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Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities

Policy and Regulatory Assessment

Factors Influencing Adoption of Wireless Technologies: Key Issues, Barriers and Opportunities for People with Disabilities

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Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities

Policy and Regulatory Assessment: Factors Influencing Adoption of Wireless Technologies: Key Issues, Barriers and Opportunities for People with Disabilities

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Executive Summary

While the adoption of wireless technologies has become increasingly widespread, significant issues involving access to these technologies still exist for people with disabilities. This report identifies key issues facing disabled users of wireless technologies, including barriers to access and use, as well as opportunities for reducing those barriers.

The 2000 Census estimates that some 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 (U.S. Census Bureau, 2003). While disabilities can involve sensory, physical, and/or cognitive conditions, and have varying degrees of severity, persons with disabilities are generally in some manner constrained in their participation in one or more normal life activities. A disabled person's participation in his or her community and society at large can be significantly different than that of a non-disabled person. Disabled individuals face many types of educational, economic, social and technological barriers to full engagement in society. These barriers, can to some extent, be bridged by advances being made in disability policy and telecommunications policy to address the needs of the disabled community and foster a better community awareness of their needs.

Legislation has been enacted to ensure equal access to public goods, access and use of commercial products and devices, and enforcement of the civil rights of people with disabilities. Section 508 of the Rehabilitation Act of 1973 and Section 255 of the Telecommunications Act of 1996 are the two pieces of legislation that have received the most praise and attention in recent years. Their aim is provide people with disabilities better access to electronic and technology information and telecommunications services, respectively.

In this report the Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities[1] examines the role that advances in wireless communications and related technologies play in providing the disabled community increased opportunities for daily interactions; and more specifically analyzes accessibility policy issues related to the use of wireless communications and other information technologies. The advancement of universal design concepts and assistive technologies, including wireless technologies, and the "disability divide" that exists between users of telecommunications technologies, are focused on as means of promoting and ensuring equal access to services and products for people with disabilities. Compilations and overviews of current government initiatives, telecommunications policies, and Supreme Court rulings interpreting the Americans with Disabilities Act are discussed as are the barriers and opportunities to these related topics.

[1] The Rehabilitation Engineering Research Center on Mobile Wireless Technologies for Persons with Disabilities (hereafter referred to as the Wireless RERC) is a five-year program that began in October 2001, sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR) of the U.S. Department of Education under grant number H133E010804. The organizational structure for the Wireless RERC is built upon research, development, and training focused activities guided and evaluated by constituent advisory groups made up of consumers, rehabilitation professionals, and wireless industry representatives. This document has been developed under the auspices of the Policy Initiatives research project (R3) directive to provide a baseline assessment of Federal policies and regulatory initiatives that focus on promoting universal access to mobile wireless technologies and to explore innovative wireless applications, such as those related to information and communications provision, that can help meet the needs of people with disabilities.

I. Overview

Mobile wireless (including "WiFi", Bluetooth and cellular) technologies are rapidly emerging as an important 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. These technologies will enable cell phones and portable or wearable computers to function as universal remote consoles for accessing information and services and controlling appliances and devices with more accuracy and consistency than they do today. 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.

Public policy plays an important if frequently overlooked role for people with disabilities, in part because "people with disabilities…interface with so many different components of public policy systems, many of which are conflicting or inconsistent, such as employment goals and requirements for income assistance programs. The larger public policy context for disability and rehabilitation research reflects interlinking service delivery systems in which changes in one system often have a substantial impact on others. The dilemma for disability and rehabilitation policy is that the various systems are not mutually reinforcing." (NIDRR, 1999)

Throughout this document, the expression "Facilitative Technology" (FT)[2] is used to describe information, communication, telecommunication and wireless technologies that could potentially be utilized to benefit persons with disabilities, extending the more commonly used term "Assistive Technology" (AT). In general, AT devices, systems, and services are used to "increase, maintain, or improve functional capabilities of individuals with disabilities."[3] This report identifies key issues at the intersection of disability policy and wireless technologies, barriers to access/use, and opportunities for reducing those barriers as well as pertinent information on the disability community, legislative and regulatory policies, and recent policy initiatives. Future updates will continue to assess developments in mobile wireless technology that can assist the disabled community.

A. 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 (U.S. Census Bureau, 2003). In addition, more than 25 million family caregivers provide aid and assistance to people with disabilities (Census, 2000). There are many types of disabilities, including sensory, physical, and cognitive, each of which may have varying degrees of severity. Some disabilities are innate while other conditions develop later in a person's life as a result of illness, age, accident or attack.

[2] The term "facilitative technology" (FT) as used in this document extends the concept of "assistive technology" (AT), shifting the focus from the individual, per se, to a focus on the interaction of the individual and the environment within which the individual operates.

[3] Technology-Related Assistance for Individuals with Disabilities Act (1988) [Public Laws 100-407 and 103-218].

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." (NOD, 2002) 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
- Young people with disabilities are more than twice as likely to drop out of high school (22 percent versus 9 percent), and only half as likely to complete college (12 percent versus 23 percent)
- 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 say they are not at all 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 information, communication, and wireless 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 (Bush, 2001). While no comparable statistics[4] catalog use of wireless technologies by people with disabilities, we can assume that the use is proportionate. To some degree the socio-economic variables described above may help explain why persons with disabilities disproportionately lack access to information and technology tools. In this report, the Wireless RERC examines the disability community and analyzes accessibility policy issues related to the use of wireless communications and other information technologies.

B. Key Stakeholders

There are many public and private organizations interested in promoting FT and universal design to the disabled community and the general population. These key stakeholders help to ensure appropriate information about the needs of the disabled community are disseminated into society,

[4] Compilation of disabilities related statistics is fairly complex due to differences in definitions, categorizations, and reporting methodologies. The National Council on Disability (2002) report noted detailed concerns about employment data in particular and expressed the twin hopes that methods for its collection are improved and that existing suspect data not be disseminated under government aegis. The report offered recommendations for developing effective data-gathering tools and techniques. For a further discussion on disability statistics see also the Disability Statistics Center FAQ. [http://dsc.ucsf.edu/UCSF/].

and help to ensure that civil rights and laws meant to support the disabled community are upheld. Many of these stakeholder groups are not-for-profit organizations that receive funding from private citizens or the Federal government. The resources they provide range from lists of products and services available for various disabilities, to information and education about the latest legislative actions that affect the disabled community.

Listed below are several noteworthy not-for-profit and industry organizations with some degree of interest in telecommunications or other communications and assistive type technologies.

The first group represents membership associations for people with disabilities, with an interest in information technologies.

- International Center for Disability Resources on the Internet (ICDRI) is a non-profit public policy center with a mission of working toward equalization of opportunities for persons with disabilities. ICDRI seeks to increase opportunities for people with disabilities by identifying barriers to participation in society and promoting best practices and universal design for the global community. ICDRI's mission includes the collection of a knowledge base of quality disability resources and best practices and to provide education, outreach and training based on these core resources. [http://www.icdri.org]

- Infinitec, Inc. is a not-for-profit corporation formed to help people with disabilities access life-enhancing technology. The site provides information about FT products, how to enhance the working and home environments with FT products, and how FT products may help enhance recreational activities for people with disabilities. [www.infinitec.org]

- Self Help for Hard of Hearing People (SHHH) represents consumers by providing information, education, support and advocacy to hard of hearing people. [www.shhh.org]

- TDI (also known as Telecommunications for the Deaf, Inc.) was established in 1968 originally to promote further distribution of TTYs (text telephones) in the deaf community and to publish an annual national directory of TTY numbers. Today, TDI is an active national advocacy organization concentrating on equal access issues in telecommunications and media for four constituencies in deafness and hearing loss: people who are deaf, hard-of-hearing, late-deafened, or deaf-blind. [www.tdi-online.org]

- The Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) is a national association dedicated to technology and disability. The association's mission is to improve the potential of people with disabilities through the use of technology. [www.resna.org]

The second group represents membership organizations for people with disabilities who have more general interests in disability-related issues.

- American Council of the Blind strives to improve the well-being of blind and visually impaired people by serving as a representative national organization; elevating the social, economic and cultural levels of blind people; improving educational and rehabilitation facilities and opportunities; cooperating with the public and private institutions and

organizations concerned with blind services; encouraging and assisting all blind persons to develop their abilities and conducting a public education program to promote greater understanding of blindness and the capabilities of blind people. [www.acb.org]

- Cornucopia of Disability Information (CODI) CODI serves as a community resource for consumers and professionals by providing disability information in a wide variety of areas including assistive technology and universal design. [www.codi.buffalo.edu]

- National Association of the Deaf (NAD) was established in 1880 and is the oldest and largest constituency organization safeguarding the accessibility and civil rights of 28 million deaf and hard of hearing U.S. residents in education, employment, health care, and telecommunications. The NAD is a private, not-for-profit organization that encompasses a federation of 51 state association affiliates including the District of Columbia, organizational affiliates, and direct members. [www.nad.org]

- National Federation of the Blind works to help blind persons achieve self-confidence and self-respect and to act as a vehicle for collective self-expression by the blind. By providing public education about blindness, information and referral services, scholarships, literature and publications about blindness, aids and appliances and other adaptive equipment for the blind, advocacy services and protection of civil rights, development and evaluation of technology, and support for blind persons and their families, members of the NFB strive to educate the public that the blind are normal individuals who can compete on terms of equality. [www.nfb.org]

- National Organization on Disability (NOD) promotes equal participation for U.S. residents with disabilities. NOD's two core programs, Community Partnership Program (CPP) and National Partnership Program (NPP) connect people with and without disabilities at the national, state and local levels. [www.nod.org]

- United Cerebral Palsy Association's (UCP) mission is to advance the independence, productivity and full citizenship of people with cerebral palsy and other disabilities, through our commitment to the principles of independence, inclusion and self-determination. [www.ucp.org]

- World Institute on Disability (WID) is an internationally recognized public policy center organized by and for people with disabilities. WID's mission is to strengthen the disability movement through research, training, advocacy, and public education so that people with disabilities can enjoy increased opportunities to live independently. [www.wid.org]

The third group of organizations represents Federally funded organizations geared toward providing information and training to businesses and governments. Many of these organizations provide specific information related to certain products, such as hearing aids or related devices, and focus on the individual rather than on community impacts. [5]

[5] The rapidly changing nature of the policy arena is such that one of the organizations listed in the first version of this document – "National HIPAA (Health Insurance Portability and Accountability Act) Alliance (NHA)" [http://www.nationalhipaaalliance.com/] no longer has an active website.

- Of particular note is ABLEDATA, a Federally funded NIDRR project whose primary mission is to provide information on assistive technology (AT) and rehabilitation equipment available from domestic and international sources for consumers, organizations, professionals, and caregivers. ABLEDATA specializes in providing assistance to businesses and governments that wish to make their existing and future facilities accessible to disabled persons. In addition, ABLEDATA provides an opportunity to advertise AT products on their internationally renowned product and technology database. [http://www.abledata.com/]

- National Rehabilitation Information Center (NARIC) funded by the National Institute on Disability and Rehabilitation Research (NIDDR) collects and disseminates the results of Federally funded research projects. [www.naric.com]

- IT Technical Assistance and Training Center (ITTATC) is a partnership between The Center for Rehabilitation Technology (CRT) at Georgia Institute of Technology (Georgia Tech), the World Institute on Disability (WID), Community Options, Inc. (COI), Rehabilitation Research and Training Center (RRTC) on Workforce Investment and Employment Policy, and Information Technology of America (ITAA). ITTATC is a collaboration of educators, researchers, policy analysts, and industry and disability leaders whose mission is to promote use of accessible and useable electronic and information technology, and to promote the benefits of universal design to manufacturers, product designers and engineers. ITTATC builds upon the legislation of Section 255 of the Telecommunications Act, and Section 508 of the Rehabilitation Act. [http://www.ittatc.org/]

The fourth group represents Federally funded research centers and rehabilitation engineering research centers (RERC) dedicated to disability issues as well as wireless and communications technology.

- RERC on Hearing Enhancement from Gallaudet University. The project focus is to develop and evaluate technology to accommodate the needs of people with hearing loss. [www.hearingresearch.org]

- RERC on Information Technology Access from University of Wisconsin in Madison. The project focus is to improve access by individuals with all types, degrees, and combinations of disabilities to a wide range of technologies, including computers, ATMs, Internet technologies, and immersive environments. [trace.wisc.edu/itrerc]

- RERC on Telerehabilitation from MedStar Research Institute. The project focus is to conduct research on various models of delivering rehabilitation services from a distance. [www.telerehab-nrh.org]

The fifth group represents industry organizations that focus primarily on disseminating information about policy being made on the community or national level. These organizations are active lobbyists for policy making, and conduct research addressing the needs of the disabled community.

- Assistive Technology Industry Association (ATIA) is a not-for-profit organization representing manufactures and merchants of technology-based assistive devices for people with disabilities. [www.atia.org]

- Cellular Telecommunications and Internet Association (CTIA) is an international organization that represents the wireless communication communities and serves the interests of service providers and manufactures. CTIA represents its members' interests to policy makers of the Executive Branch and the FCC and Congress. [www.wow-com.com]

- InterNational Committee for Information Technology Standards (INCITS), sponsored by the Information Technology Industry Council (ITI), is a trade association representing United States-based providers of information technology products and services. INCITS's mission is to provide market-driven voluntary consensus on standards pertaining to information technology products and services. [www.ncits.org]

- International Society for Augmentative & Alternative Communications (ISAAC) promotes optimal communication for people with severe communication limitations. [www.isaac-online.org]

Finally, a sixth group of organizations would include consultants on applications of technology to disability-related issues.

C. Legislative/Regulatory Policies

Overview

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.[6] Silverstein (2000) developed a valuable analytic framework, which classified these laws into five categories[7]:

1. 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. Also, as a special case, the Health Insurance Portability and Accountability Act (HIPAA), guaranteeing that private health insurance is available, portable, and renewable; and limiting pre-existing condition exclusions can be thought of as a civil rights type of legislation. HIPAA included provisions designed to encourage electronic transactions and also required new safeguards to protect the security and confidentiality of health information. The final regulation covers health plans, health care clearinghouses, and

[6] A compilation of major disability-related legislation from 1956-2003 can be found in Appendix A.
[7] See the Silverstein (2000) article which develops a disability policy framework for an extended discussion of these categories.

those health care providers who conduct certain financial and administrative transactions (e.g., enrollment, billing and eligibility verification) electronically.

2. 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.

3. 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.
4. 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.
5. 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 (Silverstein (2000).

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). (Access Board[8], 2002) 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

[8] The Access Board, formally known as the Architectural and Transportation Barriers Compliance Board, is an independent Federal agency devoted to developing and maintaining accessibility requirements for the built environment, transit vehicles, telecommunications equipment, and for electronic and information technology, providing technical assistance and training on these guidelines and standards, and for enforcing accessibility standards for Federally funded facilities

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.[9] The following section delineates key aspects of section 508, under the Workforce Investment Act (WIA) of 1998 of the Rehabilitation Act of 1973 and section 255, "Access By Persons With Disabilities", of the Federal Telecommunications Act of 1996.

Section 508 of the Rehabilitation Act

The adoption of section 508, under the Workforce Investment Act (WIA) of 1998 of the Rehabilitation Act of 1973[10], was a significant milestone for people with disabilities. Section 508 requires that Federal agencies' electronic and information technology is accessible to people with disabilities.[11] The law "provides that in their purchase and use of electronic and information technology, Federal agencies must adhere to the principles of "accessibility" to persons with disabilities." (NCD, 2002). "Section 508 prohibits Federal agencies (except those involved with national security systems) from procuring, developing, maintaining, or using electronic and information technology (EIT) that is inaccessible to people with disabilities, subject to an undue burden defense. "Undue burden" generally means a significant difficulty or expense." (DOJ, 2000) If a Federal agency claims undue burden, it is still required to provide information to an individual by "an alternative means of access that allows the individual to use the information and data" (WIA, 1998) in an equal manner.

In addition, the law states that the Access Board "shall periodically review and, as appropriate, amend the standards required…to reflect technological advances or changes in electronic and information technology." (WIA, 1998) As directed by the law, in December 2000 the Access Board published the standards developed by the Board stating that the Federal government will be the primary responsible party for ensuring section 508 compliance. The standards provide criteria for disseminating information and how to make products accessible to people with disabilities. Per the legislation, neither recipients of Federal funds nor the private sector are required to comply with section 508. However, the U.S. Department of Education has interpreted the Assistive Technology Act[12] (AT Act) of 1998 "to require states receiving assistance under the AT Act State Grant program to comply with section 508, including the Access Board's standards. […] Thus, while

[9] [http://www.access-board.gov/about/Telecomm%20Act.htm]
[10] 29 U.S.C. § 794 (d)
[11] "…When developing, procuring, maintaining, or using electronic and information technology, each Federal department or agency, including the United States Postal Service, shall ensure, unless an undue burden would be imposed on the department or agency, that the electronic and information technology allows, regardless of the type of medium of the technology individuals with disabilities who are Federal employees to have access to and use of information and data that is comparable to the access to and use of the information and data by Federal employees who are not individuals with disabilities; and (ii) individuals with disabilities who are members of the public seeking information or services from a Federal department or agency to have access to and use of information and data that is comparable to the access to and use of the information and data by such members of the public who are not individuals with disabilities..."[29 U.S.C. § 794d]
[12] The U.S. Department of Education is responsible for administering the Assistive Technology Act of 1998. The purposes of this Act are to provide funding for states to assure technology-related assistance to people with disabilities, increase access to, provision, and use of assistive technology devises and services, and increase awareness of laws and regulations pertaining to assistive technology.

section 508, on its face is limited to the Federal sector, recipients of Federal funds under the AT Act must also comply with section 508" (RESNA, 2002). The impact of section 508 may rest in large part on spillover effects from the EIT industry. If the Federal government, one of the industry's largest customers, demands accessible products, other costumers may do the same, or the industry may change its standards of its own accord in order to remain efficient on the market. The leverage value of section 508 depends upon its regulation and implementation within the Federal government. While law thus far has experienced a smooth adoption process**,** several limitations and problems with the law are already apparent.

The most obvious limitation to the law is that EIT products procured *prior* to the law going into effect are exempt from compliance; "…retroactive modification of existing EIT is not required." (DOJ, 2000) Furthermore, the Department of Justice is not responsible for enforcing Section 508; "members of the public and employees with disabilities however may file administrative complaints with agencies they believe to be in violation of Section 508, or file private lawsuits in Federal district court." (DOJ, 2000) The most important problem relates to a lack of adequate compliance monitoring within the Federal government. "The Department of Justice (DOJ) is vested with responsibility under the law to make biannual reports to the president and Congress on the implementation of Section 508. To that end, DOJ has on the one hand undertaken the responsibility of biannually measuring the performance of Federal agencies in relation to the accessibility of their public and employee Web sites. On the other hand, no monitoring procedures are in place to determine the frequency with which agencies invoke the "undue burden" defense or any of the several other exceptions to compliance authorized in the Federal Acquisitions Regulation. Nor are there any auditing procedures in place for evaluating the soundness of such undue burden claims by agencies." (NCD, 2002) Furthermore, although Federal agencies are required to document all cases in which an "undue burden" claim is made, there is no system in place to ensure the collection, review, or evaluation of these claims.

Another related issue with the law is the fact that *accessibility* does not automatically translate to *usability* for all users. Unless clear guidelines are adopted to ensure that translation occurs, this law may become moot. A check against this potential problem was built in to the law; Federal employees and members of the public have a right to file a civil rights complaint against any Federal agency that seems to be violating Section 508 mandates. Since there is no formal system in place to ensure the collection, review, and evaluation of these complaints, the problem exists here as well.

In April of 2000 the Department of Justice submitted its first report on Section 508 to the president. This report states that data collected suggested that most Federal agencies could "improve the extent to which disability accessibility issues are incorporated into their mainstream technology procurement contracts, [and that] the most significant challenge posed by Section 508 is the need for coordination between those with technological expertise and those with knowledge of disability access issues." (DOJ, 2000) The report goes on to state that the majority of Federal agencies have remained passive in their implementation of Section 508, addressing EIT accessibility issues on an ad hoc basis, and that a complete sensitivity to accessibility has not yet evolved. This lack of sensitivity was apparent in many agencies websites where graphics and visual images did not properly translate to text for disabled users as well as in the software applications that agencies selected to use that were inaccessible to disabled users. Another important finding was that few

agencies were making use of the available services to increase telecommunications access. For example, few agencies were utilizing the Federal Information Relay Service "which allows deaf and hard of hearing people to communicate via telephone with people who do not have special equipment, such as TTYs". (DOJ, 2000) These oversights may be due to inattention to detail or lack of awareness and can be easily remedied through training, however pose significant setbacks for disabled users. It is hopeful that all Federal agencies will continue to address these shortfalls and work to correct them as quickly as possible.[13]

Section 255 of the Telecommunications Act

The adoption of Section 255, Telecommunications Access for People with Disabilities, of the Federal Telecommunications Act of 1996 was another pivotal moment for people with disabilities. The Act reflected Congress's awareness that telecommunications is a tool necessary for routine daily activities, allows for independence, and is a critical tool for employment; "if telecommunications technologies are not accessible to and useable by persons with disabilities, many qualified individuals will not be able to work or achieve their full potential in the workplace." (FCC, 1999) Better accessibility to telecommunications benefits all U.S. residents, not only those with disabilities. "The purpose of section 255…of the [1996] Act is to… [bring] the benefits of the telecommunications revolution to all Americans, including those who face accessibility barriers to telecommunications products and services." (FCC, 1999)

This law requires that telecommunications service providers and telecommunications equipment manufacturers make all products and services, designed, developed and fabricated after the law took effect on February 8, 1996, accessible and usable by people with disabilities where it is "readily achievable" to do so. "The Federal Communication Commission (FCC) rules explain that where it is not readily achievable to make a particular product or service accessible, that product or service must be made compatible with peripheral devices or specialized customer premises equipment, if compatibility is 'readily achievable'." (FCC, 2002) Any products or services designed, developed or fabricated *prior* to the enactment of the law are exempt from compliance with Section 255. The law covers all wired and wireless hardware and software telephone network equipment including fax machines, answering machines, modems, and pagers, and also covers all basic and special telecommunications services.

Although Section 255 has been in effect for a relatively short amount of time, some problems are already emerging. The first problem has to do with the enforcement of the law. The FCC has sole jurisdiction over enforcement of this law. According to the NCD, there is a "perceived lack of movement on the FCC's part regarding disability civil rights issues…" and seems to have adopted a less than aggressive attitude toward the enforcement of Section 255. Since the FCC is the sole

[13] *Section 508 Resources:* Several organizations host websites devoted to providing information about Section 508, its meaning and its application. Some of the most comprehensive of these websites are listed below::

1. Government Computer News Section 508 Resources: http://www.gcn.com/Resource/section508/
2. Department of Justice Section 508 Home Page: http://www.usdoj.gov/crt/508/
3. *The Center for Information Technology Accommodation (CITA), in the U.S. General Services Administration's Office of Governmentwide Policy: http://www.section508.gov/
4. Rehabilitation Engineering and Assistive Technology Society of North American (RESNA) Technical Assistance Project: http://www.resna.org/taproject/policy/infotech/
5. WebAIM (Web Accessibility in Mind) Section 508 Checklist: http://www.webaim.org/standards/508/checklist

enforcer, it may benefit from disclosing that the guidelines it follows to ensure compliance with Section 255. The FCC and the Access Board decided to monitor compliance with Section 255 with a periodic market monitoring report (MMR) survey. The goal in using MMR was that it would highlight which product and service areas within the FCC and the industry were lagging in compliance so that additional resources could be allocated to bring those areas up to speed.

In addition, the FCC appears to rely almost exclusively on consumer complaints as a measure of the enforcement of the law. Although consumers are not allowed to file Section 255 complaints in the courts, they may file complaints formally or informally with the FCC. This is problematic according to the NCD as "no studies are known to exist measuring the extent of consumer awareness of Section 255." (NCD, 2002) . The complaints that are received may not necessarily be representative of the population as a whole, or provide an inaccurate and scientifically unsound measure of Section 255 compliance. Another problem with the law is that Section 255 applies only to telecommunication services and products involved in voice communication transmission. By this definition, services and products related to e-mail and electronic data transmission are exempt from abiding by Section 255. This interpretation of the Act is being debated. The FCC, in recognizing this limitation in the law, has broadened their interpretation to cover "all the features and functions necessary to make and complete calls, including those that could be used for e-mail, fax, data, and graphics transmission, as well as for placing, transmission, and receiving of traditional voice calls." (NCD, 2002) In order to ensure that Section 255 is not trivialized by industry progress, the FCC will solicit industry and consumer input regarding the breadth of Section 255. How this information will be used by the FCC remains unclear.[14]

C. Current Access Related Initiatives

Philosophically, the definition and conceptual understanding of "disabilities" has broadened to address 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. The following is a summary of current legislative, regulatory, and judicial activities that have the potential to impact the level of participation persons with disabilities will have in the Information Age.

Education

On October 30, 2001, President Bush established a Commission on Excellence in Special Education to recommend policies for improving the performance of students with disabilities and to support reauthorization of the Individuals with Disabilities Education Act

[14] *Section 255 Resources*
Several organizations host websites devoted to providing information about Section 255, its meaning and its application. Some of the most comprehensive of these websites are listed below:

1. Rehabilitation Engineering and Assistive Technology Society of North American (RESNA) Technical Assistance Project: http://www.resna.org/taproject/policy/infotech/
2. Federal Communications Commission: http://www.fcc.gov/cgb/consumerfacts/section255.html
3. Access Board: http://www.access-board.gov/telecomm/bulletin.htm
4. Information Technology Technical Assistance and Training Center(ITTATC): http://www.ittatc.org/laws/255/index.cfm

of 1997 (IDEA)[15]. As part of the reauthorization process, groups and committees studied the current law and the manner in which it was being implemented. The President's Commission on Excellence in Special Education (PCESE) held 13 public hearings across the country starting in January 2002 to determine the policy needs for students with disabilities. PCESE collected information related to Federal, state and local special education programs. The commission's ultimate goal was to recommend policies to improve the educational performance of students with disabilities such that the *No Child Left Behind* legislation can be fulfilled. 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*[16] provided findings and gave major recommendations to consider for reauthorization of IDEA. To date, Congress has continued to reauthorize IDEA.

Employment

Recent U.S. Supreme Court decisions in employment-related cases continue to redefine and clarify the ADA, the disabled population's primary civil rights law.[17] The high court ruled in 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 Board of Trustees of the University of Alabama v. Garrett limited the ability of state workers to sue their employers for monetary damages for violations of Title I of ADA. In both of these cases, the Court appeared to narrow the ADA's protections and coverage. Relevant to this observation, 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." (Lane, 2002)

Community Integration/Inclusion

The U.S. House Subcommittee on 21st Century Competitiveness held a hearing on "Assessing the Assistive Technology Act of 1998" in March of 2002. The purpose of the hearing was to provide a sense of how states are doing in their efforts to develop state AT Projects that successfully provide a system of services to individuals with disabilities and to provide recommendations for the future of the AT Act. "In the 11 years that the AT Act Projects have been in operation in various states nationwide, projects have focused on changing legislation, policies, practices, and organizational structures to eliminate barriers and make technology more accessible for individuals with disabilities at home, at school, at work, and in the community." (RESNA, 2001)

[15] Former President Clinton reauthorized the Education for All Handicapped Children Act of 1975 (signed by former President Ford) as the Individuals with Disabilities Education Act of 1997.

[16] *A New Era: Revitalizing Special Education for Children and Their Families* is available for download from the following website: http://www.ed.gov/inits/commissionsboards/whspecialeducation/

[17] A summary of the Supreme Court's decisions through 2003 involving the ADA and the significant implications of these decisions released by the National Council on Disability is contained in Appendix B.

Increasing awareness of and enforcing regulation for AT and universal design are critical to the advancement of disability policy. The differences between AT and universal design are important and merit discussion. IDEA, signed into law by former President Clinton, defines assistive technology as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability." (IDEA, 1997) Although this definition is specific to children, it is generally extrapolated to include all persons with disabilities. Equally important to note is that AT is any device, idea, or piece of technology that increases the independence of any individual. Thus, the benefits of AT are not limited to people with disabilities. Examples of AT can be as simple as using Braille or larger font on a web page to help ease use for a visually impaired person, or as complex as voice recognition software, touch screens, or screen reader software (JAWS). Universal design is defined as "products and environments…usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." (NCSU, 1997) The principles of universal design are that a products design should be equitable to all people, flexible in use to accommodate a range of preferences and abilities, simple and intuitive, communicate information effectively for all users regardless of sensory abilities, should minimize hazards and errors, require little physical effort, and that appropriate size and space are accommodated for to ensure comfortable and easy use by all. (NCSU, 1997) As with AT, universal design benefits all people**,** not only those with disabilities.

In addition to the above activities, the President outlined plans to expand educational opportunities for U.S. residents with disabilities, integrate U.S. residents with disabilities into the workforce, and promote full access to community life. (Bush 2001) President Bush's proposed education reform plan focuses on closing the educational attainment gap given two fundamental principles: "that all children can learn" and "that no child should be left behind". To close the educational attainment gap for students with disabilities, the Administration proposed accountability measures for state run special education programs, incorporating "Reading First" initiatives in the early years, and increased funding for special education and the TRIO program.[18] Additional funding has also been proposed for vocational rehabilitation services, to help individuals with disabilities prepare for and obtain gainful employment to the extent of their capabilities. To assist the inclusion of U.S. residents with disabilities into the workforce, "the Administration will provide Federal matching funds to states to guarantee low-interest loans for individuals with disabilities to purchase computers and other equipment necessary to telework from home." Funding has also been proposed to promote innovative transportation solutions that serve people with disabilities. To improve access within the community, "Federal matching funds will be provided annually to increase the accessibility of organizations that are currently exempt from Title III of the ADA, such as churches, mosques, synagogues, and civic organizations." (Bush, 2001)

II. Initial Identification of Critical Policy Issues

The focus of the Wireless RERC is to promote universal access to mobile wireless technologies and to explore innovative wireless applications addressing the needs of people with disabilities.

[18] The TRIO program provides tutoring; college, outreach, and student support services to help disadvantaged students including disabled individuals achieve academic success beginning in middle school, throughout high school and college, and into graduate school.

Researchers considered each of the issues discussed above for their relevance to the objectives of the RERC, the strengths (or positive aspects of the issue), the concerns (or weaknesses of the issue), the opportunities that may exist for future work in the issue, and barriers that are foreseeable in the implementation of, or a policy response to the issue. The positive and negative aspects of the issues focus on the specifics of the issue – such as particular products or applications. On a broader scale, the opportunities and barriers to each issue analyze the manner in which the issue is affected by market dynamics, population, or environment at large.

An initial range of disability**,** wireless and communication technologies related policy issues were developed from review of an array of sources. These issues were identified through research of not-for-profit agencies, government resources, and policy journals. Subsequently the list was further collapsed to a list of key policy issues that concerned access to wireless and other information and communication technologies.

A. Disability Policy Assessment

Table A presents six issues that are of general concern to both the field of disability policy as well as wireless telecommunication and information technology deployment. These include:

- Technology Access
- Independent and Community Living
- Employment Opportunities
- Expertise & Awareness
- Health Care Coverage
- Disability Policy Arena

Additional critical issues pertinent to the disability community exist, but did not meet the cross-disability criteria of intersecting disability issues and technology development.

Key Issues	TABLE A: Disability Policy Issues in Relation to the Objectives of the Wireless RERC				
	Pertinence	Positive Attributes	Negative Attributes	Opportunities	Barriers
1.0 Access to Information	Information is increasingly becoming the currency of our modern society. Unequal access to information has led to unequal opportunity and limited participation in schools, the workplace, and the community.	Connectivity to the Internet, broadband services, and computers have changed the ways many U.S. residents conduct business and function in their daily lives. Nearly half of the people with disabilities say the Internet has significantly improved their quality of life.	"People with mental or physical disabilities (such as blindness, deafness, or difficulty walking, typing, or leaving home) are less likely than those without such disabilities to use computers or the Internet."[19]	Sec. 508 of the Rehabilitation Act of 1973 requires that electronic information techno- logy developed, procured, maintained, and used by the Federal Government provide Federal employees and people with disabilities comparable access to information or technology.	Lack of access to information in our society "lies not in disability itself, but in the design of the technology that mediates our access to and use of all types of information."[20] Suboptimal enforcement of relevant legislation, as well as a lack clear guidelines for the private and public sectors pose additional barriers.
2.0 Independent and Community Living	"Thirty-five percent of people with disabilities say they are not at all involved with their communities … those with disabilities are one and a half times as likely to feel isolated from others or left out of their community than those without disabilities."[21]	2002 Help America Vote Act mandates each polling place to have at least one voting machine accessible to people with disabilities by January 1, 2006. The Act provides $160 million to improve polling places' accessibility, to ensure full and equal participation in the electoral process, and to improve voting technology.	In the 2000 Presidential election, many voters with disabilities encountered accessibility problems in attempting to cast a ballot. Some individuals with disabilities were not able to cast a secret ballot because of the lack of accessible materials.	The Wireless RERC, in addition to other NIDRR funded RERCs, is conducting research to ensure modern day technological resources are accessible to the disability community.	Technological advances can, in many cases, reinforce patterns of exclusion and isolation when they are not provided or disseminated in ways accessible or usable by people with sensory, physical, and cognitive disabilities.

[19] U.S. Department of Commerce (2001)
[20] National Council on Disability (2001)
[21] National Organization on Disability (2002)

Key Issues	TABLE A: Disability Policy Issues in Relation to the Objectives of the Wireless RERC				
	Pertinence	Positive Attributes	Negative Attributes	Opportunities	Barriers
3.0 Employment Opportunities	The direct and indirect costs of high unemployment exceed $300 billion annually.[22]	The majority of adult-age citizens with disabilities (72 percent) prefer to be working.[23]	The unemployment rate within the disability community has remained relatively unchanged from more than a decade ago. 68 percent[24] of the nation's working-aged persons with disabilities are either unemployed or under-employed.[25]	Having access and the ability to use information technology tools – adaptive equipment, assistive technology, and electronic and information technology, has allowed people with disabilities to overcome certain challenges they face.	Recent decisions made by Supreme Court justices have possibly misinterpreted the Americans with Disabilities Act, creating additional barriers to employment for people with disabilities.[26]
4.0 Expertise & Awareness	"The number of AT users has increased, and there has been an explosion in the sophistication and variety of devices … It is difficult to find assistive technology expertise and to see and try out devices."[27]	The Assistive Technology Act of 1998 provides resources to state-level assistive technology projects to further the cause of assistive technology use, including various forms of technical assistance to state and local government and to the private sector.	"In many states and regions, expertise in specialized areas of assistive technology is in critically short supply. Pre-service preparation programs … are simply not producing sufficient numbers of personnel with assistive technology knowledge."[28]	Like other NIDRR funded RERCs, the Wireless RERC plans to conduct demonstration sessions to allow both potential users and service providers within the disability community to try and provide input on the products and services that are developed.	"Aggressive awareness initiatives are needed to educate individuals who could benefit from assistive technology, their families and friends, service providers, and the public about the assistive technology available."[29]

[22] NCD, 2001a
[23] NOD, 2002
[24] NCD, 2001a
[25] NOD, 2002
[26] NCD, 2002
[27] NCD, 2000
[28] Ibid.
[29] Ibid.

Key Issues	TABLE A: Disability Policy Issues in Relation to the Objectives of the Wireless RERC				
	Pertinence	Positive Attributes	Negative Attributes	Opportunities	Barriers
5.0 Health Coverage	Devices that improve or maintain functional abilities for rehabilitation and that enhance productivity and independence are oftentimes not covered under private insurance plans, employer-based health benefits, Medicaid or Medicare.	Some states have initiated low-interest loan programs and sales tax exemptions to assist persons with disabilities with the purchase of FT.	In general, U.S. residents with disabilities have far lower incomes than other citizens; many do not have the financial resources to pay the high costs of FT out-of-pocket.	One method of driving regulatory changes in private insurance is to update the Medicare statute to reflect the expansion of its coverage of FT.	Medicaid and Medicare coverage excludes FT that falls outside the realm of "acute care."[30]
6.0 Disability Policy Arena	Disability policies are a maze of conflicting definitions, eligibility criteria, philosophical models, and requirements.	President Bush's *New Freedom Initiative* recognizes that agencies sharing responsibility for certain issues would be much more effective, efficient, and less duplicative if they were better coordinated.	Often, individuals with disabilities and their families require a comprehensive array of services and supports. However, these services and supports may be authorized under separate Federal or state programs, which have distinct eligibility rules.	Individual citizen and advocacy groups concerned about disability issues are being given an opportunity to become more active in the political process by participating on government agency panels and advisory committees.	There are numerous policy conflicts that persons with disabilities have to contend with, both specific to a given disability, in terms of priorities, as well as in terms of Federal, state and local regulatory activities.

[30] Ibid.

1.0 Access to Information

In today's society, information is the principal component of our economic and social infrastructure. Wireless technologies, ranging from the computer to the GPS (global positioning satellite) receiver, from the wireless personal digital assistant (PDA) to the digital subscriber loop (DSL) line, have become a key medium for the transmission, storage, and manipulation of information. Ready access to information technology has therefore become a fundamental source of opportunity from education and employment to the attainment of a higher standard of living. The first piece of accessibility-related legislation adopted by Congress was the Architectural Barriers Act of 1968 (P.L. 90-480). The Act also "paved the way for creating and expanding parallel requirements to electronic and information technology in the information environment of today." (NCD, 2001b) This evolution and progression has yielded the concept of "meaningful access", or access that allows people with disabilities to fully participate in all aspects of community life. As outlined by the ADA, access can be defined as the "right to fully participate in enjoyment of whatever opportunities, benefits, programs, or services an organization covered by the law offers." (NCD, 2001b) Under these criteria, access to information and to technology generating, transmitting, and storing has become a civil rights issue for many people with disabilities throughout the United States and the world. The 21st Century has also ushered in a new generation of wireless technology and products intended to increase access to information on a global scale with ease and efficiency.

Opportunities

Having access to, and the ability to use information-based technology is especially important to members of our society who have difficulties due to physical or mental constraints. These technological developments are revolutionary in their capability to empower people with varying degrees of disabilities through more efficient means of access to and interaction with the World Wide Web, communication mediums, and other assistive technologies. Wireless technologies in particular, being un-tethered to any specific physical locale, offer the potential to provide assistive information flow and services on an "as needed" basis, providing greater ability and flexibility to navigate the world.

Barriers

Electronic information and technological developments can present serious and insurmountable obstacles when basic principles of accessibility or universal design are not incorporated into the development of such technologies. The assumption that all or most information technologies are routinely available to, or usable by, people with disabilities significantly overestimates the state of information technology design. Incorporation of accessibility features into the United State's information technology infrastructure has not been, and is not consistent or reliable. When a new technology creates opportunities for some but excludes others because of design features that do not take users with special needs into account, the technology results in provoking frustration, creating divisions, and diminishing the opportunity for independence among the increasing disabled portion of our society. This is especially the case with wireless products such as handheld PDAs and cellular phones. These devices are often designed with the able-user in mind, and become largely useless to the disabled community. Wireless devices are not

required to be compatible with devices used by members of the disabled community, such as hearing aids and screen readers. Although some manufacturers do choose to ensure this compatibility as part of their business plan, until access-related legislation is enforced and regulated it is unlikely that wireless technology will be as beneficial to the disabled community as it has the potential to be.

2.0 Independent and Community Living

A physical community offers residents the benefits of pooled resources, support and a general camaraderie. Because disabled persons are often limited in mobility or communication capabilities, they can be limited in their interaction with the other people in their immediate vicinity. According to recent data, nearly one-third of persons with disabilities report that they do not interact with the other people or take advantage of available resources in their community. (NCD, 2001a) In addition, persons with disabilities are more likely to experience feelings of isolation within their communities than their non-disabled neighbors. Increased engagement by disabled persons could be enhanced by concerted efforts from Federal, state and local governments, as well as the private sector, to mitigate the barriers that disabled persons face in civic participation. The attributes of community living offer potentially tremendous medical and social benefits to persons with disabilities. U.S. residents with disabilities should therefore have full access to community-based care, quality mental health services, access to the political process, and access to ADA-exempt organizations such as religious organizations and clubs.

Opportunities

Notwithstanding cost and other barriers, individuals with disabilities are increasingly integrating wireless and other information and communication technologies into their daily lives. These technologies are being used in a variety of places and for a wide range of activities, albeit at a lower rate than the general population. Disabled U.S. residents can participate in the various aspects of their communities thanks in part to wireless technologies – such as engaging in online commerce, obtaining e-government services, and accessing valuable information, with greater freedom of movement. Broadband connectivity will make it easier for disabled people to engage in distance learning programs or telemedicine and to access a whole new array of entertainment and services that are on the horizon. In response to the events of "9/11," current planning strategies concerning disaster mobilization are an opportunity for the disability advocates to remind civic leaders of their responsibility to plan for all citizens. Another facet of a community access is the various faith and religious opportunities that are vital to community life. Churches, synagogues and mosques need to be accessible to all who wish to worship. With the theme "Access: It begins in the heart," thousands of houses of worship have recently enrolled in the *Accessible Congregations Campaign.* (NOD, 1997)

Barriers

New technological advances that are not provided or disseminated in ways accessible or usable by people with sensory, physical, and cognitive disabilities reinforce patterns of community exclusion and isolation for disabled persons. An example of an existing participation barrier is disabled constituent participation in the governmental process. According to Harris Interactive's

election data, 41 percent of eligible voters with disabilities voted in the 2000 presidential election compared to 51 percent of all adults. (NOD, 2001) The same calculation in 1996 indicated that only 31 percent of adults with disabilities voted in the presidential election then, when 49 percent of all adults voted. Although the increase in voter participation among persons with disabilities is encouraging, many polling places remain inaccessible to wheelchair users and others with limited mobility. The inaccessible nature of the polling facilities and mechanisms is an unacceptable barrier to community participation on behalf of disabled residents. These populations could be assisted by the proper design of wireless and other electronic voting technologies. The 2002 Help America Vote Act mandates that all polling places have at least one polling station accessible to people with disabilities by January 1, 2006. The Act builds upon the Americans with Disabilities Act of 1990 and the Voting Accessibility for the Elderly and Handicapped Act of 1984. The 2002 Act assigned $100 million in grants to make polling places accessible to disabled persons, $40 million in grants for disability advocacy organizations in each state to ensure that proper services are provided that enable the disabled community to fully participate in the electoral process, and $20 million in grants to promote research and development in improving voting systems and equipment. (H.R. 3295) The legislation of this Act could mean significant positive changes for people with disabilities to have equal access to a basic right.

3.0 Employment Opportunities

The prevalence of high levels of under- and unemployment among U.S. residents with disabilities (68 percent) (Census, 2000) is economically inefficient and socially disadvantageous in light of recent disability policy, especially considering that skilled workers in many specialties remain in short supply. (DOL, 2003) The fact that computerization has both reduced the physical demands associated with many jobs and placed a premium on computer and related skills, facilitates a higher participation of disabled persons in the American workforce. Too often, even when people with disabilities find jobs, they are low-level, low-paying jobs. It is uncertain whether those disabled persons currently relegated to under-utilization and unemployment would be capable to enter and remain efficient members of the workforce if the necessary assistive technology were accessible and usable. In an era when computers and other forms of electronic and information technology are utilized in an increasing proportion in all businesses and fields, even in traditional manual-labor occupations such as manufacturing or agriculture, an investment in assistive technology could potentially result in an increased opportunity and higher level of employment among people with disabilities. Indeed, employment numbers should be increasing, if for no other reason than that there are new ways for people to be employed. The deaf and hard of hearing use wireless “instant messaging” to have real-time conversations; the blind and people who are visually impaired use voice-synthesis technology to write and read documents and website information; people with limited movement ability in a traditional office have new ways to work from home. The National Rehabilitation Association strongly supports the principle that employment is integral to both health and wellness. Therefore, return-to-work would be a part of return–to-health for persons with disabilities. (Stewart, 2002) It follows that enfranchising this group of U.S. citizens would improve the health and wellness of society as well.

Opportunities

In his *New Freedom Initiative*, President Bush supports providing employment opportunities to people with disabilities and therefore reducing their dependence on benefits and other assistance. Outlined in the *New Freedom Initiative* are commitments to expand teleworking opportunities; strong support for effective and swift implementation of the Ticket to Work and Work Incentives Improvement Act (TTWWIIA, PL 106-170); enforcement of the ADA and provision of tax incentives to encourage small business compliance; and promotion of innovative accessible transportation solutions. (Bush, 2001) The Ticket to Work Program is the cornerstone of the TTWWIIA. Through this program, people with disabilities now have more choices and expanded opportunities when attempting to go to work. The Ticket Program provides a Ticket to Social Security disability and Supplemental Security Income (SSI) that may be used to obtain rehabilitation and employment services. An individual may choose to receive services from a public or private service provider in their community. Service providers, called Employment Networks, work with Social Security and SSI beneficiaries to provide assistance designed to help with the transition to work. Because the Ticket Program is voluntary, people with disabilities who receive a Ticket are not required to work, but may choose to use their Ticket to attempt to work. Likewise, Employment Networks are not required to accept Tickets. The program started being phased in nationally in February 2002 and is expected to be fully implemented throughout the country by the end of 2003.

Barriers

Two of the major employment programs impacted by the Bush Administration's fiscal year 2003 budget proposal are the Projects with Industries and the Supported Employment program. (Stewart, 2002) As an addition to the Rehabilitation Act of 1968, the Projects with Industries program has developed linkages with the business community on behalf of disabled people that would be difficult to maintain without substantial involvement of state or local governments. The Supported Employment program has resulted in a strong emphasis on serving individuals with the most significant disabilities. The proposed changes could sharply curtail the use of Supported Employment services by a program that is already under-funded.

4.0 Expertise & Awareness

Gaining expertise in FT is akin to "swimming upstream," given the rapid pace at which technology itself is changing. While increasingly usable, products built upon wireless technologies still are not as accessible as they could be. Individuals with disabilities find themselves in need of FT to remain autonomous and productive, yet access to expertise to assist in obtaining such technology is limited. While modest investments have been made in increasing the pool of individuals with assistive technology knowledge and skills, there continues to be a significant shortage of available personnel with expertise in the field of FT. FT, as well as AT, expertise needs to be cultivated and expanded in pre-service preparation programs, consumer empowerment activities, and other training venues. In addition to expertise, aggressive awareness initiatives are needed to educate the public and potential users about the existence and benefit of the assistive technology available today. Recent reports continue to illustrate that consumers with disabilities are not aware of current assistive technologies that

could address their functional or cognitive disabilities. (NCD, 2000) These studies also suggest that disabled persons tend to rely on personal interactions with families, friends, and service providers to obtain information about FT and services.

Opportunities

One opportunity to impact this policy area is the State Assistive Technology Programs, funded under Title I of the Assistive Technology Act, provide information dissemination and training services across all disciplines, all disability and technology areas, and all funding streams. State AT programs facilitate the coordination of pre-service and in-service training designed to increase AT competencies across a variety of disciplines. Another responsibility of the AT programs are to coordinate community access centers that house equipment demonstration and short-term equipment loan programs that provide persons with disabilities hands-on access to devices and information needed to make decisions about what will meet their needs. State AT programs are charged with the facilitation of public and private collaborations with telecommunications service providers to ensure development and implementation of adaptive equipment programs. AT programs coordinate individual advocacy programs to assist consumers with their navigation through the complex policy system associated with assistive technologies. In addition, State AT programs are responsible for the implementation of change initiatives designed to increase access to assistive technologies through supportive policies and service delivery systems. (ATAP, 2000)

Barriers

Consumers, advocates, providers, and policymakers must possess or have ready access to knowledge concerning available and pending FT and specifically, AT, as well as a working knowledge of the technology's purpose and function, if they are to be an effective resource. In many states and regions, expertise in specialized areas of AT is in critically short supply. Pre-service preparation programs in education, health care, and other service areas are not producing sufficient numbers of personnel with AT knowledge to minimally meet needs of disabled consumers and related personnel. Similarly, consumers, providers and manufacturers are faced with the enormous task of trying to stay current in a technology area that is undergoing rapid change. This current culture of ignorance among the various players in producing and using assistive technologies is having a detrimental effect on the efficacy and proliferation of assistive technologies and products.

5.0 Health Care Coverage

Because the costs associated with purchasing, operating and maintaining assistive and facilitative technologies are very high, often the only opportunity to obtain such a device is through private insurance, Medicaid or Medicare assistance. Due to the disproportionate number of disabled people that are socio-economically disadvantaged, disabled persons must often rely on the latter two forms of medical assistance for acquiring FT. Because of their limited employment and reduced discretionary income, people with disabilities are more than twice as likely (28 percent versus 12 percent of others) to delay needed health care because they cannot afford it. (NOD, 2001a) "The current definitions of durable medical care, medical equipment, and medical

necessity provided by Medicaid and Medicare standards were enacted in the 1960s, when medical care was viewed primarily as curative and palliative, with little or no consideration given to increasing an individual's functional status." (NCD, 2000) Medicare coverage of FT reflects the narrow care bias that existed when the program was established in 1965. FT that does not meet narrow definitions of durable medical equipment or prosthesis are generally considered to be a "comfort" or "convenience" item. Technologies or devices falling outside these classifications are not covered, even when they are connected to the health or safety needs of the individual. As the largest payer for durable medical equipment, Medicare's standards are commonly followed for coverage of FT in private health insurance. In addition, the Medicaid program is the primary financing mechanism for health and long-term services for many people with disabilities. Because of these antiquated limitations of what can and cannot be covered under Medicare, Medicaid and private insurance, financial support for FT is severely limited. (NCD, 2000)

Opportunities

The Balanced Budget Act and Workforce Investment Act established an option for states to allow persons with disabilities to buy into Medicaid coverage. (Association of Tech Act Projects, 2000) Medicaid and Medicare policies regarding responsibility for FT purchase within long-term care per diems could be revised to clearly provide additional, adequate funding for FT for those Medicaid recipients whose services are "bundled" in long- term care rates. These changes would pave the way for comprehensive coverage of FT, such as hearing aids, power mobility, and augmentative communication devices, critical to the health and independence of individuals with disabilities. These changes would also affect private insurance plans, as many private plans defer to Medicare standards in the interpretation of their covered services. This influence on private insurance carriers would be an opportunity for facilitating changes in private insurance without intrusive Federal regulation. In a number of states, FT initiatives are working to implement state tax incentives on many devices and pieces of equipment in addition to providing tax credits for out-of-pocket assistive technology expenditures. For high-cost assistive technology, the savings to an individual with a disability can amount to hundreds of dollars. Beginning to show on the horizon of innovative health care coverage is the area of telemedicine or telehealth. Telemedicine is the idea that medical advice, education, and treatment may be made available to individuals via telecommunications devices such as email and video conferencing. Telemedicine would have the potential to reach many individuals in need of health care but who do not have easy access to it. These populations include rural communities where access is available but not accessible and the disabled community where individuals may not have the opportunity to physically go to a physician's office for consultation. Supporters of telemedicine emphasize that this technology is not meant to replace actual person-to-person consultation and interaction. However the technology may act as a useful and cost-savings supplement to it for a variety of illnesses and medical concerns.

Barriers

The primary barrier to wider access is cost. For example, some computers with adaptive technology can cost as much as $20,000. Couple these prohibitive costs with the unwillingness of private insurance carriers, Medicare or Medicaid to pay for such technologies, and the

financial barrier to such technology becomes very apparent. Individuals with disabilities frequently face low annual and lifetime reimbursement caps in the coverage of durable medical equipment and FT as part of the rehabilitative process. In addition, there are often severe limitations on the duration in which an individual can access assistive medical equipment benefits after an injury or accident. Often in such instances, the emphasis of assistance is frequently on meeting acute needs with limited provisions for devices required for long-term or functional improvement. (NCD, 1994)

6.0 Disability Policy Arena

The policy field addressing issues of disabilities is a convoluted arena of conflicting definitions, eligibility criteria, philosophical models, and requirements among various private and public entities. The goal of improving access to FT and wireless technology is a moving target. For example, just as inroads were made in ensuring FT coverage in health care plans, the health care industry underwent a fundamental change from fee-for-service to managed care in the early 1990s, and work began anew to ensure access to FT in managed care plans. Even when Federal policy is consistent, the vast majority of Federal programs are implemented at the state level with a corresponding myriad of inconsistencies and lack of coordination among various state agencies. As a result, FT access barriers continue to be created and removed at the state level, even when Federal policy is unchanged. Because disabilities transcend all gender, ethnic and age boundaries, the equally diverse Federal, state and local policies designed to assist disabled people only add to the confusion and frustration for people with disabilities, and associated advocacy organizations.

Opportunities

President Bush's *New Freedom Initiative* recognizes that agencies sharing responsibility for certain issues would be much more effective, efficient, and less duplicative if they were better coordinated. Both the Access Board and the Federal Communications Commission (FCC) used community-based disability groups when formulating, implementing and executing the provisions of Section 255 of the Telecommunications Act of 1996 and Section 508 of the Rehabilitation Act of 1973. This successful model of the government's role in disability policy represents a proactive example for governmental involvement in disability planning.

Barriers

People with disabilities, providers, advocates, and policy makers are expected to be knowledgeable about FT and the respective policies and procedures that govern their development, production and dissemination. But when each state maintains its own funding policies and procedures in addition to the various standards set forth by the assorted Federal programs, the relationships and responsibilities among the government entities can be quite confusing. "For example, some [FTs] that are "medically necessary" for a person under age 21 are suddenly no longer "medically necessary" when the person turns 21. In addition, some policies assert that [FTs] for medical restoration purposes can be funded if necessary for employment, but not if necessary for education. To navigate the [FT] policy maze, interested

parties must understand the [FT] portions of many different pieces of often contradictory Federal, state and local legislation." (NCD, 2000)

B. Telecommunications/Wireless Policy Issues

Table B presents six current issues that are associated through the interrelation between new wireless and telecommunications technologies and the capability for disabled persons to lead a more connected and accessible lifestyle. These include:

- Spectrum Allocation
- Location Technology
- Digital/Disability Divide
- Device Incompatibility
- Consumer Utility
- Inter-Carrier Text Messaging / Universal Design

These issues, as were those in the preceding section, were derived through research involving industry, not-for-profit and government sources for information pertaining to current initiatives and emerging trends in areas that fall within the scope of the Wireless RERC. Each constitutes a significant issue that currently exists at the intersection of wireless and telecommunications technologies and access/usability on behalf of those users who are disabled.

1.0 Spectrum Allocation

Radio spectrum is the portion of the electromagnetic radiation spectrum operating between the frequency limits of 9 kilohertz and 300 gigahertz. In the United States, the FCC is responsible for administering spectrum for non-Federal government usage. The regulatory responsibility for Federal government utilization of the spectrum falls to the National Telecommunications and Information Administration (NTIA) within the U.S. Department of Commerce. At issue in this analysis are the regulatory practices set forth by the FCC on the management of spectrum for third-generation wireless services.

If the next generation of the information superhighway is the wireless Internet, then radio spectrum is the concrete that will allow the construction of such a system. "Third generation", or 3G wireless technology, provides access to a wide range of telecommunication services supported by fixed and mobile telecommunication networks. 3G (and subsequent advanced) services promise a more connected, capable and efficient lifestyle for all potential users. While significant progress has been made towards achieving third-generation wireless services, the U.S. government currently lacks a comprehensive, long-term spectrum management plan to allow expansion of these services. Potential providers of 3G services have been lobbying for 120MHz of the current spectrum to be re-assigned for the expanded provision of 3G services. For those individuals who are disabled, the value of 3G technology goes beyond the mere novelty of such capabilities to a technology that supports a better standard of living. Through the compatibility of services and use of small pocket terminals with worldwide roaming capabilities, 3G technologies allow development of new wireless systems and devices that combine voice,

Internet, and multimedia services. With these capabilities never before possible, the services available to disabled persons through 3G technologies could provide the ability to lead a more accessible, independent and autonomous lifestyle.

Key Issues	TABLE B: Telecommunications/Wireless Policy Issues in Relation to the Objectives of the Wireless RERC				
	Pertinence	Positive Attributes	Negative Attributes	Opportunities	Barriers
1.0 Spectrum Allocation	The U.S. government currently lacks a comprehensive, long-term spectrum management plan to accommodate third-generation wireless services that could be used to improve the lives of disabled persons.	The proposed method of spectrum management would commit additional frequency to expand wireless services and capabilities.	Using market mechanisms for spectrum allocation could be a suboptimal solution to spectrum management.	The 120MHz of spectrum would allow the wireless industry to improve current service and coverage and provide the accommodations for future services and capabilities that would be of value to disabled persons.	Nascent technologies, such as smart antennas, could potentially disrupt the current process of designating spectrum for a specific use.
2.0 Location Technology	Location technology would allow for the capability to determine a wireless phone user's exact location for the delivery of emergency services (e911) as well as relevant consumer goods and services in a specific geographic area.	This technology would remedy the location dilemma associated with wireless phone 911 calls and serve as a locator for those persons who become disoriented or lost.	Issues related to privacy/security and infrastructure are connected with the ability to track a user's position. In addition, unwanted "spam" from advertisements in a given area could become a nuisance.	Location technology would allow monitoring of those individuals who become disoriented. In addition, the service could be configured to cater to a disabled person's specialized needs/services once in a given area.	Industry organizations have proposed that the following four principles be met before location technology could be implemented: • consumer notice • consent or "opt-in" security/integrity • being technology neutral.
3.0 Digital/Disability Divide	The term "digital divide" refers to a gap between those who have access and can effectively use new information and communication tools, such as the Internet, and those who do not. While a consensus does not exist on the nature of the divide (and whether the divide is growing or narrowing), researchers are nearly unanimous in acknowledging that some sort of difference in access exists at this point in time.	National funding to bridge the digital divide reached an all-time high in 2001. The investments from industry and government collaboration created jobs, expanded educational opportunities and even provided state-of-the-art health care to people far away from the nearest medical services. The productivity and economic growth during this period has been well documented.	The Bush FY03 budget eliminated over $100 million in public investments previously available for community technology grants and information technology training programs that offer real payoffs to rural communities, the working poor, minorities, children and persons with disabilities. Still, the Administration remains focused on closing the "attainment gap" and The President is seeking billions of dollars for educational reform.	Through the research and information dissemination efforts of the RERCs, an outreach program could facilitate the inclusion of disabled persons into the population that is included on the disadvantages side of the digital divide.	The conventional concept of the digital divide includes addressing access and use issues among socially, economically and geographically disadvantaged users. From the perspective of the RERCs, access and use barriers are also relevant to those individuals with disabilities. The digital divide movement is only now beginning to recognize this population.

Key Issues	TABLE B: Telecommunications/Wireless Policy Issues in Relation to the Objectives of the Wireless RERC				
	Pertinence	Positive Attributes	Negative Attributes	Opportunities	Barriers
4.0 Device Incompatibility	Compatibility refers to the capability of operating various wireless devices simultaneously with medical devices. Because the technologies rely on electronic spectrum to operate, the interference often causes one or both the devices to operate less efficiently.	With the proliferation of wireless technologies as methods of communication for disabled persons, compatibility will allow for the efficient coexistence of both vital communication and medical resources for persons with disabilities.	Because of interference in electronic compatibility, certain wireless devices that are vital to the communication capabilities of disabled persons are rendered inefficient around incompatible medical devices. Of particular concern is the interference between wireless phones and hearing aids.	The FCC has recognized the issue of device compatibility with regards to hearing aids and wireless phones. Through the many interests represented in the RERCs (industry, government, not-for-profit, academia), compatibility issues will be recognized in the development of future technologies and systems.[31]	Because the compatibility initiative transcends market brands, functions and even purposes, coordinating this concern could face complications as rival companies and different industries coordinate their resources and efforts.
5.0 Consumer Utility	Even though technology could be available to an individual, there remain issues concerning the ability to financially afford such technology and even how to inform persons that would not otherwise realize the value of such technology.	If a technology is available but not being utilized, especially by those who could feasibly benefit the most from such technology, then one could make an argument that the resource is being wasted. Removing the financial and awareness constraints to such technology would not only benefit the user, but the user's community as well.	Lack of available access to insurance coverage is a serious problem for persons with disabilities who need affordable "assistive technology" such as wireless or telecommunications devices that could maintain or improve their functional and cognitive capabilities.	Attitudinal and awareness barriers may be easier to mitigate than economic and technical barriers.	Lack of resources in low-income communities cannot explain the technology gap alone. The substantial costs associated with telecommunications hardware, combined with skepticism among the poor about the benefits technology might bring, hinder deployment of new information infrastructure in impoverished neighborhoods.
6.0 Inter-Carrier Text Messaging +Universal	As a component of universal design (UD), inter-carrier text messaging refers to the delivering of text messages between carriers, regardless of air interfaces or products.	Text messaging has become an effective way for disabled persons to communicate. Up until this point, text messaging was only available through the same carrier. This restriction prohibited communication between users who subscribed to different carriers.	To avoid conflicts, irregularities and inconsistencies there must be a provision to offer carriers a solution to ensure revenue generation from inter carrier-messaging transactions.	Increasing numbers of software and technological solutions that allow inter-carrier text messaging.	Until market-wide adoption of inter-carrier text messaging exists, there will continue to be barriers to those who want unrestricted access to send and receive messages.

[31] http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-01-320A1.txt

For example, 3G phones under development would help people with hearing impairments lead more independent lives. Hearing-impaired users will be able to call up news, weather and sports information in sign language from a video server via 3G phones, give commands to their phones in sign language, and access real-time interpretation services to aid them in communicating with hearing people. (Perera, 2001)

One of the FCC's functions is to set the rules for spectrum sharing (or non-sharing) through allocation, creating interference parameters and then acting as the arbitrator. In the past, the allocation of specific services into their own dedicated pockets of spectrum has fostered a special interest mentality toward the FCC's regulatory practices. The Commission often is faced with mediating cases of spectrum interference – in other words, contemplating whether certain spectrum interference gains outweigh other interference costs. The spectrum management objective of the FCC strives to create incentives for the efficient utilization of this valuable resource at every given point in time by established users and technologies as well as new entrants and nascent technologies.

Opportunities

The proposed changes to the spectrum allocation policies to allow for broader deployment of 3G technologies would support a new breed of assistive technologies to aid disabled persons in their pursuit of a better standard of living. The telecommunications industry would 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. In addition, a revamped process for spectrum allocation could set aside spectrum for uses that are not necessarily the most economical, but that offer the greatest benefit to society.

Barriers

The current methods of spectrum allocation and management could prove problematic for nascent technologies that allow for the manipulation of the spectrum that supports wireless telecommunications. For instance, satellite and terrestrial spectrum sharing scenarios, once believed impossible, are now becoming realities. Sophisticated ultrawideband technology that accommodates data at faster speeds at a lower power can theoretically co-exist with spectrum users in any frequency. Priority access capability allows for flexibility for a higher valued use some of the time, without having to dedicate specific frequencies to those uses all of the time. In addition, the Department of Defense's "XG" program seeks to produce even further advances in spectrum sharing technology through dynamic assignment of frequency, time and space. These competing technologies, should they materialize, could possibly complicate the current spectrum management process.

2.0 Location Technology

Location technology provides the ability to determine a wireless telecommunications user's location while the device is in operation. There are various processes to determine the location of a mobile device. One process is the "cell of origin" technique. In this procedure, the mobile

network base station cell area is used as the location of the mobile handset. The positioning accuracy achieved depends upon the network cell size, which, if outside of urban areas, can be large. Perhaps more accurate than the "cell of origin" technique, the "time of arrival" process determines the mobile handset position by measuring the time of arrival of a handset signal to at least three network base stations, which are synchronized to compute the coordinates of a user's location.

The ability to assess location – either from the user's standpoint or from an external source – has tremendous value to both the disabled and non-disabled population. This technology is most closely associated with the "e911" initiative to provide a wireless telephone user's location information. This location capability is often necessary to coordinate emergency services when the user is unable to communicate. Location technology also has potential for location specific advertising. Such advertising can notify a user when they are in a close proximity to a favorite restaurant or store. Location technology also has the potential to increase public safety by, for example, notifying a user about their proximity to a police station.

The e911 capability gives accurate and dependable location information in times of emergency regardless of a user's inability or disability to effectively communicate. In addition, the user could voluntarily "opt-in" to receive location notifications through a telecommunications device that would be germane to a user's disability. For example, a user could arrange to be notified when they are within a certain proximity to a dialysis clinic or even receive information about the accessibility of restaurants or stores within a certain radius to a user's location. The location technology would also be invaluable in the monitoring of those patients who wander off, or who have cognitive disabilities and may become disoriented and lost.

The costs associated with implementing e911 will be tremendous for the cell phone companies. To offset the costs associated with this program, the cell phone companies would likely recoup their investment by partnering with merchants for so-called location-based commerce, or "L-comm." (Said and Kirby, 2001) Merchants hope that phone customers will be receptive to receiving discounts and alerts tailored to their location and interests. Consumer advocates worry that the new technology will create a barrage of cell-phone junk mail and, more seriously, jeopardize phone customers' privacy. Because the proposed location technology within telecommunications devices would emit a signal revealing a user's location at any given moment, there is potential for that information to be used as a violation of a person's privacy and security. For example, if wireless service carriers track users' locations at all times, detailed records of a customer's daily movements could be created. Those files could be subpoenaed and held against the user in a divorce or other legal action. This raises 5th Amendment issues.[32]

Opportunities

On a broader scale, location technology can be used by the government to provide notices or alerts to persons in a given area about wrecks, emergencies, or breaking news stories that affect a very specific location. The ability to tailor news and information to a specific area would give

[32] The 5th amendment to the U.S. Constitution, a provision of the Bill of Rights, states that any person has the right to refuse to answer questions, in any government proceeding, on the grounds of possible self-incrimination.

citizens, businesses and governments the ability to make more efficient decisions about their time and resources.

Barriers

To protect the privacy of location information, members of the cellular and telecommunications industry have collaborated and support a four-point privacy protection platform. The first measure requires that cellular and telecommunications providers inform their customers about the collection and use of location information. The next provision concerns a consent or "opt-in" provision, providing customers with the ability to consent prior to the collection and use of location information. In addition, the cellular and telecommunications providers would like to ensure the security and integrity of the collection location data, along with a provision to permit customer verification of the data. Lastly, the consortium believes that a technology-neutral provision would be necessary to provide uniform privacy rules and expectations for those services that utilize location technology.

3.0 Disability Divide

The expression 'disability divide' draws upon the term 'digital divide' refers to a gap between those who have access to, and can effectively use, new information and communication tools, such as the Internet, and those who do not have such access, specifically in regard to people with disabilities. While a consensus does not exist on the extent of the divide (and whether the divide is growing or narrowing), researchers are nearly unanimous in acknowledging that some sort of divide exists at this point in time. The term, "disability divide," a variant of digital divide, has recently emerged into the mainstream as it relates to the disabled community. This term is meant to refocus awareness of how the digital divide (generally thought of as the opportunity gap between the wealthy who have access to advanced technologies and the poor who do not) affects people with disabilities specifically, and to address the gap that remains between abled and disabled people despite advances in assistive technologies and more widespread awareness of implementing universal design. While creating web sites and technology that is accessible by all, it is equally important to improve beyond accessibility standard minimums. While building ramps to ensure access to a building addresses accessibility, building wheelchairs that can climb stairs pushes accessibility standards even farther.

"For many people with disabilities some new technologies are as much or more a barrier to than a source of access and inclusion. The cellular telephone is a great boon to many, but for people who use hearing aids, problems of incompatibility have made cell phones largely inaccessible and unusable. The graphical user interface has vastly enhanced access to high-speed data and pictures, but if Web sites are not designed with persons who use speech access in mind, these ubiquitous technologies become impenetrable walls checking access to the wealth of information and opportunity the Web conveys." (NCD, 2002)

Despite the substantial growth of the Internet since the early 1990s, some citizens still do not have access to basic information technology (IT) tools, hardware, software, or the Internet itself. Access is an issue that affects people at home, at school and in the community at large. The disabled community, including the visually impaired, the homebound, and millions of people

with other disabilities, often find themselves lacking access to basic Internet tools because of the limited investments in FT development, marketing, and dissemination.

National funding to bridge the digital divide reached an all-time high in 2001. Thanks in large part to industry and government collaboration, there was a substantial increase in investments during the last six years that enabled many communities to embrace digital technologies. The impact of this increased investment to remedy the digital divide produced new employment opportunities, expanded educational opportunities and even provided state-of-the-art health care to people far away from the nearest medical services.

This "disability divide" is a significant issue; in 1998, the Current Population Survey data showed that Americans with disabilities were "less than half as likely as their non-disabled counterparts to have access to a computer at home. The gap in Internet access is even more striking: almost three times as many people without disabilities have the ability to connect to the Internet at home as those with disabilities." (Kaye, 2000) The suggestion that people with disabilities have the most to gain from access to technology (social, economic, and personal gains) illustrates the significance of this divide.

Opportunities

The recent economic downturn has reduced potential state, local, foundation and corporate resources available for initiatives and investment in digital opportunity activities to bridge the digital divide. Continued Federal leadership and support for technology access, training, innovation and research is important if economically, geographically and disabled "have-nots" are to use information technology to break the cycle of economic and education disadvantages.

Barriers

The conventional concept of the digital divide includes addressing access and use issues among socially, economically and geographically disadvantaged users. Access and use barriers are also relevant to those individuals with disabilities. According to the most recent census data available, approximately 21 percent of those individuals aged 25-64 who consider themselves as possessing "any disability" fall at or below the designated poverty level – as compared to only 8 percent of the non-disabled population. (U.S. Department of Commerce, 2001) As evidenced by this data, a disproportionate number of disabled persons are classified as living in poverty compared to the non-disabled portion of the population. Thus, a larger number of disabled persons are affected by the digital divide than non-disabled persons.

4.0 Device Incompatibility

Device incompatibility refers to the inefficient operation (or inoperability) of one or more electronic devices due to interference in operating mechanisms or media. For the purpose of this analysis, device incompatibility encompasses those electronic devices that are utilized by disabled persons as well as the medical devices employed by such persons.

Inadequately shielded medical devices may be incompatible with many radio frequency sources including televisions, electronic power lines, pagers, AM, FM, CB, and amateur radios, police, fire, ambulance and paramedic radios, wireless personal computers and modems, wireless, cordless, and landline phones. The medical devices that many disabled persons depend on to achieve an acceptable standard of living could be rendered ineffective through interference with the frequency emitting devices listed above. The ineffectiveness or sub-optimal level of performance of medical devices utilized by this portion of the population could pose a serious or even fatal risk to a disabled person.

Wireless telecommunications has the potential to provide improved health care at lower cost to patients. Wireless telecommunications devices can offer health care administrators a method for managing their entire EMC environment. In that way, hospitals can experience the benefits that wireless technologies, like wireless phones, bring to health care and patient management. Studies have shown that hospitals that install compatible wireless telecommunications systems have demonstrated a significant improvement in the quality and efficiency of healthcare.

The digital electronics revolution brings many benefits to consumers, including advanced wireless telecommunications. However, the proliferation of digital technologies has also generated some interference and "growing pains" with devices designed before digital technologies became ubiquitous. Thus, many of these older devices do not include sufficient immunity to newer technologies. Of particular concern are the millions of people who rely on hearing aids to augment poor sound perception. Some hearing aid wearers may experience interference (typically a "buzz") when in a close proximity to certain wireless telecommunications devices that are in use. Because information relating to device compatibility does not currently exist, it is the individual’s responsibility to determine the compatibility of hearing aid devices and the various telecommunications technologies.

Opportunities

In issuing a Notice of Proposed Rulemaking (NPRM), the FCC has begun its position concerning hearing aid compatibility with respect to wireless telecommunications devices. (FCC, 2001) The Cellular Telecommunications and Internet Association (CTIA) and its member companies are taking a leadership role in bringing relevant industries and experts together to better define the compatibility issues concerning wireless telecommunication devices. In addition, the Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma [http://www.ou.edu/engineering/emc/] is an independent center dedicated to the investigation, education and dissemination of information related to the electromagnetic compatibility of electronic equipment with wireless devices.

Barriers

Issues relating to power, distance, and shielding (or combinations of the three) are the three main factors that contribute to device incompatibility between telecommunications technologies and medical devices. To remedy these problems, there exist three possible courses of action: the emitted signal strength must be decreased; the interference-prone device must be moved away

from the signal; or the signal from the device must be blocked through an increase in the shielding around the medical device. Because the compatibility issue transcends market brands, producers and even functions, the realization of the remedies outlined above depends on the coordination and cooperation between rival companies and industries. Because such cooperation may not be in the economic best interests of a producer, there could exist substantial market barriers to achieving device compatibility.

5.0 Consumer Utility

This issue is concerned with the barriers created by cost and awareness of technology that persons with disabilities may have in obtaining or effectively utilizing wireless technologies. In differentiating itself from the digital divide concern, consumer utility examines the cases where the technology exists, but is not being efficiently utilized due to an array of financial and awareness issues.

Even though valuable wireless telecommunications technologies are available to disabled individuals, there remain issues concerning the ability to financially afford such technology. In addition, some members of the disabled population may not even be aware of the potential value of a particular technology or product, or how to utilize a product or technology in order to produce maximum usage value.

To the portion of the population that is both economically challenged and disabled, the lack of access to insurance coverage is an overwhelming barrier to assistive telecommunications technologies. For this population, access to FT may be largely limited to health insurance providers, however legislation requiring FT be covered by insurance plans is lacking. Although the enactment of the ADA marked significant progress toward providing equal opportunity to employment and services for persons with disabilities, it did not provide similar opportunity for access to health insurance. For persons with disabilities, concerns about access to adequate and affordable health insurance drive decisions about many aspects of life. These decisions in turn are correlated to other choices on occupation, employment and living arrangements.

Opportunities

Extending the information revolution through telecommunications technologies to those who are both economically disadvantaged and disabled is not solely focused on providing affordable, equitable and usable access to technology and knowledge. The process must also involve the support, development and sustainability of procedures that are both valuable and relevant in the lives of people who use them. To remedy this cost and awareness dilemma, not-for-profit organizations must become more responsible for addressing, coordinating and delivering services in response to the increasingly wide range of needs that the disabled population requires. Not for profits are more than just medium through which information resources are distributed to individuals. These organizations' proximity to and experience with those they serve contributes to their roles as community facilitators. In this role, not-for-profits can play an important role as early adopters and disseminators of tools, resources, and practices most likely to succeed in addressing the cost and awareness barriers associated with access to useful telecommunications technologies.

Barriers

Lack of technological resources in low-income communities does not explain the technology gap alone. The substantial costs associated with telecommunications hardware, combined with skepticism among the poor about the benefits technology might bring, also hinder deployment of new information infrastructures in impoverished communities. Many disabled and low-income people are skeptical about the value of wireless technologies – an attitude derived from inexperience or a negative previous exposure with technology. This bias must be addressed if the value of telecommunications technologies is to be realized by low-income persons with disabilities.

6.0 Inter-Carrier Text Messaging as a Component of Universal Design

"Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." (NCSU, 1997) As a component of universal design, inter-carrier text messaging is the ability to compose and deliver text messages between carriers and devices regardless of network, interface or device.

Text messaging has long provided a medium for communication-impaired people to effectively communicate. Those individuals with speech disabilities can input a message via a keyboard apparatus into a wireless telecommunications device and send the message to another machine that is capable of receiving text messages.

To date, text messaging has failed to catch on as a mainstream form of communication in the U.S. Until spring of 2002, text messaging was only available through the same carrier. Despite the recent advances in text messaging technology, and better inter carrier compatibility, the feature is still widely underused among all users in the United States Users wishing to communicate via text messaging are required to have compatible devices and interfaces; this restriction prohibits communication between users who subscribe to different carriers and who used different devices. These obstructions can and likely will be eliminated if the demand for a flexible text messaging infrastructure increases among all users, at which point a natural push for inter carrier compatibility would occur.

Because text messaging generates revenue for carriers, there must exist an economical solution to allow inter carrier text messaging that optimizes the financial interests of both users and providers. To avoid billing complications and irregularities associated with communications between two carriers, text messaging has thus far been managed by one carrier at a time. In order to promote this communication method as a reliable and effective process, the carriers must agree on billing procedures so as not to discourage users and impede technology development.

Opportunities

The most significant obstacle inhibiting the growth of text messaging in the U.S. has been the lack of interoperability between carriers. By removing this barrier, U.S. consumers and businesses will have the opportunity to adopt messaging services en masse, as evidenced in other countries around the world that have supported inter-carrier text messaging. For example, Cingular Wireless TDMA (time division multiple access) released a text messaging service in March 2002 that is compatible with the phones of all text-enabled users in the U.S., regardless of their wireless carrier. In addition, the inter-carrier messaging offered by AT&T Wireless will be

available to post-paid and prepaid subscribers in all of the company's TDMA and GSM (Global Standard Mobile). InphoMatch, a wireless messaging application provider, provides software for AT&T's inter-carrier messaging services. The software will allow users to send messages between and across U.S. carriers simply by inputting the recipient's wireless phone number without requiring a separate e-mail address.

Barriers

Until carriers implement universal adoption of inter-carrier text messaging, barriers will continue to exist for those who wish to communicate via this medium. The economic aspect of inter-carrier adoption is crucial to including those carriers who do not have the resources or coverage to compete with the larger, more established providers of text messaging.

III. 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

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. [http://www.wirelessrerc.org/news/policyassessment.html]

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.
[http://www.ncd.gov/newsroom/publications/progressreport_07-26-02.html#chap11]

Disability "Divide" (access to technology and accessibility of technology): Access to telecommunications 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 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.
[http://www.ncd.gov/newsroom/publications/progressreport_07-26-02.html#chap11].

E-911 (wireless) call accuracy: 911 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. [http://www.fcc.gov/cgb/dro/e911tty.htm]

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.
[http://www.whitehouse.gov/news/releases/2003/02/20030212-12.html]

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 this website is to provide individuals with access to government information and resources related to disability issues and the President's New Freedom Initiative (http://www.hhs.gov/newfreedom/) all from a single location, DisabilityInfo (http://www.disabilityinfo.gov/).

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." (ICDR)
[http://www.ed.gov/PressReleases/02-2003/02242003.html]

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**. [**http://www.wirelessrerc.org/news/policyassessment.html]

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. [http://www.wirelessrerc.org/news/policyassessment.html]

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. [see: http://www.fcc.gov/cgb/dro/links.html]

IV. Barriers to Access/Use

The policy issues examined in the preceding sections represent significant focal areas from both a disability and wireless telecommunications perspective that impact access to technology. 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**.

A. Awareness/Proficiencies

A primary concern associated with the deployment and use of wireless and other telecommunications technologies by people with disabilities is a lack of awareness that a given technology exists, or that it could be of benefit. 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.

B. 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.

C. 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.

V. 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:

- Proposed policy/regulatory interventions
- Market mechanisms
- Outreach/awareness prospects

A. Proposed 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* (Bush, 2001) 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. Finally, the initiative also promotes better access to community life for people with disabilities through financing options for purchasing homes, and ensuring the accessibility of community organizations such as churches and civil society institutions. As a component of President Bush's *New Freedom Initiative* (Bush, 2001), 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.

B. 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 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. According to the most recent Census data, about 1 in 5 U.S. residents are considered somewhat disabled, with approximately 1 in 10 being considered severely disabled. (U.S. Department of Commerce, 1997) 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.

C. 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. As noted above, the financial incentive to implementing an effective advertising campaign simply does not exist from the manufacturers' point of view. Therefore, other means must be employed to deliver the relevant information to those who can benefit from such assistive technologies the most – disabled persons. There exist four primary mediums through which information can be effectively disseminated to unsuspecting and potential beneficiaries of assistive telecommunications technologies, products and methodologies: industry or not-for-profit organizations, conferences, government entities and user forums.

Organizations

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.

Quick reference and referral guides to products and technologies are often available through these various organizations. In addition, these organizations will offer and coordinate user-training workshops for those who want to familiarize themselves with research methods and procedures. These organizations also produce a tremendous amount of documentation regarding AT products, technologies and methodologies. Some of the key organizations are discussed in section I part B.

Conferences

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.

Listed below are examples of several pertinent assistive technology conferences that have been held:

- 18th Annual CSUN Conference: Technology and Persons with Disabilities: March 19-22, 2003, Los Angeles, CA.
- RESNA 26th International Conference on "Technology & Disability: Research, Design, Practice & Policy": June 19-23, 2003, Atlanta, GA.
- 7th European Conference for the Advancement of Assistive Technology in Europe: August 31 - September 3, 2003, Dublin, Ireland.

Government Entities

Former President Reagan signed the Technology-Related Assistance for Individuals with Disabilities Act, otherwise known as the "Tech Act," into law on August 19, 1988. It 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. Listed below are some of the Technology Assistance projects that can be found in the Southeast:

- **Alabama**
  Statewide Technology Access and Response (STAR) System for Alabamians with Disabilities
  Alabama Department of Rehabilitation Services
  [http://www.rehab.state.al.us/star]
- **Florida**
  Florida Alliance for Assistive Services and Technology (FAAST)
  [http://www.faast.org]
- **Georgia**
  Tools for Life
  Department of Labor/Tools for Life
  [http://www.gatfl.org/]
- **South Carolina**
  South Carolina Assistive Technology Program (SCATP)
  [http://www.sc.edu/scatp/]
- **Tennessee**
  Tennessee Technology Access Project
  [http://www.state.tn.us/mental/ttap.htm]

User Forums

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. Consumers and developers have the opportunity to share their experiences with specific AT products. 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 are examined below:

- The popular msn.com and web portal 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 where anyone can ask questions and share information 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.

VI. 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 other RERCs (see Appendix C for a complete analysis of the pertinent RERCs) 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 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.

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Appendix A

Major Disability-Related Legislation

1956 - 2003

MAJOR DISABILITY-RELATED LEGISLATION 1956-2003[33]

YEAR	TITLE	PUBLIC LAW	CONTENT
1956	Social Security Amendments of 1956	P.L. 84-880	Established the Disability Insurance Trust Fund under Title II of the Social Security Act and provided for payment of benefits to workers with disabilities under the Social Security Disability Insurance program. Benefits were limited to workers age fifty and older.
1958	Captioned Films for the Deaf Act	P.L. 85-905	Permitted the Office of Education to purchase, lease, or accept films (primarily recreational films), provide captions for them, and distribute them through state schools for the deaf, as well as through other appropriate state agencies.
1960	Social Security Amendments of 1960	P.L. 86-778	Eliminated the limitation on benefits to workers over age fifty (1956), and encouraged workers by authorizing a nine-month trial work period during which the beneficiary could have earnings without jeopardizing benefits.
1963	Social Security Act Amendments of 1963	P.L. 88-156	Established a new project grant program to improve prenatal care for women from low-income families for whom the risk of mental retardation and other birth defects was known to be inordinately high. In addition, authorizations for grants to the states under the Maternal and Child Health and Crippled Children's programs (originally established in 1935 under P.L. 74-271) were increased and a research grant program was added.
1963	Mental Retardation Facilities	P.L. 88-164	Authorized Federal support for the construction of mental

[33] Credit for this compilation through 1999 goes to Robert Silverstein, Director of the Center for the Study and Advancement of Disability Policy.

	Construction Act of 1963		retardation research centers, university-affiliated training facilities, and community service facilities for children and adults with mental retardation.
1965	Elementary and Secondary Education Act of 1965	P.L. 89-10	The core of the Act, Title I, authorized a multi-billion dollar program of aid to assist the states and local school districts in providing compensatory education to educationally disadvantaged children residing in low-income areas.
1965	Social Security Act Amendments of 1965	P.L. 89-97	Title XVIII (Medicare) authorized health insurance benefits for eligible elderly persons or eligible persons with disabilities. Direct payments are made for medical services on behalf of eligible participants through "fiscal intermediaries," for example, private health insurance companies. "Part A" reimbursed hospitals and other covered entities. "Part B" provided supplemental medical insurance benefits. Title XIX authorized grants-in-aid to the states for the establishment of a medical assistance program to improve the accessibility and quality of medical care for low-income individuals (Medicaid).
1965	Elementary and Secondary Education Act Amendments of 1965	P.L. 89-313	Authorized aid to state agencies operating and/or supporting schools for children with disabilities.
1966	Library Services and Construction Act Amendments of 1966	P.L. 89-511	Authorized assistance for students with physical or mental disabilities who were in residential schools operated or substantially supported by the state. Part B of Title IV of the Act made Federal funds available to state agencies for library services for individuals who were certified by a responsible authority as unable to read or to use conventional printed materials as a result of physical limitations. Such services could be provided through public or nonprofit library agencies or organizations.
1966	Military Medical Benefits Act	P.L. 89-614	Expanded health care benefits for dependents of active

	Amendments of 1966		duty members of the uniformed services (the Army, Navy, Marine Corps, Air Force, Coast Guard, and the commissioned corps of Public Health Service). Under the expanded benefits of the Civilian Health and Medical Program of the Uniformed Services Program (CHAMPUS) for the handicapped, the spouse or child of an active duty member is eligible for services if he or she has a serious physical disability or is moderately to severely mentally retarded.
1967	Mental Retardation Amendments of 1967	P.L. 90-170	Authorized Federal funds to assist in the cost of initiating services in community mental retardation facilities.
1967	Elementary and Secondary Education Act Amendments of 1967	P.L. 90-247	Expanded instructional media programs to provide for the production and distribution of educational media for the use of persons with all types of disabling conditions (not just deafness), their parents, actual or potential employers, and other persons directly involved in working on behalf of persons with disabilities.
1967	Social Security Act Amendments of 1967	P.L. 90-248	Added a list of mandatory and optional services under the Medicaid program and required participating states to offer early and periodic screening, diagnosis, and treatment services to all Medicaid-eligible children.
1968	National School Lunch Act and Child Nutrition Act of 1968	P.L. 90-302	The childcare component provided Federal assistance for meals served in institutions providing nonresidential day care for children. Facilities eligible to participate included day care centers, settlement houses, recreation centers, and institutions providing day care for youngsters with disabilities.
1968	Architectural Barriers Act of 1968	P.L. 90-480	Required buildings and facilities designed, constructed, altered, or financed by the Federal government after 1969

			to be accessible to and usable by persons with disabilities.
1968	Vocational Education Act Amendments	P.L. 90-576	Required each state to earmark ten percent of its basic grant for services for youth with disabilities.
1970	Elementary and Secondary Education Act Amendments of 1970	P.L. 91-230	Created a separate Act, The Education of the Handicapped Act (EHA). Part B authorized grants to states to assist them in initiating, expanding, and improving programs for the education of children with disabilities. EHA also established several competitive grant programs such as personal preparation, research, and demonstration.
1970	Urban Mass Transportation Act Amendments of 1970	P.L. 91-453	Required eligible local jurisdictions to plan and design mass transit facilities and services so that they would be accessible to and useable by people with disabilities.
1970	Developmental Disabilities Services and Facilities Construction Amendments of 1970	P.L. 91-517	Included broad responsibilities for a state planning and advisory council to plan and implement a comprehensive program of services for persons with developmental disabilities. In addition, the legislation authorized grants to support interdisciplinary training in institutions of higher education of personnel providing services to persons with developmental disabilities (currently known as university-affiliated programs).
1971	Amendments to Title XIX of the Social Security Act (Medicaid Program)	P.L. 92-223	Authorized public mental retardation programs to be certified as intermediate care facilities; and require that these programs offer, among other things, “active treatment.”
1972	Small Business Act Amendments of 1972	P.L. 92-595	Expanded the authority of the Small Business Administration to provide direct and guaranteed loans for nonprofit sheltered workshops employing persons with disabling conditions and individuals with disabilities interested in establishing their own businesses.

1972	Social Security Amendments of 1972	P.L. 92-603	Repealed existing public assistance programs and added in their place a new Title XVI (Supplemental Security Income, SSI) program. This program authorizes cash benefits for individuals and couples who are aged, blind, or disabled. In addition, children under eighteen years of age with disabilities or blindness are eligible for benefits, provided that their disabilities were comparable in severity to adult recipients. Medicare coverage was authorized for Social Security beneficiaries with disabilities after they fulfilled a specified waiting period.
1973	Social Security Disability Act Amendments of 1973	P.L. 93-66	Tied increases in benefit levels under the disability insurance program to the Consumer Price Index, thus authorizing automatic annual cost-of-living adjustments in benefit payments.
1973	Federal-Aid Highway Act of 1973	P.L. 93-87	Authorized the use of funds under the Highway Program "to provide adequate and reasonable access for the safe and convenient movement of physically handicapped persons, such as across curbs constructed or replaced at all pedestrian crosswalks throughout the states." Improvement funds may also be used for providing accessible rest stop facilities
1973	Rehabilitation Act of 1973	P.L. 93-112	Included a complete revision of the state formula grant supporting the vocational rehabilitation program and the competitive programs supporting personnel development, research, and demonstrations. In addition, the legislation, among other things, adds "Section 502," which established the Architectural and Transportation Barriers Compliance Board to enforce the Architectural Barriers Act of 1968 and provide technical assistance to agencies subject to section 504 regulations. Also included in the legislation is "Section 504," which prohibited discrimination against otherwise qualified persons with

			disabilities in any program or activity receiving Federal funds. The legislation also contains "Section 508," which requires that Federal agencies' electronic and information technology is accessible to people with disabilities
1973	Amtrak Improvement Act of 1973	P.L. 93-146	The National Railroad Passenger Corporation was directed to take all steps necessary to ensure that no elderly or handicapped individual is denied intercity transportation on any passenger train operated by or on behalf of the Corporation. Steps include: acquiring special equipment and devices and conducting special training for employees; designing and acquiring new equipment and facilities and eliminating architectural and other barriers in existing equipment or facilities; and providing special assistance to persons who are elderly or disabled while boarding and alighting and within terminal areas.
1974	Housing and Community Development Amendments of 1974	P.L. 93-383	Expanded the low-income rent subsidy program under "Section 8" to include families consisting of single persons with disabilities. The legislation also extended the "Section 202" direct loan program to nonprofit agencies to projects for persons with mental as well as physical disabilities.
1974	Elementary and Secondary Education Amendments of 1974	P.L. 93-380	Included amendments to Part B of the Education of the Handicapped Act (EHA) that laid the basis for comprehensive planning, the delivery of additional financial assistance to the states, and the protection of handicapped children's rights.
1974	Urban Mass Transportation Act Amendments of 1974	P.L. 93-503	Required project applicants to assure that the fares charged to the elderly or persons with disabilities during non-peak hours do not exceed one-half of generally applicable rates for other riders during peak hours. In addition, localities were permitted under this Act to

			transport riders who are elderly or disabled free of charge and still be eligible for Federal grant aid.
1974	Community Services Act	P.L. 93-644	Stipulated that ten percent of children enrolled in the Head Start program must be children with disabilities.
1974	Social Services Amendments of 1974	P.L. 93-647	Consolidated social service grants to states under a new Title XX of the Social Security Act.
1975	Developmental Disabilities Assistance and Bill of Rights Act	P.L. 94-103	Created a "bill of rights" for persons with developmental disabilities, funded services for persons with developmental disabilities, added a new funding authority for university affiliated facilities, and established a system of protection and advocacy organizations in each state.
1975	Education for All Handicapped Children Act	P.L. 94-142	Amended the Education of the Handicapped Act to mandate a free appropriate public education for all children with disabilities in a state, regardless of the nature or severity of the child's disability (Part B of the Education of the Handicapped Act).
1977	Tax Reduction and Simplification Act	P.L. 95-30	Congress authorized a special tax credit to induce businesses to hire certain categories of chronically unemployed workers, disadvantaged youth, welfare recipients, and other hard to place persons, including individuals with disabilities.
1977	Legal Services Corporation Act Amendments of 1977	P.L. 95-222	Required the Corporation to establish procedures for determining and implementing service priorities, taking into account the relative needs of clients eligible for assistance, including people with disabilities and other individuals facing special difficulties in accessing legal services.
1978	Civil Rights Commission Act Amendments of 1978	P.L. 95-444	Expanded the jurisdiction of the Civil Rights Commission to include protection against discrimination on the basis of

			handicap.
1978	Rehabilitation, Comprehensive Services, and Developmental Disabilities Amendments	P.L. 95-602	Established the National Institute of Handicapped Research and new programs for people with disabilities, including comprehensive service centers, independent living centers, recreation programs, and pilot programs for employment. The legislation also updated and made functional the definition of the term “developmental disability” and clarified the functions of the university-affiliated programs
1979	Food Stamp Act of 1979	P.L. 96-58	Authorized food stamps for residents of community living arrangements for persons with blindness or disabilities, by redefining “eligible households” to include disabled or blind recipients of benefits under Title II or Title XVI of the Social Security Act who are residents in a public or private nonprofit group living arrangement that is certified by the appropriate state agency or agencies regulations issued under section 1616(e) of the Social Security Act.
1980	Civil Rights of Institutionalized Persons Act	P.L. 96-247	Authorized the U.S. Department of Justice to sue states for alleged violations of the rights of institutionalized persons, including persons in mental hospitals or facilities for people with mental retardation
1980	Social Security Act Amendments	P.L. 96-265	Authorized special cash payments (section 1619(a)) and continued Medicaid eligibility (section 1619(b)) for individuals who receive Supplemental Security Income (SSI) benefits but, nonetheless, engage in substantial gainful activity. The provision was made effective for three years.
1980	Federal Advisory Committee Act	P.L. 96-523	Permitted the employment of personal assistants for Federal employees with disabilities both at their regular duty station and while on travel status

1981	Omnibus Budget Reconciliation Act	P.L. 97-35	Consolidated six programs authorized under Title V of the Social Security Act into a single block grant authority (Maternal and Child Health) to address, among other things, the needs of children with special health care needs. In addition, the existing Title XX program was converted into a Social Services Block Grant Program. Authorized the Secretary of Health and Human Services to grant "home and community-based" waivers to enable states to furnish personal assistance and other services to individuals who, without such services, would require institutional care as long as costs under the waiver do not exceed the cost of providing institutional care to the target population. Limited Child Care Program to children up to age twelve, except children with disabilities, for whom no age limit was set.
1981	Small Business Act Amendments of 1981	P.L. 97-35 (within the Omnibus Budget Reconciliation Act of 1981)	Placed the Handicapped Assistance Loan Program administratively within the regular SBA loan system.
1982	Tax Equity and Fiscal Responsibility Act of 1982	P.L. 97-248	Permitted states to cover under their Medicaid plans home care services for certain children with disabilities, even though family's income and resources exceeded state's normal eligibility standards.
1982	Job Training Partnership Act	P.L. 97-300	Revamped the Comprehensive Employment and Training Act (CETA). The Act emphasizes training for private sector jobs. The Act established a "State Job Training Coordinating Council" and the "Private Industry Council (PIC)".

1982	Telecommunications for the Disabled Act of 1982	P.L. 97-410	Required that workplace telephones used by persons with hearing aids and emergency phones be hearing-aid-compatible.
1984	Rehabilitation Act Amendments of 1984	P.L. 98-221	Transformed the National Council on Disability from an Advisory Board in the Department of Education into an independent Federal agency.
1984	Voting Accessibility for the Elderly and Handicapped Act	P.L. 98-435	Required that registration and polling places for Federal elections be accessible to persons with disabilities.
1984	Child Abuse Amendments of 1984	P.L. 98-457	Required states to enact procedures or programs within child protection agencies to respond to cases in which medical treatment is withheld from disabled infants.
1984	Social Security Disability Benefits Reform Act of 1984	P.L. 98-460	Extended the section 1619 worker incentive program under SSI for an additional three years. The 1984 amendments also required the Secretary of HHS to publish uniform standards for SSI and SSDI disability determinations.
1984	Developmental Disabilities Act of 1984	P.L. 98-527	Added a statement of purpose to the Act and authorized protection and advocacy systems to have access to the records of persons with developmental disabilities residing in institutions.
1985	Consolidated Omnibus Budget Reconciliation Act of 1985	P.L. 99-272	Authorized states to cover case management services on less than a statewide or comparable basis to targeted groups under Medicaid; expanded the definition of "habilitation" for Home and Community-Based Waiver recipients with developmental disabilities to cover certain pre-vocational services and supported employment for previously institutionalized individuals; authorized states to cover ventilator-dependent children under the waiver program if they would otherwise require continued

			inpatient care.
1986	Protection and Advocacy for Mentally Ill Individuals Act of 1986	P.L. 99-319	Established a formula grant program operated by existing protection and advocacy systems primarily focusing on incidences of abuse and neglect of mentally ill individuals.
1986	Education of the Deaf Act of 1986	P.L. 99-371	Changed the name of the school from "Gallaudet College" to "Gallaudet University," and extended the statutory authority of the National Training Institute for the Deaf (a residential facility for postsecondary technical training and education for individuals who are deaf in order to prepare them for successful employment) (Title II). Established a Commission on Education of the Deaf under Title III of the Act. The Commission consists of twelve members that study the quality of infant and early childhood programs, as well as elementary, secondary, postsecondary, adult, and continuing education programs for individuals who are deaf. The Commission makes recommendations to the President and Congress for improving current programs and practices.
1986	Handicapped Children's Protection Act	P.L. 99-372	Overturned a Supreme Court decision and authorized courts to award reasonable attorneys fees to parents who prevail in due process proceedings and court actions under part B of the Education of the Handicapped Act.
1986	Air Carriers Access Act	P.L. 99-435	Prohibited discrimination against persons with disabilities by air carriers and provided for enforcement by the U.S. Department of Transportation.
1986	Education of the Handicapped Act Amendments	P.L. 99-457	Included a new grant program for states to develop an early intervention system for infants and toddlers with disabilities and their families and provide greater incentives for states to provide preschool programs for children with disabilities between the ages of three and

			five.
1986	Amendments to the Job Training Partnership Act	P.L. 99-496	Required special consideration for persons with disabilities in the awarding of discretionary grants.
1986	Higher Education Act Amendments of 1986	P.L. 99-498	Authorized construction/renovation grants and loans to institutions of higher education. Among the purposes for which funds under this Act may be used is to bring academic facilities into compliance with the Architectural Barriers Act of 1968 and section 504 of the Rehabilitation Act of 1973.
1986	Rehabilitation Act Amendments of 1986	P.L. 99-506	Clarified that supported employment is a viable outcome of vocational rehabilitation and specified that states must plan for individuals making the transition from school to work.
1986	Tax Reform Act of 1986	P.L 99-514	Extended “targeted jobs tax credit” through 12/31/88.
1986	Employment Opportunities for Disabled Americans Act	P.L. 99-643	Made the section 1619(a) and 1619(b) work incentives a permanent feature of the Social Security Act. The Act also added provisions to enable individuals to move back and forth among regular SSI, section 1619(a) and section 1919(b) eligibility status.
1987	Developmental Disabilities Assistance and Bill of Rights Act Amendments of 1987	P.L. 100-146	Updated language in the legislation, strengthened the independence of the State Planning Councils, strengthened authority of protection and advocacy systems to investigate allegations of abuse and neglect, and created separate line items for core funding and training for university affiliated programs.
1987	Housing and Community Development Act of 1987	P.L. 100-242	Required HUD to earmark fifteen percent of section 202 funds for non-elderly persons with disabilities.
1988	Civil Rights Restoration Act	P.L. 100-259	Amended the Rehabilitation Act of 1973’s definition of an individual with a disability and defined coverage of section 504 as broad (e.g., extending to an entire

			university) rather than narrow (e.g., extending to just one department of the university) when Federal funds are involved.
1988	Education Amendments of 1988	P.L. 100-297	Made a number of changes in Chapter 1, including the provisions dealing with aid to state-operated and supported schools for children with disabilities.
1988	Medicare Catastrophic Coverage Act of 1988	P.L. 100-360	Clarified the circumstances under which Medicaid reimbursement would be available for services included in a child's individualized education program (IEP) or individualized family services plan (IFSP) under the Individuals with Disabilities Education Act.
1988	Hearing Aid Compatibility Act of 1988	P.L. 100-394	Required most telephones manufactured or imported into the United States to be compatible for use with telecoil-equipped hearing aids.
1988	Temporary Child Care for Handicapped Children and Crisis Nurseries Act of 1986	P.L. 100-403	Authorized the Secretary of Health and Human Services to make grants to states for public and nonprofit agencies to furnish temporary, non-medical care services to children with disabilities and special health care needs.
1988	Technology-Related Assistance for Individuals with Disabilities Act	P.L. 100-407	Provided grants to states to develop statewide assistive technology programs.
1988	Fair Housing Act Amendments	P.L. 100-430	Added persons with disabilities as a group protected from discrimination in housing and ensured that persons with disabilities are allowed to adapt their dwelling place to meet their needs.
1988	Telecommunications Accessibility Enhancement Act of 1988	P.L. 100-542	Allowed the Administrator of General Services Administration (GSA) to take such actions as are necessary to assure that the Federal telecommunications system is fully accessible to hearing and speech-impaired individuals.

1988	Small Business Administration Reauthorization and Amendment Act of 1988	P.L. 100-590	Enlarged the class of organizations eligible to receive Handicapped Assistance Loans to include both public and private entities.
1988	Traffic Safety for Handicapped Individuals Act	P.L. 100-641	Required the Department of Transportation to issue regulations establishing a uniform parking system for people with disabilities.
1989	Omnibus Budget Reconciliation Act of 1989	P.L. 101-239	Specified, among other things, that at least thirty percent of the Maternal and Child Health Block Grant under Title V of the Social Security Act must be used to improve services for children with special health care needs. Included a major expansion in required services under Medicaid's Early and Periodic Screening, Diagnosis, and Treatment Program (EPSDT). Required the Social Security Administration (SSA) to establish a permanent outreach program for children who are blind or otherwise disabled.
1990	Americans with Disabilities Act (ADA)	P.L. 101-336	Guaranteed the civil rights of people with disabilities by prohibiting the discrimination against anyone who has a mental or physical disability in the area of employment, public services, transportation, pubic accommodations, and telecommunications.
1990	Carl D. Perkins Vocational Educational Applied Technology Amendments	P.L. 101-392	Rewrote the vocational legislation, eliminated the ten percent earmarking for disabled youth, but included specific language to assure students with disabilities access to qualified vocational programs and supplementary services.
1990	Television Decoder Circuitry Act	P.L. 101-431	Required closed caption circuitry (computer chip) to be part of all televisions with screens thirteen inches or larger manufactured for sale and use in the United States.
1990	Education of the Handicapped Act	P.L. 101-476	Stimulated the improvement of the vocational and life

	Amendments of 1990		skills of students with disabilities to enable them to be better prepared for the transition to adult life and services.
1990	Individuals with Disabilities Education Act Amendments (IDEA)	P.L. 101-476 (within the Education of the Handicapped Act Amendments of 1990)	Renamed the Education of the Handicapped Act and reauthorized programs under the Act to improve support services to students with disabilities, especially in the areas of transition and assistive technology.
1990	Developmental Disabilities Act Amendments of 1990	P.L. 101-496	Maintained and further strengthened programs authorized under the Act.
1990	Omnibus Budget Reconciliation Act of 1990	P.L. 101-508	Established a limited purpose optional state coverage of community supported living arrangements services for persons with mental retardation and related conditions (authority has since expired). Authorized community supported living arrangements and stressed individualized support rather than the standardized services common to the ICF/MR program. Included a provision called the "access credit" that enables small businesses to claim credit against taxes for half of the first $10,000 of eligible costs of complying with the ADA.
1990	National Affordable Housing Act	P.L. 101-625	Established a distinct statutory authority to fund supportive housing for people with disabilities, with a separate financing mechanism and selection criteria.
1991	Individuals with Disabilities Education Act of 1991	P.L. 102-119	Enhanced infants and toddlers program and extended the IDEA support programs.
1991	Civil Rights Act of 1991	P.L. 102-166	Reversed numerous U.S. Supreme Court decisions that restricted the protections in employment discrimination cases and authorized compensatory and punitive damages under Title V of the Rehabilitation Act of 1973 and ADA.
1991	Intermodel Surface Transportation	P.L. 102-240	Authorized increased set aside funds under section 16(b)

	Efficiency Act of 1991		of the Act to assist facilities in meeting the special transportation accessibility needs of those who are elderly or disabled.
1992	Rehabilitation Act Amendments of 1992	P.L. 102-569	Included changes that increase access to state vocational rehabilitation systems for those with the most significant disabilities, enabled consumers to have greater choice and control in the rehabilitation process, and provided opportunities for career advancement.
1993	Family and Medical Leave Act	P.L. 103-3	Allowed workers to take up to twelve weeks of unpaid leave to care for newborn and adopted children and family members with serious health conditions or to recover from serious health conditions.
1993	National Voter Registration Act	P.L. 103-31	Required states to liberalize their voter registration rules to allow people to register to vote by mail, when they apply for driver's licenses, or at offices that provide public assistance and programs for individuals with disabilities such as vocational rehabilitation programs.
1993	National and Community Service Trust Act of 1993	P.L. 103-82	Established a national service program, including tuition assistance and a living allowance for individuals age seventeen and older who volunteer part-time or full-time in community service programs.
1994	Technology-Related Assistance for Individuals with Disabilities Act Amendments	P.L. 103-218	Reauthorized the 1988 "Tech Act," that was established to develop consumer-driven, statewide service delivery systems that increase access to assistive technology devices and services to individuals of all ages with disabilities. The 1994 amendments emphasize advocacy, systems changes activities and consumer involvement.
1994	Goals 2000: Educate America Act of 1994	P.L. 103-227	Provided a framework for meeting national educational goals and carrying out systemic school reform for all children, including children with disabilities.

1994	Developmental Disabilities Assistance and Bill of Rights Amendments of 1993	P.L. 103-230	Rewrote and updated provisions pertaining to State Planning Councils and extended and strengthened provisions pertaining to protection and advocacy systems, university affiliated programs, and programs of national significance.
1994	School-to-Work Opportunities Act of 1994	P.L. 103-239	Authorized funds for programs to assist students, including students with disabilities, in the transition from school to work.
1994	Improving America's Schools Act of 1994 (IASA)	P.L. 103-382	Reauthorized the Elementary and Secondary Education Act (ESEA), which provides the framework of Federal grants to states for elementary and secondary education programs. Among other provisions, the legislation amends the Individuals with Disabilities Education Act to establish a new state program supporting statewide systems of support for families of children with disabilities.
1995	Child Abuse Prevention and Treatment Act (CAPTA) Amendments of 1995	P.L. 104-235	Included new family resource and support program that supports state efforts to develop, operate, expand and enhance a network of community-based, prevention-focused, family resource and support programs which would be equipped to address, among other things, the additional family support needs of families with children with disabilities.
1996	Telecommunications Act of 1996	P.L. 104-104	Required telecommunications manufacturers and service providers to ensure that equipment is designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable.
1996	Developmental Disabilities Assistance and Bill of Rights Act Amendments of 1996	P.L. 104-183	Extended authority to fund Developmental Disabilities Councils, Protection and Advocacy Systems, University Affiliated Programs, and Projects of National Significance.

1996	Health Insurance Portability and Accountability Act of 1996	P.L. 104-191	Improved access to health care for twenty-five million U.S. residents by guaranteeing that private health insurance is available, portable, and renewable; limiting pre-existing condition exclusions; and increasing the purchasing clout of individuals and small employers through incentives to form private, voluntary coalitions to negotiate with providers and health plans.
1996	Personal Responsibility and Work Opportunity Reconciliation Act of 1996	P.L. 104-193	Provided a new, more restrictive definition of disability for children under the Supplemental Security Income program (SSI), focusing on functional limitations, mandating changes to the evaluation process for claims and continuing disability reviews, and requiring redeterminations to be performed before a child turns eighteen.
1996	Mental Health Parity Act of 1996	P.L. 104-204 (provisions implementing Act added in P.L. 105-34)	Included a provision that prohibits insurance companies from having lower lifetime caps for treatment of mental illness compared with treatment of other medical conditions.
1997	Individuals with Disabilities Education Act Amendments of 1997	P.L. 105-17	Included the first major changes to Part B since enactment in 1975, extended the early intervention program, and included a significant streamlining of the discretionary programs.
1997	Balanced Budget Act of 1997	P.L. 105-33	Established the State Children's Health Insurance Program (SCHIP) to expand health insurance coverage for low-income children not covered by Medicaid; Authorized the Social Security Administration to make redeterminations of childhood SSI recipients who attain age eighteen using adult disability criteria one year after they turn eighteen; Provided that states must continue Medicaid coverage for disabled children who were receiving SSI benefits as of

			August 22, 1996 and would have been eligible except their eligibility terminated because they did not meet the new SSI childhood disability criteria; Permitted states to allow workers with disabilities whose family income is less than 250% of poverty to buy into Medicaid (and pay premiums based on sliding scale of income); Eliminated the requirement of prior institutionalization with respect to habilitation services provided under the Medicaid Home and Community-Based Waiver; Provided that "qualified alien" non-citizens lawfully residing in the United States who received SSI on August 22, 1996, would remain eligible for SSI—i.e., eligibility "grand fathered"; Provided that "qualified aliens" lawfully residing in the United States on August 22, 1996 would be eligible for SSI if they meet the SSI definition of disability or blindness; Directed the Secretary in consultation with specified organizations to conduct a study of Medicaid's EPSDT program; Permitted states to mandate adults (including adults with disabilities) into Medicaid managed care by an amendment to state Medicaid plan and not by having a waiver approved. Exempts SSI eligible kids, certain foster care and adopted kids, and certain Native Americans; and Directed the Secretary to undertake a study of any special challenges of serving children with special health care needs and chronic conditions in Medicaid managed care.
1998	Workforce Investment Act of 1998	P.L. 105-220	Consolidated many of the Federal job training programs and provided workforce investment activities through statewide and local workforce investment systems. The law also reauthorized the Rehabilitation Act of 1973 by providing greater linkages with the generic workforce investment systems, increased consumer choice and

			involvement, and greater accountability (outcome measures).
1998	Assistive Technology Act of 1998	P.L. 105-394	Reauthorized and extended the programs formerly authorized under the Technology-Related Assistance for Individuals with Disabilities Act, while limiting to thirteen years a state's eligibility for a systems change grant.
1998	Crime Victims and Disabilities Awareness Act	P.L. 105-301	Directed the Attorney General to conduct a study to examine the nature and extent of crimes committed against people with disabilities.
1999	Ticket to Work and Work Incentives Improvement Act	P.L. 106-170	Provided health care and employment preparation and placement services to individuals with disabilities that will enable those individuals to do the following: Reduce their dependency on cash benefit programs; Encourage states to adopt the option of allowing individuals with disabilities to purchase Medicaid coverage that is necessary to enable such individuals to maintain employment; Provide individuals with disabilities the option of maintaining Medicare coverage while working; and Establish a return to work ticket program that will allow individuals with disabilities to seek the services necessary to obtain and retain employment and reduce their dependency on cash benefit programs.
2003	Unemployment Benefits Bill	P.L. 108-1	Amends the Temporary Extended Unemployment Compensation Act of 2002 (Title II of P.L. 107-147) to extend the temporary extended unemployment compensation program for five months.

Appendix B

Supreme Court Decisions Interpreting the ADA

1998-2003

SUPREME COURT DECISIONS INTERPRETING THE AMERICANS WITH DISABILITIES ACT [34]

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
Pennsylvania Department of Corrections v. Yeskey, 524 U.S. 206 (1998)	June 15, 1998	Whether Title II of the ADA covers state prisons and prisoners.	Title II of the ADA unambiguously extends to state prison inmates.	Demonstrates that the ADA covers some categories of enterprises not expressly mentioned in the Act. Demonstrates breadth and broad coverage of the ADA.
Bragdon v. Abbott, 524 U.S. 624 (1998)	June 25, 1998	1) Whether asymptomatic HIV is a disability under the ADA. 2) When deciding whether a private health care provider must perform invasive procedures on an infectious patient in his office, should courts defer to the provider's professional judgment, as long as it is reasonable in light of then current medical knowledge?	1) Asymptomatic HIV infection is a physical impairment under the ADA. 2) Reproduction is a major life activity under the ADA, which HIV infection substantially limits within the meaning of the ADA. 3) The existence of a significant health risk from treatment or accommodation of person who is disabled must be determined from the standpoint of the person refusing treatment or accommodation, but the risk assessment must be based on medical or other objective evidence, and not simply on that person's good-faith belief that a significant risk exists.	The list of major life activities in the ADA regulations is not exhaustive. This ruling should be very helpful to most persons with HIV trying to establish they have a disability under the ADA. Major life activities under the ADA are not limited to activities that have a public, economic, or daily character.

[34] Credit for this compilation through 2002 goes to Robert L. Burgdorf, Jr., National Council on Disability

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
Wright v. Universal Maritime Service Corp., 525 U.S. 70 (1998)	November 16, 1998	Whether a general arbitration clause in a collective bargaining agreement requires an employee to use the arbitration procedure to address an alleged violation of the ADA.	There is "a presumption of arbitratability" in collective bargaining agreements, but the presumption extends only to interpreting or applying the terms of the collective bargaining agreement. Any union-negotiated waiver of employees' statutory right to a judicial forum for claims of employment discrimination, if valid at all, must be "clear and unmistakable."	The Court did not reach the question whether a waiver would be enforceable if it was, in fact, clear and unmistakable.
Cleveland v. Policy Management Systems Corp., 526 U.S. 795 (1999)	May 24, 1999	The extent to which application for and receipt of disability benefits preclude a person with a disability from bringing an ADA claim.	The Court identified five rationales for claimants making legitimate representations of total disability while pursuing ADA claims. A negative judicial presumption of direct conflict between the two claims should not be applied.	Interrupted a large body of lower court decisions that had prevented individuals who had filed for or were awarded Social Security disability benefits from pursuing ADA employment discrimination claims.

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
Sutton v. United Airlines, 527 U.S. 471 (1999)	June 22, 1999	Whether corrective and mitigating measures should be considered in determining whether an individual is disabled under the ADA.	Determinations of disability under the ADA must take corrective (mitigating) measures into account.	If a disability is corrected by medication or an assistive device, ADA protections are not available unless the condition still substantially limits or the person is regarded as still substantially limited in a major life activity. If regarded as substantially limited in the major life activity of working, plaintiff must show that employer believed the limitation affected a range of jobs in various classes or a class of jobs, not just a single, particular job. Has the illogical result of permitting employers to terminate a person from a job because of a physical or mental condition and then to argue the condition is not serious enough to constitute a disability.

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
Murphy v. United Parcel Service, 527 U.S. 516 (1999)	June 22, 1999	1) Whether conditions that are improved with medication should be considered in the medicated or non-medicated state for purposes of determining disability. 2) What does the "regarded as" prong mean under the ADA?	1) Medication is considered a mitigating measure for purposes of determining whether someone has a disability. 2) The inability to perform a single, particular job does not constitute a substantial limitation in the major life activity of working. 3) Likewise, being regarded as unable to perform a single, particular job does not constitute discrimination under the ADA "third prong."	Same principles as Sutton.
Albertson's, Inc. v. Kirkingburg, 527 U.S. 555 (1999)	June 22, 1999	1) Whether having monocular vision constitutes *per se* disability under the ADA. 2) Whether an employer who requires as a job qualification that an employee meet an otherwise applicable Federal safety regulation must justify enforcing the regulation solely because its standard may be waived in an individual case.	1) A showing of significant restriction is required in order to establish substantial limitation. Mitigating measures can include the body's own systems (sometimes subconscious), not just medication and devices. An individual must offer evidence that in their own personal situation, the extent of the limitation is substantial (case by case basis). 2) An employer does not need to justify enforcing a waivable regulation.	*Per se* disability status could be appropriate in some circumstances. People with monocular vision would not have an "onerous burden" in showing they have a disability. However, a mere difference in an individual's manner of performing an activity does not necessarily constitute a substantial limitation.

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
Olmstead v. L.C., 527 U.S. 581 (1999)	June 22, 1999	Whether the ADA requires a state to place persons with mental disabilities in community settings rather than in institutions when the state's treatment professionals have determined that community placement is appropriate, and what standard is to be applied in assessing a state's assertion of a fundamental alteration defense to the obligation to afford such community placement.	Undue institutionalization qualifies as discrimination by reason of disability. States are required to place persons with mental disabilities in community settings rather than in institutions when the State's treatment professionals have determined that community placement is appropriate, the transfer from institutional care to a less restrictive setting is not opposed by the individual, and the placement can be reasonably accommodated, taking into account the resources available to the State and the needs of others with mental disabilities. States can resist program modifications that would fundamentally alter the nature of the services or programs.	This decision has become the new impetus for a national effort to increase community-based alternatives and eliminate unjustified institutional placements. The Court indicated that the fundamental alteration defense may be upheld when 1) the cost of community-based care is equitable in view of resources available for the range of services a State provides to others with disabilities; and 2) the State's waiting list for transferring people out of institutions moves at a reasonable pace.
Board of Trustees of the University of Alabama v. Garrett, 531 U.S. 356 (2001)	February 21, 2001	Whether the 11th Amendment bars employees of a state from recovering monetary damages from the state for violations of Title I of the ADA.	Suits by employees of a state to recover money damages from the state for violations of Title I of the ADA are barred by the 11th Amendment.	It is possible that analytical standards applied here will be applied also to bar private suits for monetary damages against states under Title II. However, in footnote 9 of the opinion, the Court indicated that Title I of the ADA is still applicable to the states, and can be enforced by the United States in actions for money damages.

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
PGA Tour, Inc. v. Martin, 532 U.S. 661 (2001)	May 29, 2001	Whether Title III of the ADA protects qualified entrants with disabilities participating in professional golf tournaments, and whether allowing a golfer with a disability to use a golf cart when all other competitors must walk would "fundamentally alter the nature" of the tournaments.	The concept of public accommodations should be construed liberally to afford people with disabilities equal access to a wide variety of establishments available to people without disabilities. Title III specifically identifies golf courses as a type of public accommodation. PGA Tour's golf tours and their qualifying rounds are covered by Title III of the ADA. The walking rule in golf is not an essential attribute of the game and waiving it will not, therefore, fundamentally alter the nature of the game.	Significant in guiding the application of the reasonable modification requirement in future cases. Professional sports and participants in them are covered by the ADA.
Buckhannon Board and Care Home, Inc. v. W.Va. Dep't of Health and Human Resources, 532 U.S. 598 (2001)	May 29, 2001	Whether Federal statutes that allow courts to award attorney's fees and costs to the "prevailing party" authorize awards of fees to parties whose lawsuits brought about voluntary changes in the defendants' conduct but did not result in judgments on the merits or court ordered consent decrees.	A judgment, consent decree, or settlement in a party's favor is required before attorney's fees will be awarded.	Significant turnaround from prevailing view and practices. Defendants will be able to moot an action before a judgment in an effort to avoid an award of attorney's fees, and plaintiffs with meritorious but expensive cases will be deterred from bringing suit.

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
Toyota Motor Manufacturing, Kentucky, Inc. v. Williams, 122 S.Ct. 681 (2002)	January 8, 2002	What is the proper standard for determining whether an individual is substantially limited in performing manual tasks?	The proper standard for demonstrating "a substantial limitation in the major life activity of performing manual tasks" is whether or not the impairment prevents or restricts performing manual tasks that are "of central importance to most people's daily lives" and has "permanent or long-term" impact. Being limited in performing a "class of manual activities," (i.e., activities affecting the ability to perform specific manual tasks at work) is an insufficient standard for meeting the definition of a qualified individual with a disability under ADA.	Suggests that Congress intended to create a demanding standard for meeting the definition of "disabled" and suggests that people must be visibly and functionally unable to perform in certain specific, socially expected ways before they are entitled to the protection of the ADA.
EEOC v. Waffle House, Inc., 122 S.Ct. 754 (2002)	January 15, 2002	Whether an agreement between an employer and an employee to arbitrate employment-related disputes bars the EEOC from pursuing victim-specific judicial relief under the ADA.	An arbitration agreement does not bar EEOC from pursuing victim-specific judicial relief on behalf of an employee.	Limits an employer's ability to keep disputes out of courts and partially reverses last year's ruling in which the Court said that an employee's signature on an employment contract containing an arbitration agreement waives an employee's right to go to court on their own behalf. Affirms EEOC's ability to assist people with disabilities in asserting their civil rights protections in the workplace.

CASE	DATE RENDERED	QUESTION PRESENTED	HOLDING	IMPLICATION OF DECISION
U.S. Airways, Inc. v. Barnett, 122 S.Ct. 1516 (2002)	April 29, 2002	Whether the rights of a worker with a disability who seeks assignment to a particular position as a reasonable accommodation under the ADA take precedence over other workers' rights to bid for the position under the employer's seniority system.	The ADA does not ordinarily require the assignment of an employee with a disability to a particular position to which another employee is entitled under an employer's established seniority system, but might in special circumstances.	The Court's characterization of reasonable accommodations as "special" and "preferential" fuels the misconception that the ADA gives people with disabilities some type of advantage over people without disabilities. The decision imposed changes, related to reasonable accommodation, to the enforcement guidelines on reasonable accommodation and undue hardship under the ADA. The EEOC issued these new enforcement guidelines on October 17, 2002.
Chevron U.S.A., Inc. v. Echazabal, 122 S.Ct. 2045 (2002)	June 10, 20020	Whether the EEOC regulation that allows employers to refuse to hire applicants because their performance on the job would endanger their health due to a disability is permitted under the ADA.	The EEOC regulation allowing employers to refuse to hire applicants because their performance on the job would endanger their health due to a disability is permissible under the ADA.	The decision invites paternalistic conjecturing by employers and their physician about perceived dangers to individuals with disabilities, often based on ignorance and misconceptions about particular conditions, and fosters perceptions that individuals with disabilities are commonly irrationally self-destructive.
Barnes v. Gorman, 122 S.Ct. 2097 (2002)	June 17, 2002	Whether punitive damages may be awarded in private causes of action brought under either Title II of the ADA or under Section 504 of the Rehabilitation Act of 1973.	Punitive damages are not available under either Section 504 or Title II of the ADA.	Removes a potent potential sanction against egregious violators of Section 504 and Title II of the ADA.

Appendix C

Overview of Other Telecommunications/Information Technology Related Rehabilitative Engineering Research Centers

RERC DESCRIPTION	PROJECT FOCUS	STRONG POINTS	LEVERAGING PROSPECTS
Rehabilitation Engineering Research Center on Hearing Enhancement Gallaudet University Department of Audiology and Speech-Language Pathology Kendall Greene Washington, DC 20002 **E-mail:** info@hearingresearch.org **URL:** www.hearingresearch.org **PI:** Matthew H. Bakke, PhD 202.651.5335 **Contact:** Lois O'Neill Dissemination Coor. 718.350.3203(V/TTY) 718.899.3433 (Fax) **Start Date:** August 1, 1998	Develop and evaluate technology to accommodate the needs of people with hearing loss. Goals are accomplished by: (1) developing and evaluating improved, cost-effective technological aids; (2) developing and evaluating instrumentation for detecting hearing loss at an early age; (3) providing improved access to modern telecommunications; (4) developing and evaluating specialized technology for community, home, and work environments; and (5) pursuing an active program of dissemination and training to ensure effective utilization of AT.	<u>Training and Technical Assistance activities include:</u> (1) developing training and technical assistance materials on the hearing AT needs, as well as coping issues of hard-of-hearing people; (2) providing training opportunities for individuals, with and without disabilities, to become researchers and practitioners in the fields of audiology, speech pathology and engineering; and (3) target and train small groups of individuals with hearing loss, around the country, to serve as advocates and leaders in the use of AT in their local communities to encourage utilization of hearing assistive technologies and promote knowledge of their availability. Dissemination and Utilization activities include: (1) involvement and support of an Assistive Technology Resource Center at Lexington School/Center for the Deaf. Consumers with hearing loss and their families, and hearing healthcare professionals, will be allowed to visit the Center for demonstrations of equipment and/or hands-on assistance with hearing assistive devices.	Conduct demonstrations of equipment in conjunction with the RERC on Hearing Enhancement so consumers and their families and healthcare professionals will be allowed to have hands-on assistance with assistive devices.

RERC DESCRIPTION	PROJECT FOCUS	STRONG POINTS	LEVERAGING PROSPECTS
Rehabilitation Engineering Research Center on Communication Enhancement Duke University Division of Speech Pathology and Audiology DUMC 3888 Durham, NC 27710 **E-mail:** aac-rerc@mc.duke.edu **URL:** www.aac-rerc.com **PI:** Frank DeRuyter, PhD 919.684.6271 **Contact:** Kevin Caves, BSME, ATP 919.681.9983 (Phone) 919.681.9984 (Fax) **Start Date:** November 1, 1998	This project incorporates several activities that focus on augmentative and alternative communication (AAC) technologies: (1) investigates attitudinal barriers toward technology use by elderly people with communication disorders, their listeners, and service providers; (2) studies the organizational strategies of adult AAC users to determine if preferences are predictive of performance using AAC; (3) studies how to improve AAC technologies for young children with significant communication disorders; (4) evaluates and enhances communication rate efficiency and effectiveness through the development of procedures and software technology that simulates and measures the performance of AAC technologies; (5) identifies barriers to employment, describes strategies to overcome them, documents design specifications for AAC technologies, and describes action plans to achieve successful employment outcomes; (6) increases employment opportunities for graduates of an employment and AAC program; and (7) develops a coordinated program that monitors and seeks out technology developments in both commercial form and prerelease development stages that affect the engineering and clinical AAC field.	Research activities include: (1) identification of various attitudinal barriers toward AAC technology and its use by the elderly; and (2) expanding employment opportunities for AAC users. Training activities include: (1) increasing the number of qualified rehabilitation professionals in AAC through support of formal and mentored educational experiences; and (2) increasing the number of students who will gain engineering education, training, and research experience through projects related to the AAC-RERC. <u>Dissemination, Utilization and Technical Assistance activities include:</u> (1) active involvement in the facilitating technology transfer.	Utilize research on attitudinal barriers toward technology.

RERC DESCRIPTION	PROJECT FOCUS	STRONG POINTS	LEVERAGING PROSPECTS
Rehabilitation Engineering Research Center on Information Technology Access Trace Research & Development Center University of Wisconsin-Madison 2107 Engineering Centers Bldg. 1550 Engineering Dr. Madison, WI 53706 **E-mail:** info@trace.wisc.edu **URL:** trace.wisc.edu/itrerc **PI:** Gregg C. Vanderheiden, PhD 608.263.5788 **Contact:** Nancy Gores 608.262.2309 (Voice) 608.263.5408 (TTY) 608.262.8848 (Fax) **Start Date:** June 12, 1998	Improve access by individuals with all types, degrees, and combinations of disabilities to a wide range of technologies, including computers, ATMs, kiosks, point-of-sale devices and smartcards, home and pocket information appliances, Internet technologies (XML, XSL, CSS, SMIL, etc.), intranets, and 3-D and immersive environments The program identifies strategies that can be used by industry to broaden the user base for their standard products, so individuals with as broad a range of abilities as possible are able to use standard products directly. Further, the Center targets specific compatibility and interconnection standards work to ensure that people who cannot use products directly are able to operate them using assistive technologies.	Research activities include: (1) developing cross-technology and cross-user strategies that is, strategies that will work across a wide range of technologies, and across a wide range of users. Dissemination, Utilization and Support activities include: (1) taking proven ideas and moving them out to industry (This includes other investigators, programs, or companies that develop ideas that would contribute to making information systems more accessible.); (2) developing information and demonstration videos; (3) providing an information response line for their research focus areas; and (4) supporting undergraduate, graduate, and post-doctoral education.	Take advantage of their contacts and expertise in the areas of technology transfer.

RERC DESCRIPTION	PROJECT FOCUS	STRONG POINTS	LEVERAGING PROSPECTS
Rehabilitation Engineering Research Center on Telerehabilitation MedStar Research Institute National Rehabilitation Hospital 102 Irving Street Northwest Washington, DC 20010 **E-mail:** michael.j.rosen@medstar.net **URL:** www.telerehab-nrh.org **PI:** Michael Rosen, PhD **Contact:** Donal Lauderdale 202.877.1554 (Phone) 202.723.0628 (Fax) Email: donal-evelyn.v.lauderdale@medstar.net **Start Date:** October 1, 1998	Conduct research on various models of delivering rehabilitation services at a distance: telerehabilitation. Research projects encompass the areas of: Telehomecare--telesupport to caregivers of stroke victims; Telecoaching--remote jobsite coaching of persons with mental disabilities; Telehealth pain management--psychological intervention at a distance; and Behavioral Virtual Reality--investigation and training of social and attending behaviors using virtual environment technology. The center is also engaged in development projects focusing on Telemonitoring, passive sensing of functional performance and health parameters using unobtrusive instrumentation; HomeTelerehab, interactive systems for remote delivery of therapy, assessment, teaching, and demonstration at home; and Teleplay, therapeutic play, including embedded teleassessment for children with disabilities.	Research activities include: (1) focus on rural telerehabilitation applications; (2) a Pacific Rim Initiative; and (3) a policy study that is about reimbursement and other incentives and disincentives to implementation of services. The Center establishes the following National Resource activities: (1) a Home Care and Telerehabilitation Technology Center; (2) a Home Care and Telerehab Education/Training Center; and (3) a Virtual Library on Telerehabilitation that serves as the focal point for information dissemination on telerehab-germane practice, policy, and technology.	Opportunities may exist to partner on rural applications and the Telerehabilitation RERC's Pacific Rim Initiative. In addition, information derived for the policy study on reimbursement and other incentives and disincentives to implementation of services could be useful.

RERC DESCRIPTION	PROJECT FOCUS	STRONG POINTS	LEVERAGING PROSPECTS
Rehabilitation Engineering Research Center on Telecommunication Access Trace Research & Development Center University of Wisconsin-Madison 2107 Engineering Centers Bldg. 1550 Engineering Dr. Madison, WI 53706 **E-mail:** info@trace.wisc.edu **URL:** trace.wisc.edu/telrerc **PI:** Gregg C. Vanderheiden, PhD Trace Center Judy Harkins, PhD Gallaudet University 608.263.5788 (Vanderheiden) 202.561.5257 (Harkins) **Contact:** Nancy Gores 608.263.2309 (Voice) 608.263.5408 (TTY) 608.262.8848 (Fax) **Start Date:** September 1, 1999	Identify telecommunication access barriers in current and future technologies, work with others in the field to identify solution strategies, test them, implement any necessary standards, and assist industry in transferring the ideas into their commercial products. Technologies being addressed include: (1) customer premises equipment (CPE) of all types, including phones, video phones, pagers, messaging systems, etc.; (2) telecommunication systems and services, including voice mail, interactive voice response systems, etc.; (3) network topologies; (4) telecommunications standards; and (5) next-generation multimedia telecommunication systems, including telecollaboration, virtual meetings, etc.	<u>Dissemination and Technical Assistance activities include:</u> (1) providing technical assistance to all who are working in this area including those in industry trying to implement universal / accessible design, consumer groups working to advocate for or support more universal design, the Access Board and the FCC; (2) developing information and demonstration videos; (3) providing an information response line for their research focus areas; and (4) supporting undergraduate, graduate, and postdoctoral education.	Examine the effectiveness of the information and demonstration videos that are developed by RERC on Telecommunication Access.

RERC DESCRIPTION	PROJECT FOCUS	STRONG POINTS	LEVERAGING PROSPECTS
Rehabilitation Engineering Research Center on Technology Transfer (T^2RERC) Center for Assistive Technology University at Buffalo 515 Stockton Kimball Tower 3435 Main Street Buffalo, NY 14214 E-mail: smarnold@buffalo.edu URL: http://cosmos.buffalo.edu/t2rerc/ **PI:** Stephen Bauer, PhD University at Buffalo Contact: James Leahy 800-628-2281(Voice/TTY) 716-829-3141 716-829-2420 (Fax) Email: jimleahy@acsu.buffalo.edu	T^2RERC has three primary objectives: 1) advance the methods of technology transfer through research projects, 2) transfer technologies into products through development projects, and 3) facilitate the commercialization of new and improved assistive devices through utilization projects. These three primary objectives are being accomplished through collaborations with academic, industrial, consumer and government stakeholders.	The T^2RERC's activities are organized within three major divisions: the Research & Evaluation Program; the Development Program; and collectively the Technical Assistance, Dissemination and Strategic Partnership Programs. The T^2RERC's Research & Evaluation Program is exploring and documenting the process of technology transfer, establishing performance benchmarks and validating best practices, and providing information to improve its efficiency and effectiveness by examining the carriers and barriers that comprise the critical success factors of technology transfer. The Development Program facilitates the transfer of core technologies and prototype devices into new products. This Program supports two major efforts: the Demand Pull Project and the Supply-Push Project. The T^2RERC also facilitates technology transfer with all stakeholders through Technical Assistance, Dissemination and Strategic Partnership Programs.	For Demand Pull, each year the T^2RERC partners with one other RERC to determine the needs for advanced technology within a selected assistive technology industry.