototypes, including cost-effective situational awareness tools for authorized organizations, and access by authorized emergency responders to critical emergency related data, such as sharing of electronic medical response information, including information from electronic health records.
- Enable the above efficiently with the first reference models of two key shared “core services”; both services that follow need to become national standards to allow federation.
 - Develop an agency locator core service: a map-based registry of organizations involved in emergencies that is needed for routing/sharing of information about incidents of all magnitudes among local, state, federal and private entities responsible for emergency response. This will be the emergency equivalent of the Domain Name Services that manage the Internet.
 - Develop access control/identity rights management and related security services where the above referenced organizations are registered, given appropriate authorizations to send and receive emergency information, and confirmed identities are used in communications.
- Support multi-level government processes to establish the rights and policies by incident type and area to register in the above core service software applications.
- Require contractors and grantees to use the cross-domain emergency standards that have already been produced; support practitioners in an intensive, national, all-domain effort to develop shared standards for messaging, taxonomy, core services, etc.
- Support a national effort to develop broadband-delivered digital training for emergency responders.. Support other forms of training in the previously cited new services and technologies.

4.6 Democracy and Civic Engagement

4.6.1 Opportunity

The Internet is rapidly changing how we live, learn and earn in our society. More importantly, citizens of our democracy are more engaged in politics, using the Internet to become informed and to register their views on candidates and issues. A recent study from the Pew Internet and American Life Project (April 2009) found that

“some 74% of Internet users--representing 55% of the entire adult population--went online in 2008 to get involved in the political process or to get news and information about the election.”⁴²

In the report from the Knight Commission on the Information Needs of Communities in Democracy, “Informing Communities: Sustaining Democracy in the Digital Age,” the commission recommended that policies be shaped by “steer[ing] to true north of what is constant, the need for the free flow of information in a democracy.”⁴³

Ironically, many scholars perceived the Internet as a medium that would hamper the gains of democracy. In his article *Surfing Alone: The Internet Communities, Public Opinion and Civic Participation*, Frank Rusciano pointed to a degradation in social capital, especially as the Internet prompted people to lose sight of their ability to share and form physical relationships among each other. Citing the Social Capital Benchmark Survey (2000) spearheaded by sociologist Robert Putnam, Rusciano’s findings presented the case that the more people are online, the less likely they are engaged in traditional, physical spaces that promote intimacy—whether at a parent-teacher association meeting or a baseball game. Claiming the Internet as a “threat to social capital in postmodern societies”⁴⁴ was perhaps at best a wrong assumption, especially as people look to the web to identify, share and solve social problems. Alberto Ibarguen, President of the Knight Foundation, has stated the case strongly that the information needs of society are of paramount importance to communities in democracies as informed decision making and civic participation is rooted in strong local news and opinion. As the news industry continues to evolve and newspapers close or limit publishing, news is more and more often to be found only through the Internet.

The power of the Internet to mobilize people around specific issues and encourage their feedback through next generation web tools that include blogging, podcasting and wikis also suggests the revitalization, not degradation of American democracy. More people are effectively using social networking sites like Facebook, Twitter, MySpace and Gather to not only build communities of similar interests, but to galvanize individuals around common causes. Since its launch in 2007, *Causes* introduced to over 175 million Facebook users has been the leader in getting individuals organized around social concerns and the organizations that address them.

The web is increasingly becoming the core of how we learn about and connect to social issues. And the emerging connection between the Internet and television broadcasting is becoming more apparent. In an assessment of the “first one hundred days in office” for President Barack Obama and his administration, anchors from a major television news show used live interactive polls hosted on the network’s web sites to gather public opinion. In real time, viewers registered their votes on a variety of questions that *were* compiled and reported within minutes. High-speed broadband has also made it possible for people to organize and share their own opinions in the form of a blog that could be a commentary, description of events, audio file or video graphic. According to Technorati, a firm that tracks blog activities, over 175,000 new weblogs are created daily; and, more than two blogs are created each second of the day. While blogs can cover a range of topics, bloggers are rapidly reengineering how public opinion gets created and vetted by ordinary citizens.

4.6.2 Current State of Adoption and Challenges

⁴² Smith, Aaron, 2009, “The Internet’s Role in Campaign 2008.” Pew Internet and American Life Project, at <http://www.pewinternet.org/Reports/2009/6--The-Internets-Role-in-Campaign-2008.aspx>.

⁴³ Knight Commission on the Information Needs of Communities in Democracy, “Informing Communities: Sustaining Democracy in the Digital Age,” The Aspen Institute and the John S. and James L. Knight Foundation, October 2, 2009, <https://secure.nmmstream.net/anon.newmediamill/aspen/kcfinalenglishbookweb.pdf>

⁴⁴ Rusciano, Frank Louis, 2005, “Surfing Alone: Internet Communities, Public Opinion and Civic Participation.” Public Opinion Pros Publication.

By definition, democracy means government by the people. Democracy speaks to the ability of the people to understand their government and participate in discussions that affect their daily lives, from education to the environment. Having the ability to exercise this right directly is one of the most tremendous opportunities of the web. Modern technology can give voice to the voiceless and provide a forum for the exchange of ideas that improves the quality of life for all Americans. Additionally moving government information and services online has the potential to create more openness and access in all forms of government.

When government uses broadband effectively, more people are able to benefit. In the publication, *Using Technology and Innovation to Address Our Nation's Critical Challenges*, the Benton Foundation stated that the deployment of universal broadband and related applications offers a "tremendous opportunity to reenergize government, making it more efficient, transparent, accountable, and open to the active participation of the citizens it serves, while generating cost savings in the billions of dollars."⁴⁵ The report cited the following examples for how government benefits with ubiquitous broadband access.

- The federal Office of Management and Budget reported to Congress that certain federal e-government initiatives resulted in benefits totaling \$508 million in fiscal year 2008.
- The United Nations has estimated that e-government initiatives can result in cost savings of 10-50 percent.
- The U.S. Department of Commerce, focusing only on savings in procurements, has estimated annual savings of \$49 billion by the federal government and \$58 billion by state and local governments.⁴⁶

Government use of web 2.0 applications further promotes efficiency when citizens are able to point out waste, fraud and government abuse. Examples of best practices in this area include the bipartisan Federal Funding Accountability and Transparency Act of 2006, sponsored by then Senator Barack Obama and co-sponsored by Senator John McCain, creating USASpending.gov which launched in December 2007. On USASpending.gov, information about federal grants, contracts, loans and other financial information are available to the general public.⁴⁷ Recovery.gov is another example of government using the web to promote democracy and civic participation as it was formed to provide transparent and updated information about the administration's stimulus plans. On the site, individuals can learn more about the investments associated with the American Recovery and Reinvestment Act and get involved in the dialogue for how best to spend and leverage funding.

As suggested by the Benton Foundation report, governments could do much more when broadband is more readily available and applications are easy to use. Providing the opportunity for increased civic participation through planned virtual town halls or giving Americans the opportunity to vote on legislative ideas before they hit the congressional floor are both examples of ways to deepen resident engagement in the political process.

There are challenges associated with the digitization of our democracy. Disparities in digital access exist due to issues related to broadband affordability, availability and adoption. Digitizing democracy without addressing disparities in access or the Digital Divide will only serve to disenfranchise and disempower large segments of America. Even among those who have broadband-connected devices, there is great disparity in the sophistication and skills of users. Variations in peoples' comfort with digital tools and their information literacy levels create additional barriers to truly using web-based tools for democracy and civic engagement. Refer to Section 3 for discussion about the importance of creating Universal Access, a topic important in all areas of broadband adoption and use, but of special importance to democracy and access to government services.

An additional challenge is the speed of governments in adopting broadband applications that foster a culture of use. While many applications are stellar, many more web-based government websites and services are in need

⁴⁵ Benton Foundation, 2009, "*Using Technology and Innovation to Address Our Nation's Critical Challenges*", Benton Foundation.

⁴⁶ Benton Foundation, 2009, "*Using Technology and Innovation to Address Our Nation's Critical Challenges*", Benton Foundation.

⁴⁷ Benton Foundation, 2009, "*Using Technology and Innovation to Address Our Nation's Critical Challenges*", Benton Foundation.

of a major overhaul to make content accessible, easy to navigate and more reflective of our language and literacy diversity. While this is a massive undertaking, it is one with big returns. City agencies, town planning departments, state agencies, and federal bureaus that have created searchable directories, online ordering or reporting, and interactive applications have generally seen service and satisfaction improve. Spending the time and money to make government web portals more efficient and transparent are steps to reinvigorating civic participation, and promoting adoption.

4.6.3 Policy Options for Reinvigorating Democracy and Government

Several policy options are offered to address the issue of digital democracy and government.

Until Universal Access is available, either in homes or in public computing and community centers, full engagement and full access to services will be inhibited. Therefore, aggressive initiatives to Bridge the Digital Divide are critical. While covered in more detail in Section 2, this issue is critical to broad based civic and community engagement.

Maintain a free and open flow of Information⁴⁸

- Strengthen credible communication information intermediaries, such as libraries, schools and higher education institutions
- Recognize that journalism is critical to community health and civic engagement and invest in traditional and alternative forms of community information and news.
- Direct media policy towards innovation, competition, and support for business models that provide marketplace incentives for quality journalism
- Increase support for public service media aimed at meeting community information needs.

Transform the way the government manages information and interactions:

- Integrate new media and social networking tools into governmental portals to ease consumer use and promote information transparency.
- Promote a digital democracy agenda that solicits, responds and acknowledges the voice of the people.
- Connect private sector thought leaders to government agencies to determine how to bring new web 2.0 and social networking tools onto current government interfaces.
- Migrate government services, when possible, to open source platforms that allow for rapid adoption of innovation.

Promote a digital democracy agenda that solicits, responds and acknowledges the voice of the people:

- Create an official national town hall web site that allows for the constant collection of ideas around public issues and cultivates an ongoing exchange at all levels of citizenship.
- Ensure that the national platform is multilingual, “multi-abled” and literacy appropriate to be reflective and inclusive of the country’s diversity.

⁴⁸ Knight Commission on the Information Needs of Communities in Democracy, “Informing Communities: Sustaining Democracy in the Digital Age,” The Aspen Institute and the John S. and James L. Knight Foundation, October 2, 2009, <https://secure.nmmstream.net/anon.newmediamill/aspen/kcfinalenglishbookweb.pdf>

- Allow people to hear and speak from the location that they are most comfortable and create synergies between the various media to allow for immediate response and exchange.

Encourage Information Literacy:

- Promote information literacy through all government channels to help citizens more easily determine which sources are credible and valid. This can include increasing proficiency requirements for education and including Information literacy guidelines with other government publication and promoting information literacy through national campaigns.
- Increase funding to libraries and directly fund their efforts to promote information literacy.

5 ENGAGEMENT AND ADVOCACY

The value of broadband is contingent on how it is used and shared among various stakeholders. More importantly, broadband use not only depends on the applications and content available, but also on the attitude and intentions of users. In creating a profound impact on what we do and how we do it, broadband is an enabler that allows for more integrated experiences between users and interfaces. Tapscott and William⁴⁹ note that, “we are entering a new age where people participate in the economy like never before . . . This change presents far-reaching opportunities for every company and for every person who gets connected.” McAfee and Brynjolfsson⁵⁰ offer a similar but more focused observation: “[T]he internet and enterprise IT are now accelerating competition within traditional industries in the broader U.S. economy. Why? Not because more *products* are becoming digital but because more *processes* are.” When addressing engagement and advocacy, the value proposition of broadband is increased when the message speaks to the relationship between these two concepts. Moreover, it is equally important to customize messages that reflect the experiences of individuals that have completely avoided broadband adoption or are minimal users. Campaigns that are multilingual and rich in multimedia and that align broadband to local networks can encourage the participation of such groups. Advocacy efforts that bring groups together to craft these messages and develop strategies for broadband inclusiveness can significantly enhance the implementation of many of the options outlined in this paper.

5.1 Challenge

Before us is the challenge engaging those who are not connected or are not digitizing their processes very well. If we miss this challenge, certain demographics of our population and our economy are not going to advance in the global economy. It is imperative that every effort be made to advocate for getting connected, and for engaging in aggressive digitization. This is particularly true at the local level, a level where interpersonal connections already exist, and where the risk of disconnection is greatest.

To meet this challenge, we must communicate and demonstrate broadband by focusing on culture, context, convenience and control. Culture refers to our ability to meet people where they are located and to design messages that speak to their unique demographic or specific interests. Context encourages us to connect broadband to the essential verticals -- education, employment, health care, social services, and other applications and services that improve quality of life. When broadband is available anywhere, anytime, and any way, the level of convenience for users, especially those that have been marginal users, increases prompting them to get more engaged. Finally, the ability of users to control the applications that display on their PCs or mobile devices helps

⁴⁹ Tapscott, Don, and Anthony Williams, 2006, *Wikinomics: How Mass Collaboration Changes Everything*. Portfolio (Penguin Books). p.10.

⁵⁰ McAfee, Andrew, and Erik Brynjolfsson, 2008, “Investing in the IT That Makes a Competitive Difference,” *Harvard Business Review*, July-August 2008. Retrieved April 13, 2009, from <http://hbr.harvardbusiness.org/2008/07/investing-in-the-it-that-makes-a-competitive-difference/ar/1>.

people to feel a sense of ownership and power over their issues conversations. Strategies that serve to bring more people online should address these elements to effectively garner the attention and support of consumers.

5.2 Analysis of current state of consumer knowledge and engagement⁵¹

One major reason for low rates of broadband adoption and use is lack of relevance. Simply put, many people do not see why the online world is appealing or understand the inherent benefits of being online. The Pew Internet and American Life Project reported that over 16 percent of U.S. adults feel broadband is not relevant to them.⁵² Research shows there may be paths to reach this 16 percent:

- Adoption and use can be predicted by perceptions of two factors: usability and usefulness.⁵³ Perceived usability, or ease-of-use, largely determines whether an individual will try a particular information tool. Expected usefulness plays a small role early in adoption, it is overwhelmingly important in continued use.
- The best predictor of adoption of information technology at home is use of information technology at work, particularly for those with less formal education.⁵⁴
- Tech-savvy leadership is a vital factor in the adoption and use of information technology at the organizational level.

5.3 Opportunity

The term “opportunity” has at least two meanings in the context of this section. One refers to opportunity to reap multi-level benefits from increased adoption and use of broadband connectivity to the Internet. That is, such benefits will not merely inure to the adopters and users themselves, but also to a variety of individuals and entities that deal with them, including broadband service providers, hardware vendors, software firms, professional services providers, public and private enterprises, community organizations, etc.

The other meaning of “opportunity” relates to the resources currently available to facilitate increased adoption and use. For example, a critical opportunity currently exists to focus on increasing adoption and use among business, civic, and political leaders in traditionally underserved communities, because once they have taken this step themselves, they will serve as role models and opinion leaders, effectively diffusing broadband and related technologies into the workplace, into religious gatherings, into political movements, and into civic organizations.

The logical connectors are community development, economic development, and social service organizations dedicated to helping low adopters, especially marginalized groups, achieve the full potential of broadband. Each of these stakeholders have both relationships and technology needs. And, these needs align with how products and processes are integrated. Working together, public and private sector groups that advocate for increased broadband use can influence a national message that appeals to consumers at the levels of culture, context, convenience and control.

5.4 Policy Options

⁵¹ Portions of this section were drawn from Laudeman, Greg, 2006, “Information Technology and Community-Level Socioeconomic Development,” *Journal of the Community Development Society*. 36(1): 41-53.

⁵² Horrigan, John, 2009, “Stimulating Broadband: If Obama builds it, will they log on?” Pew Internet and American Life Project. Retrieved April 14, 2009 from <http://www.pewinternet.org/Reports/2009/Stimulating-Broadband-If-Obama-builds-it-will-they-log-on/Obamas-Online-Opportunities-If-you-build-it-will-they-log-on.aspx?r=1>.

⁵³ Cooper, R. B. & R. W. Zmud, 1990, Information technology implementation research: a technological diffusion approach. *Management Science*. Feb. 36(2): 123-139.

⁵⁴ Hollifield, C. A. & J. Donnermeyer, 2003, Creating demand: influencing information technology diffusion in rural communities. *Government Information Quarterly*. 20: 135-150.

The following policy options can contribute to increased adoption and use of broadband connectivity and hence to increased engagement and advocacy among individuals and groups that have historically underutilized broadband connectivity:

- Technology companies and their industry associations should engage local business, civic, and government leaders through local, state, and university-based development organizations. It is necessary to be clear and honest about benefits, and about costs. This honesty should start with technology companies: they are the ones that will benefit most from increased adoption of broadband. When dealing with those on the “user” side, technology companies must do their best to put aside any corporate biases and turn off their sales pitches. Be frank and open about how your company will benefit—and profit—from increased adoption, and about the costs it is incurring to drive demand. At the same time, take a similar approach to the “total perceived pain of adoption” (to use Coburn’s terms) as well as the practical benefits to users.
- Advocates of broadband connectivity must should express the value of broadband in ways that connect with the values of potential users. This may be the greatest challenge for technology experts: They must change the way they think about their products and services. Part of the value of working through development organizations, particularly university-based organizations, is that they can act as translators as well as intermediaries. Together, technology companies and development organizations can effectively engage leaders and advocate for broadband benefits. Together they can improve perceptions of usability and usefulness, “cross the chasm” by reducing the “pain” of adoption, and help leaders to “get connected” and to “digitize processes as well as products.” Geoffrey Moore⁵⁵ pointed out the important distinction between innovations that require a change of behavior and those that do not. He maintains that information technology represents a “continuous” innovation for the more educated and tech-savvy, while it is a “discontinuous” innovation for those who are not used to dealing with intangibles and with constant change. This creates a “chasm” between early adopters and others. Pip Coburn⁵⁶ boiled it down to a function of perceived crisis versus total perceived pain of adoption: Adopting new technology can solve problems but it can also be painful, so the crisis averted by the solution must be larger than the difficulties associated with adopting the technology.
- Strategic efforts must also be made to target unserved and underserved communities that ultimately produce adoption deficient communities. Finding ways to leverage private sector investment for national campaigns that integrate processes and products can be one option to spur engagement. Additionally, identifying local advocates that can serve as role models for broadband use can help consumers better place the value of broadband in their daily lives.

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⁵⁵ Moore, Geoffrey, 1991, *Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Consumers*. Harper Business.

⁵⁶ Coburn, Pip, 2006, *The Change Function: Why Some Technologies Take Off and Others Crash and Burn*. Portfolio.

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