Adoption of Information and Communication Technologies: Key Policy Issues, Barriers and Opportunities for People...

Conference Paper · January 2004

DOI: 10.1109/HICSS.2004.1265319 · Source: DBLP

2 authors, including:

Paul M.A. Baker
Georgia Institute of Technology

67 PUBLICATIONS **361** CITATIONS

Adoption of Information and Communication Technologies: Key Policy Issues, Barriers and Opportunities for People with Disabilities

Paul M.A. Baker, Ph.D.
GCATT/Georgia Institute of Technology
E-mail: paul.baker@gcatt.gatech.edu

Christine Bellordre
GCATT/Georgia Institute of Technology
E-mail: christine.bellordre@gcatt.gatech.edu

Abstract

While wireless communication and other information linked technologies have rapidly achieved widespread levels of adoption, a significant array of stakeholder groups have been effectively excluded, not by as much by active intent as by inadvertent oversight and lack of awareness. Many of these technologies routinely used by the general population are frequently inaccessible to persons with disabilities. Barriers to the use of these technologies by people with varying disabilities may be subtle and unintentional, but never the less very real. This paper presents preliminary results of policy research designed to develop a framework for assessing the status quo, developing inclusive policy initiatives, and evaluating the efficacy of the research approach.

1. Introduction

Mobile wireless information and communication technologies are rapidly emerging as an important new medium to send and receive data, text, voice and video. Many routine daily activities – such as making doctor's appointments, calling home, obtaining directions and purchasing goods and services – already rely on existing telecommunication tools. New wireless technologies will permit cell phones, and portable or wearable computers to function as universal remote consoles for accessing information and services and controlling appliances and devices. For example, a personal digital assistant may be used to conduct financial transactions, program a VCR, set a home thermostat, check the coffee pot, or locate and schedule public transportation. In short, wireless devices are becoming an integral part of daily life, and without access to these technologies, people with disabilities may find themselves increasingly excluded from many activities.

Given the key role of the public sector in directly shaping, and indirectly influencing the deployment of and access to these technologies, research focused on assessment and development of policy frameworks needs to be undertaken with respect to the regulatory and legal environment. The goal this research project is to develop a framework and a process for evaluating, developing and initiating policies, rules and regulations that support increased access to wireless information and communication technologies by people with disabilities. Objectives include 1) reviewing federal and state regulations and policies; 2) monitoring and analysis of policy and practices; and 3) developing policy options and recommendations that could increase access to these technologies for people with disabilities. The research agenda includes interviews with key stakeholders, analysis of relevant project materials and related policy/regulatory documents, and participation in relevant state and national meetings. Literature reviews include primary and secondary resources as well as programmatic, technical, legal, legislative, regulatory and executive policy level materials. The results of the policy research thrust may be essential to establish a body of credible evidence for influencing policy decisions at the state and Federal (U.S.) levels.

A wide array of linked policy areas are included in the assessment: 1) wireless and other information and communication technologies, 2) Disability policy, including the changing paradigms in provision of services to people with disability, 3) legal issues: professional licensure and liability, safety and standards; 4) privacy, security, and confidentiality; in that many technological approaches can come at the risk of loss of personal privacy; 5) device/user

interfaces and capacity; and 6) applicability of policy initiatives to advance universal design to improving access to technology by people with disabilities.

2. Methodology

There are four phases to this project. The first phase, reported on in this paper, involved the collection and analysis of existing, proposed, and developing wireless communication and information technologies, policies and practices as they impact on persons with disabilities. Some of the contextual variables influencing these policies include: location/geography (urban, suburban, inner city, rural & other variations); age; diagnosis; type of disability-related services needed and type of disability-related services available. Key and expert informants on technological application of universal design, disability policy, services, and advocacy were selected primarily for their expertise and experience in the implementation and diffusion of technology. Input from allied Rehabilitation Engineering Research Centers (RERC) personnel, especially as it relates to the technical, legal, safety and efficacy issues that influence policy, process and regulatory change, is included in the emergent policy framework.

In Phase Two, the policy framework will be submitted to the panel of experts for review. The experts will be asked to support, refute, add to, or modify the identified assumptions, facts and consequences. Further they will be asked to identify and rank the most significant potential consequences across policy frames; especially those that represent patterns across multiple application areas..

In Phase Three, an assessment of the educational and information needs of advocates for the use of communication and information technologies to assist persons with disabilities will be undertaken. Educational strategies will be identified and documented, or developed with identified disability advocates for integrating technological issues into their disability advocacy agendas.

Phase Four of the project is oriented toward development of policy and practice options including alternate demonstration models and development of model policies, both with respect to public policy (e.g., access standards) and industry guidelines (e.g., Sec. 508 accommodations). Because technology rapidly changes as well as policies and regulation governing use of these technologies, emerging policies are monitored and analyses updated on a regular basis. Information on current developments has been collected from multiple sources, including proposed legislative language, announcements from relevant federal and state agencies, contact with agency representatives, legislative staff, and industry representatives. Primary sources include: the Federal Communications Commission, National Telecommunications and Information Administration (NTIA), U.S. Department of Education, office of Special Education and Rehabilitative Services; U.S. Department of Labor, Office of Disability Employment Policy; the National Organization on Disability; other RERCs, and the U.S. Access Board, among other more specialized agencies.

Project research outcomes include: 1) production of a report assessing the status of policies and technologies affecting use of wireless and other communication technologies by people with disabilities. The report (summarized in this paper) includes a comprehensive initial policy analysis with policy options and recommendations, which will be updated annually based on ongoing monitoring and analysis. 2) Dissemination of research findings will be made to appropriate agencies and organizations who can implement necessary changes, including consumer advocacy organizations. 3) A report identifying questions in need of empirical evaluation will be completed; and 4) a report documenting training and information needs of potential advocates for increased access to communication technologies, with recommended strategies for communicating the benefits of these technologies for people with disabilities to policymakers and other key decision makers.

3. Policy context

3.1. The disability community

The impact of disabilities is felt by a significant part of the U.S. population. An estimated 49.7 million men, women and children – almost 20 percent of the United States population – have a disability that to some degree impacts their everyday activities [1]. There are many types of disabilities, including sensory, physical, and cognitive, each of which may have varying degrees of severity. Whatever the circumstance or conditions, persons with disabilities are frequently limited to some degree in their participation in one or more normal life activities.

According to a report recently released by the National Organization of Disabilities (NOD) the “state of the union” is not the same for U.S. residents with disabilities as it is for U.S. residents without disabilities. As a community, persons with disabilities remain “pervasively disadvantaged” [2]. The NOD report examines several aspects of disabled life in the

United States, and presents pertinent demographic statistics based on 2000 and 2001 survey data:

- Only 32 percent of U.S. residents with disabilities of working age are employed
- People who have disabilities are roughly three times as likely to live in poverty (29 percent versus 10 percent), with annual household incomes below $15,000
- One out of five adults with disabilities has not graduated from high school, compared to less than one of ten adults without disabilities
- 35 percent of people with disabilities are not involved with their communities, compared to 21 percent of their non-disabled counterparts.

While 63 percent of people with disabilities say that life has improved in the past decade, many individuals are still in need of support and assistance. Could wireless based information and communication technologies be a key to helping persons with disabilities overcome the unique and diverse challenges they face? Only 25 percent of persons with disabilities own a computer compared to 66 percent for non-disabled adults. In addition, only 20 percent of people with disabilities have access to the Internet, compared to over 40 percent of U.S. adults who are classified as non-disabled [3]. While no comparable statistics catalog use of wireless technologies by people with disabilities, we can assume that the use is proportionate.

3.2. Legislative/regulatory policies

The facilitation of an environment that is inclusive of persons with disabilities has been a slow and complex process. Over the years, the Federal government has enacted legislation and developed policies affecting people with disabilities. Silverstein [4] developed a valuable analytic framework, which classified these laws into five categories :

- *Civil Rights Statutes* – non-expiring laws that prohibit covered entities (such as state or local governments, and businesses) from discriminating against individuals on the basis of, or by reason of, disability. Examples include: The Americans with Disabilities Act (ADA), which prohibits discrimination on the basis of disability in employment, public services (including transportation), public accommodations and telecommunications; and Section 504 of the Rehabilitation Act of 1973, which prohibits discrimination by recipients of federal aid, such as hospitals, universities, and public schools.
- *Entitlement Programs* – guarantee eligible individuals a specified level of benefits (i.e., open-ended) or provide a state or other entity with a fixed allotment of funds over a specified period of time (close-ended). As an example of a closed ended program, Title XXI of the Social Security Act (otherwise known as the State Children's Health Insurance Program (SCHIP)), guarantees $40 billion to states until 2007 to provide health insurance for low-income children who do not qualify for Medicaid including children with disabilities.
- *Discretionary Programs* – formula-based and competitive grants that provide supplementary federal financial assistance to support specified activities carried out by other entities. An example of a formula grant program to state and local agencies that targets the needs of individuals with disabilities is Part B of Title VII of the Rehabilitation Act of 1973, which assists states in providing, expanding, and improving the provision of independent living services. The rehabilitation research funded by NIDRR was established under Title II of the Rehabilitation Act of 1973 and is an example of a discretionary program that offers competitive grants.
- *Regulatory Statutes* – provide minimum protections for a class of persons (including, but not limited to, persons with disabilities). Examples include: the National Voter Registration Act of 1993, which requires states to provide enhanced voter registration services at locations where driver's licenses, public assistance, and state disability-related services are provided; and Section 225 of the Telecommunications Act of 1996, which requires that telecommunications equipment and services be accessible to persons with disabilities if readily available.
- *Miscellaneous Provisions* – provides funding for various programs through appropriations, tax legislation and loans. For instance, the "Disabled Access Tax Credit" is a miscellaneous provision that provides tax credits to small businesses for expenses incurred in becoming compliant with the Americans with Disabilities Act.

Key regulations targeted at addressing the concerns and needs of people with disabilities in terms

of access are the Architectural Barriers Act, section 508 of the Rehabilitation Act, the Assistive Technology Act, and section 255 of the Telecommunications Act of 1996. One of the first major efforts toward accessibility regulation concerning physical access barriers is generally considered to be the Architectural Barriers Act of 1968 (P.L. 90-480) [5]. Adopted by Congress in 1968, it mandated the removal and avoidance of a variety of physical barriers to access in the design and construction of federally funded buildings and facilities. Similar legislation has been ratified to eliminate analogous barriers to the access of wireless and other information and communications technologies. Section 508 of the Rehabilitation Act of 1973 (P.L. 94-541), as amended, ensures that electronic and information technology developed, procured, maintained, and used by the Federal Government is open and accessible for people with disabilities. However, this law applies only to the public sector. Section 255 of the Telecommunications Act of 1996, a comprehensive law which overhauled regulation of the telecommunications industry, requires telecommunications products and services to be accessible to people with disabilities. According to the Access Board, "readily achievable," means easily accomplishable, without much difficulty or expense.

Philosophically, understanding of "disabilities" is progressively developing into a movement that addresses all aspects of disabled life in the United States. As focal areas for improving the quality of life for people with disabilities, education, employment and community integration represent significant areas of recent policy activity. Congress is scheduled to reauthorize the Individuals with Disabilities Education Act (IDEA). As part of the reauthorization process, groups and committees are studying the current law and the manner in which it is being implemented. The President's Commission on Excellence in Special Education (PCESE) has been holding hearings across the country since January 2002. PCESE's final report was delivered to the President on July 1, 2002, per Executive Order 13227. The Commission's report, *A New Era: Revitalizing Special Education for Children and Their Families* provided findings and gave major recommendations to consider for reauthorization of IDEA.

Recent U.S. Supreme Court decisions in employment-related cases continue to redefine and clarify the American with Disabilities Act (ADA), the disabled population's primary civil rights law. The high court ruled in the Toyota Motor Manufacturing, Kentucky, Inc. v. Williams that to qualify as disabled, a person must have substantial limitations on abilities that are "central to daily life," and not only to life in the workplace. The decision in the Board of Trustees of the University of Alabama v. Garrett stripped the right of state workers to sue their employers for monetary damages for violations of Title I of ADA. In both of these cases, the Court has tended to narrow the ADA's protections and coverage. At an annual meeting of the Corporate Counsel Institute at Georgetown University Law Center, Justice Sandra Day O'Connor observed that the Supreme Court "has been obliged to wrestle with a heavy load of disability rights cases because the 1990 Act was drafted too hastily by Congress" [6].

4. Critical policy issues

An initial set of disability, wireless and communication technologies related policy issues was identified through research of not-for-profit agencies, government resources, and policy journals [7]. The first iteration examined two sub-policy arenas: disability policy issues, and telecommunications/wireless policy issues. Disability policy issues included: Access to Information, Community Living, Employment Opportunities, Expertise & Awareness, Health Care Coverage, and general Disability Policy concerns. Associated telecommunications/wireless policy issues included: Spectrum Allocation, Location Technology, Digital Divide, Device Incompatibility, Consumer Utility, Inter-Carrier Text Messaging / Universal Design These were subsequently collapsed into a set of key policy issues generally impacting the use of wireless and information and communications technologies by people with disabilities.

4.1. Key issues refinement

Following publication of the first version of the policy assessment, comments and suggestions received allowed the development of a subsequent list of ten key policy issues. While many issues touching on technology and accessibility are of concern to a number of disability-related interests, the following list details ten policy issues focusing on wireless and information technologies or application of technologies that impact the quality of life for people with disabilities. These include:

- Affordability of assistive technology products
- Definition of telecommunication/information services
- Disability divide/access/awareness

- E-911 (wireless) call accuracy
- Inter-agency coordination
- New Freedom Initiative
- Re-prioritizing the nation's disability and rehabilitation research agenda
- Spectrum allocation/availability
- Universal design and product development
- Wireless device (in)compatibility

4.1.1 Affordability of assistive technology products. Assistive technology products are frequently not covered by health insurance plans (private or public), making affordability a key issue. Legislation that regulates insurance coverage of these products either does not exist or is very difficult to find. People with disabilities often need expensive equipment, such as specialized wheelchairs or assistive devices; the lack of financial options available to the disabled community creates barriers to meeting basic needs such community participation, employment, and economic independence met.

4.1.2. Definition of telecommunication/information services. While Section 255 of the Federal Communications Act defines "telecommunication services" as services that facilitate and carry voice communication; e-mail and data transmission capabilities are technically not covered under this section. The FCC is seeking to broaden the definition of "telecommunication services" to include these other applications.

4.1.3. Disability "divide." Access to tele-communications technologies does not appear to be equal between people with and without disabilities partially as a result of cost of services and lack of awareness of services availability. A National Council on Disability (NCD) Report [8] notes that many people with disabilities see advances in technology as barriers rather than vessels of easier access. Cell phones and PDA's facilitate increased communication unless those people are deaf or require voice-activated software to utilize information technologies.

4.1.4. 911 (wireless) call accuracy. E-call centers do not currently have the necessary infrastructure to determine the exact location of a wireless call. The FCC has required that wireless carriers provide technology that can pinpoint callers' locations in emergency situations. Emergency dispatchers receiving e-911 calls placed from cellular phones are unable in many places to pinpoint the location of the caller. Limited financial resources, lax enforcement of regulation, lack of access to proper technologies and regulatory considerations all contribute to this failure.

4.1.5. Federal inter-agency coordination. Government agencies responsible for the accessible dissemination and regulation of disability-related legislation may be generating redundant efforts toward the implementation of key disability related legislation. The Secretaries of Education, Health and Human Services, Labor, and Commissioner of Social Security established the Interagency Working Group on Assistive Technology Mobility Devices (Working Group) to improve the coordination of the Federal programs that help provide individuals with disabilities assistive technology mobility devices.

4.1.6. Federal New Freedom Initiative. Among the Initiative's goals are increased access to assistive and universally designed technologies; expansion of educational opportunities; integration of Americans with disabilities into the workforce; and promotion of full access to community life. An early result of this is the requirement that Federal agencies work together to build a single website addressing the issues and needs of people with disabilities. The goal of the website is to provide individuals with access to government information and resources related to disability issues and the President's New Freedom Initiative from DisabilityInfo (http://www.disabilityinfo.gov/).

4.1.7. Re-prioritizing the nation's disability and rehabilitation research agenda. The U.S. Department of Education announced a new web site developed by the Interagency Committee on Disability Research (ICDR), which will be used to gather information about research needs for Americans with disabilities. The ICDR was mandated "to promote coordination and cooperation among Federal departments and agencies conducting rehabilitation research programs."

4.1.8. Spectrum allocation/availability. Proposed changes to spectrum allocation policies allowing broader deployment of 3G technologies could support new assistive technologies. The telecommunications industry could see an improvement in the service coverage that is available to users, an enhancement of device reliability and quality, and an improvement in overall customer satisfaction with a given technology. A revamped process for spectrum allocation could set aside spectrum for uses that while not necessarily the most economical, could offer other social benefits.

4.1.9. Universal design for products. Lack of communication between product designers and potential consumers hamper the development universal design (UD) concepts. 54 million citizens have some degree of disability and may be underserved by modern technologies because of product design. Despite the size of this potential product market, manufacturers may not be designing suitable products to accommodate the needs of the disabled community, either through UD or assistive technology (AT). Increasing awareness of AT/UD parameters are critical to the development of new products.

4.1.10. Wireless device (in)compatibility. Wireless devices, which tend to be developed to meet specific requirements may interfere with each other, resulting in inefficient product functioning. For example, motorized wheelchairs may receive interference from wireless devices (phones, PDAs), and hearing aids are not compatible with some wireless phones, which cause one or the other of the devices to function incorrectly. Digital phones can cause hearing-aids to buzz uncomfortably. As part of the revisions to Part 22 of FCC rules, the FCC plans to monitor wireless progress on this issue by requiring progress reports on their research and development in years three and four of the five-year plan [9].

4.2. Barriers to access/use

In analyzing the intersection of disability policy and wireless technologies three underlying barriers to access/use appear to be relevant to this nascent environment of disability and technology collaboration, i.e., awareness and proficiency factors, economic barriers, and incompatible technologies.

4.2.1. Awareness/Proficiencies. A primary concern associated with the deployment and use of wireless and other telecommunications technologies in general is a lack of awareness that a given technology exists, or that it could be of benefit [10]. This is especially the case with people with disabilities. The purpose and potential utility of a technology must be known in order to associate value with the product. This component of awareness and a user's proficiency with a technology constitutes the first barrier on behalf of disability access to assistive telecommunications technologies. Because the environment of wireless related technologies is in a perpetual state of development, the sheer volume of new products and technologies is staggering. In addition to lacking a reliable method of communicating advances in AT/FT/Universal Design, assessment of these new products is rarely, if ever, completed with consideration of the specialized needs and requirements of disabled persons. As a result, the current and potential users of telecommunications technologies may be significantly uninformed as to the availability or utility of these devices.

At present, current or potential users of assistive telecommunications technologies must actively seek out appropriate information from researchers, manufacturers or policy makers. While factors such as socio-economic or geographic circumstances may contribute to lack of pertinent information available to prospective FT users, the single greatest barrier to efficient information dissemination is the insufficient resources currently invested in formulating effective awareness campaigns. The responsible parties to promote and inform the public on assistive technologies – namely, government, industry and not-for-profit organizations – lack the appropriate resources, incentive, organization, or in some cases, simply the awareness that such efforts are necessary.

Another component of awareness is that users lack familiarity with the technologies. In this capacity, lack of familiarity is manifested through two different types of user attitudes. Some users, frequently those who are older or economically disadvantaged, could harbor feelings of skepticism about the benefits or effectiveness of wireless telecommunications technologies – perhaps as a result of previous experiences of culturally ingrained attitudes. In addition, some persons with disabilities may use an assistive telecommunications device without a complete understanding of a device's capabilities or operating functions. Alternatively, the design of the device (i.e. extensive system menu prompts) may be for all intents inaccessible for certain users.

4.2.2. Economic Barriers. The most complex (and useful) wireless devices with the potential for dramatically improving the standard of living for a disabled person tend to be prohibitively expensive to a portion of the population already more likely to be unemployed or receive government assistance. Because the potential value of such technologies has not been fully realized, these devices are often not covered under private health insurance plans, employer-based health benefits, or the two primary public health insurance programs for persons with disabilities – Medicaid and Medicare. Some states have initiated low-interest loan programs and sales tax exemptions to assist persons with disabilities with the purchase of assistive technology. However, because the utility of assistive telecommunications technologies has not been fully appreciated, such

devices are often not included in such state programs. The introduction of wireless assistive technologies, requiring additional hardware and software capabilities, further complicates the expensive/utility aspects of these technology purchases and must be addressed.

4.2.3. Technology Incompatibilities. Technological inconsistencies, or incompatibilities, across products of different design, manufacturer, or purpose can create barriers to the efficient and effective operation of devices by potential users. Disabled people, who rely on such devices, are especially susceptible to harm if such inconsistencies render a medical or communication device ineffective. As some telecommunications and medical devices operate in overlapping or adjacent frequency spectrum ranges, there does exist a possibility for malfunction and potential harm. Quite often medical centers post signs prohibiting the use of certain devices within certain proximity to medical equipment, but for some disabled persons the use of assistive telecommunications devices are necessary to function in daily life. Designers and manufactures of incompatible devices are not effectively collaborating to ensure that such vital devices are reliable and efficient in all circumstances and situations.

4.3. Opportunities

The key policy issues presented above represent opportunities for policy strategies and/or technological design approaches to improve access on behalf of those people who are disabled. Closer examination of the issue confluence of disability policy and wireless technologies reveals three principle areas of opportunity: policy/regulatory interventions, market mechanisms, and outreach/awareness prospects

4.3.1. Policy/Regulatory Interventions. Policy and regulatory interventions on behalf of wireless telecommunications technologies (including assistive as well as general devices) can affect the success or failure of a product or methodology. Proposed policies and regulations in this field address many issues and take many forms, but consistent support can be found for two main initiatives across the diverse assistive telecommunications organizations, groups and supporters. Ideally these directives and others like them will not only encourage the development of new devices but also reinforce the importance of FT being flexible and useable by all people. If products and services are not useable, the extent of their accessibility becomes moot.

The first initiative is concerned with the adoption of Section 508 of the Rehabilitation Act of 1973, as amended, across all public institutions. Currently, the requirements of Section 508 for information technology accessibility apply only to Federal agencies. Recipients of Federal funds and the private sector are not responsible to the regulations as set forth by Section 508. States that receive Federal funds under the Assistive Technology Act of 1998 are required by that Act to provide proof of compliance with the requirements of Section 508. Currently all states and territories receive AT Act dollars and report some form of Section 508 assurance, however these compliance assurances provide few specific details about how compliance is being met. This lack of consistency and detail in state execution of Section 508 invokes several concerns:

- What state entities are subject to the requirements?
- What accessibility standards will be used to determine product compliance?
- What procedures will be used to review products prior to purchase?
- Who is responsible for oversight and compliance?
- What recourse is available for enforcement?

The opportunities presented by universal applicability of Section 508 would support the development and procurement of accessible information technology in all public entities, including state, county and local governments and schools.

The second initiative supports increased access to assistive and universally designed telecommunications technologies. The president's New Freedom Initiative [11] emphasizes the development of assistive technologies by providing funding for the creation of more and better AT. The initiative also provides funding to expand educational opportunities for people with disabilities, and provides funding to increase the integration of people with disabilities into the work force by encouraging telecommuting and encouraging transportation solutions.

As a component of President Bush's New Freedom Initiative [11], this intervention could provide support for the Rehabilitative Engineering Research Centers' budgets for promoting new assistive telecommunications technologies. As technology and product "developers", these Centers collaborate with various industry organizations to assist in bringing new technologies and products to

market. Because assistive technologies are often too expensive for most users, this proposed policy and regulatory opportunity would provide support for low-interest loan programs for the purchase of assistive telecommunications products.

4.3.2. Market Mechanisms. With the lure of making money, markets have cultivated many innovations, technologies and new products that seek to be the next "must-have" addition to consumers' lifestyles. Assistive wireless telecommunications technologies have long been thought of as a very specific product designed for a very small fraction of the population – namely, those persons who are disabled. But, as recent data indicates, the definition of "disabled" is not as exclusive as was previously thought. Per the Census Bureau, a person is considered to have a disability if he or she has difficulty in performing certain functions, or has difficulty in performing activities of daily living, or has difficulty with certain social roles.

Any person who has difficulty with one or more of the above activities, depends on an assistive device for one of the above activities, or who depends on another caretaker for basic activities, is considered severely disabled. Millions of U.S. residents who had previously attributed their difficulty or inability to perform certain tasks to seemingly trivial physical deficiencies can now be considered as "disabled" to some degree under these definitions supported by the Census Bureau. Hence, this once very specific portion of the population now accounts for a 20 percent share of the citizenry of this country. Twenty percent of any population as a potential consumer base is a tremendous market for capitalistic expansion.

These figures, coupled with the fact that the mean age of the American population is getting older (and along with age comes an increased chance for the onset of a disability), the total number of people in the United States with disabilities is expected to increase in the future.

Because a smaller percentage of people in previous years were considered to be disabled, there has been a deficiency in quality research that documents the market potential of assistive technologies. As a result, it has been difficult to convince designers and manufacturers on the economic viability of such products. Not only are there more potential disabled consumers than previously thought, but manufacturers must also realize that assistive technologies can also benefit the non-disabled public at large. Assistive telecommunications technologies facilitate a more efficient data transfer between users who would otherwise have difficulty utilizing conventional means of communication. Although not required by non-disabled users, such assistive telecommunications technologies could offer a more convenient or efficient alternative to existing technologies.

Now that it can be demonstrated that a market exists for assistive telecommunications technologies, the resources, competition and experience offered through a market-based economy offer unlimited opportunities to both sides of the economic equation – both to the producers and consumers of assistive telecommunications technologies.

4.3.3 Outreach/Awareness. Because the inefficient dissemination of information regarding available assistive and wireless telecommunications technologies, products and methodologies continues to be a barrier to the effective delivery, usage and understanding of such aides, the outreach and awareness opportunity is vital to successful utilization. There exist four primary mediums through which information can be effectively disseminated to unknowledgeable, potential beneficiaries of assistive telecommunications technologies, products and methodologies: industry or not-for-profit organizations, conferences, government entities and user forums.

The not-for-profit and industry organizations are currently the most comprehensive resource for information relating to assistive telecommunications technologies. Those organizations that are not-for-profit are primarily supported through federal funds, disabled organizations, or the manufacturers of AT products themselves. These resources often include databases that contain information on available and pending assistive telecommunications products. These databases contain detailed descriptions of specific products - including price and company information. Most of these valuable information resources include a personalization search option to maximize the efficiency of a product or technology search.

Conferences offer an effective environment for the collaboration, discussion and dissemination of information regarding assistive telecommunications technologies. Conferences are opportunities to bring the various constituents in designing, producing, marketing, and using assistive telecommunications technologies together to coordinate efforts, resources and planning. In addition, research papers are presented, workshops are conducted and educational opportunities are facilitated during the duration of FT and disability conferences.

Government entities can provide assistance under various legislative authorizations. For example, the Technology-Related Assistance for Individuals with Disabilities Act, otherwise known as the "Tech Act,"

provides funding to develop statewide, consumer-responsive information and training programs designed to meet the assistive technology needs of individuals with disabilities. The Tech Act was reauthorized in 1994 by former President Clinton and again in 1998 as the Assistive Technology Act. Each state and territory in the United States has a Technology Assistance project that has current information on assistive technology resources for that state.

User forums are a nascent medium in the dissemination of assistive telecommunications information. Forums provide the opportunity for people with disabilities to review evaluations of products and technologies composed by other disabled people, as well as regular consumers and technical professionals in a range of specialties. Most user forums have an online product review form that can be easily completed and submitted to facilitate the information collection and dissemination. User Forums also allow manufacturers the opportunity to examine consumer feedback on their products, providing valuable market information.

Two popular user forums include: the Adaptive and Assistive Technology (AAT) forum, and RehabTool.com. The AAT forum offers numerous services to users including a "community" opportunity for those people with similar interests to establish an internet-based organization. [http://communities.msn.com/AdaptiveandAssistiveTechnology]. RehabTool.com is another popular online community, open information exchange about AT. [http://www.rehabtool.com/forum/]

The two sites offer message board forums for questions relating to assistive technology, assistance in finding new or used adaptive equipment, and opportunities for users to share their AT experiences and opinions.

5. Conclusions

The concept of disability is changing in the United States. The perception of a disabled person as someone with an obvious physical or cognitive deficiency or impairment is changing into a broader, more inclusive label that applies to a much larger portion of the population. We as a society are currently at a very crucial point in the realization that access and usability is not as equitable as we had previously thought. A fundamental portion of access and usability is the ability to effectively transmit and receive information. As the landscape of access on behalf of disabled persons is quite broad, the purpose of this assessment has been to review those policies that are germane to disabled access to assistive wireless telecommunications technologies. As a component of universal design, nascent technologies should be designed to accommodate as many possible users and their special needs as possible. Recent developments such as audio or visual aides in crowded areas – vital to sensory impaired individuals – have facilitated a very effective method of information dissemination among the non-disabled as well.

Research to determine other potential benefits for both the disabled and non-disabled communities alike must be sustained to foster the idea that assistive technologies are more than a specific product with a narrow market and financial burden for manufacturers. Previously, research concerning AT focused on the costs associated with implementing and providing the services – provisions often mandated through legislative or regulatory policies. Future research concerning assistive technologies need to focus on the positive attributes of these devices for universal design and methodologies if such FT products are to find their way into the mainstream market.

Leveraging the resources and capabilities of the RERCs and other organizations would facilitate the research, business and academic collaboration, and the information dissemination process. With the power of member industry, academic and other organizations, the market mechanisms stirred as a result of this changing attitude with regards to assistive telecommunications technologies would address the barriers to access and use discussed earlier in this analysis. With a larger potential market base, assistive telecommunications technologies would enjoy the benefits associated with a competitive marketplace – thereby offering improved technologies at affordable prices.

Marketing the capabilities and benefits of assistive telecommunications technologies has always presented problems for both producers and users alike. However, with the larger market base described above, the creators of AT would have incentive to initiate an effective advertising campaign. In addition, through the increased investment in product research and development, as well as the desire to have a unique product identity, the previous problems of technology incompatibility would be remedied.

Wireless information and communications technologies offer our society the means to lead a more independent, knowledgeable and convenient lifestyle, unfettered by physical locale, making information readily available regardless of location or time. For the portion of our population who suffer from some degree of disability, assistive telecommunications technologies are often more a necessity than a convenience. Wireless information

devices can provide an avenue to achieving higher standards of living for persons with physical or cognitive disabilities. Basic design principles behind assistive technologies can prove useful to a much larger portion of the population than previously imagined. Larger markets for these technologies provide incentives to development of new products. Finally, a policy agenda placing an emphasis on expanded research and support initiatives to develop new applications of telecommunications technologies can result in increased opportunities for people with disabilities, and reduce barriers existing in day to day living.

Acknowledgements

The research reported here is being conducted under the auspices of the Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities (Wireless RERC), funded by the National Institute on Disability and Rehabilitation Research of the U.S. Department of Education under grant number H133E010804. The opinions contained in this publication are those of the grantee and do not necessarily reflect those of the U.S. Department of Education. The authors wish to acknowledge the work of Andy McNeil and Lisa Griffin who were researchers on a previous draft of this project.

References

[1] U.S. Census Bureau (Census). *Disability Status: 2000.* Washington, D.C. : U.S. Department of Commerce, issued March 2003, C2KBR-17.

[2] National Organization on Disability. *The State of the Union 2002 for Americans with Disabilities.* Washington D.C. , 2002. Retrieved from http://www.nod.org/cont/dsp_cont_item_view.cfm?viewType=itemView&contentId=751&fromLocHmePg=T&fromLocationId=2&timeStamp=25-Jan-0202:17:24 April 2002.

[3] Kaye, H.S. Computer and Internet Use Among People with Disabilities. *Disability Statistics Report (13)*. Washington, DC: U.S. Department of Education, National Institute on Disability and Rehabilitation Research, 2000.

[4] Silverstein, Robert. "Emerging Disability Policy Framework: A Guidepost for Analyzing Public Policy." *85 Iowa Law Review 1691,* 2000.

[5] United States Access Board. (2002) Architectural Barriers Act 1968. Retrieved from http://www.access-board.gov/about/ABA.htm on December 18, 2002.

[6] Lane, Charles. "O'Connor Criticizes Disabilities Law as Too Vague." *The Washington Post.* March 15, 2002, Page A02.

[7] Georgia Centers for Advanced Telecommunications Technology (GCATT). *Policy and Regulatory Assessment: Factors influencing Adoption of Wireless Technologies: Key Issues, Barriers and Opportunities for People with Disabilities.* Office of Policy and Programs, GCATT, Atlanta, Georgia, and Wireless RERC, Atlanta, GA, 2002.

[8] National Council on Disability. *National Disability Policy: A Progress Report December 2001-December 2002.* Washington D.C.: National Council on Disability, July 26, 2003. Retrieved from [http://www.ncd.gov/newsroom/publications/progressreport_final.html]

[9] Federal Communications Commission (FCC). *Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones,* Washington D.C., FCC, 2001. Retrieved from http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-01-320A1.doc on Dec. 18, 2002.

[10] Georgia Centers for Advanced Telecommunications Technology (GCATT). *DigitalGeorgia: A White Paper on Information and Communications Technology in Georgia.* Office of Policy and Programs, GCATT. Prepared for the Office of the Governor, Atlanta, Georgia, 2000.

[11] Bush, George, W. *New Freedom Initiative,* Executive Order. Washington D.C., The Whitehouse, 2001. Retrieved http://www.whitehouse.gov/news/freedominitiative/freedominitiative.pdf, December 18, 2002.