



MobileFuture
Wireless. Innovation. Freedom.

MOBILE ABILITY

**The Transformational Impact of
Wireless Innovation for People with Disabilities**



Mobile Future is a broad-based coalition of businesses, non-profit organizations and individuals interested in and dedicated to advocating for an environment in which innovations in wireless technology are enabled and encouraged. Our mission is to educate the public and key decision makers on innovations in the wireless industry that have transformed the way Americans work and play and to advocate for continued investment in wireless technologies.

Mobile Future
1325 Pennsylvania Avenue, NW
Suite 600
Washington, D.C. 20004
T: 1 (800) 459-5998

“All of society benefits from the widespread use of accessibility features such as captioning, speech recognition, and speech output. Now is the time to engage in this endeavor in earnest and show that we do indeed believe that this is a big deal, for people with disabilities and for all Americans.”

- FCC Chairman Julius Genachowski,

“Delivering on the Promise of Equal Access to Broadband for People with Disabilities”

Martin Luther King, Jr. Library

Washington, D.C.

March 10, 2010

Foreword

In each of our modern lives, broadband holds a pivotal key to enhancing economic opportunities, expanding access to education, improving our health and participating in civil society. Nowhere is this potential more powerfully on display than at the intersection of broadband and mobility. And, arguably no community has put this nearly limitless potential to more transformational use in their daily lives than the 1 in 5 Americans who, today, are living with disabilities.

From leading wireless carriers to devoted garage innovators, the mobile innovation community is embracing the true spirit of mobile broadband's much-touted promise to bring opportunity and quality of life enhancements to all Americans. From people with disabilities who are finding innovative uses for connected smartphones and mainstream mobile applications to technologists who are thinking and creating for the unique needs of specific communities, profound innovation is underway today.

This report is intended as a celebration of this innovation—and an exploration of the common elements, values and commitments that can ensure it is continually nurtured. Twenty years ago, our nation made an extraordinary commitment to accessibility and opportunity in passing the landmark Americans with Disabilities Act (ADA). Wireless grew up in this era. And, today, it is ushering in a second wave of quality of life advances and inclusiveness for 54 million Americans with disabilities.

From voice-activated GPS technology that can guide a blind person down the street, to access to closed captioned video on the go, to the fact that kids with disabilities now can go to school with smartphones in their pockets rather than large, cumbersome assistive devices, these innovations reflect awe-inspiring progress. Equally encouraging is the certain fact that we have barely scratched the surface of what mobile innovation can do to expand the horizons and grow the range of opportunities available to this community.

On behalf of the Mobile Future community, we thank the organizations and technologists who contributed their insights to the development of this report. It is our hope that this paper reflects just one small contribution to a growing conversation and further exploration around unlocking opportunities in the digital/mobile age.

With the release of its National Broadband Plan and subsequent report on broadband for people with disabilities, the Federal Communications Commission is signaling its own commitment to encouraging these life-changing innovations. At this important juncture, we offer this paper to help inform both great products and meaningful policy.



Jonathan Spalter
Chairman
Mobile Future

SPEEDING DIGITAL INCLUSION

A smartphone uses voice activation of a mapping application to guide a blind person walking down the street. A front-facing camera on a wireless device enables a deaf person who relies on sign language to communicate with his or her doctor via Video Relay Service. Mobile screen readers narrate everything from the day's newspaper to email messages. Captioned mobile videos aid both people with hearing loss and those who find themselves in noisy environments. A child or teen with a speech disability can choose to use a "cool" smartphone, utilizing an assistive speech application instead of carrying a specialized device that makes them "different" from their classmates.



From the commitment and innovation of wireless carriers to the ingenuity of inventors creating groundbreaking new applications, mobile broadband offers a new world of possibilities. But perhaps nowhere is the intersection of mobile and broadband making more of a difference in people's lives than among people with disabilities.

Celebrating its 20th anniversary in July 2010, the Americans with Disabilities Act is landmark legislation that made equal opportunity and accessibility for individuals with disabilities the law of the land. Mobile innovation emerged and evolved in this new era of inclusiveness, and wireless technology today is driving dramatic quality of life innovations, benefiting all Americans. For example, vibrating alerts used by deaf individuals for decades are now regularly cell phone features, giving all consumers the option of alerts to calls and texts without disturbing others.

Twenty years after the passage of the Americans with Disabilities Act, our nation's wireless infrastructure has evolved to robust 3G and 4G networks, and the connected mobile community has grown to over 280 million Americans. No longer is that device in your pocket used exclusively for phone calls. It is a robust innovation tool, our Internet on the go, and our gateway to a fast-growing universe of mobile applications that can enhance virtually every aspect of our modern lives. Importantly, for the 54 million Americans with disabilities, today's fast-emerging combination of robust hardware, state-of-the-art wireless networks and innovative, diverse applications can allow devices to achieve impressive levels of personal customization that can be tailored to meet any individual's unique needs and preferences.

The power of technology is not lost on any of us, and nowhere does it hold more potential than for people with disabilities. This is something more and more mobile innovators are keenly aware of today. The concept of universal design—the notion that innovation should be broadly accessible to all Americans, including those with disabilities—is more often the rule rather than the exception. More of the latest wireless devices are accommodating a broad range of needs from this highly diverse community – meaning devices or applications increasingly come “out of the box” in an accessible way or are compatible with widely used accessibility tools (eg., closed captioning or voice activation features).

Mobile innovation has given rise to the development of more versatile features that assist users in overcoming unique obstacles to navigating their device. On the customer service side, too, wireless providers are making important strides – from offering large print bills, and making materials available in braille to staffing service centers with representatives knowledgeable about the diverse needs of customers with disabilities.

Of course, developing highly customizable mobile devices requires an understanding of the realities driving particular needs. For example, among people who are deaf or have hearing loss, sign language users have different requirements than those who rely on hearing aids or text to communicate. An aging baby boomer with failing eyesight may simply need larger text, for example, while a blind person needs her mobile device to literally talk her through its various features. Bottom line: Innovators must think through a range of unique and diverse needs and seek direct feedback from these communities. This type of collaboration has led to significant advancements in hearing aid compatibility and the availability of devices that have built-in screen readers or are compatible with widely available screen reading software. Some carriers, such as AT&T , Verizon , T-Mobile and Sprint , have even developed plans tailored to meeting the communications needs of people impacted by a disability or aging.

Additionally, many mobile capabilities that are helpful to individuals with disabilities have gained widespread use. In 2002, T-Mobile introduced the Sidekick, changing the way those with hearing and speech disabilities communicated while on the go. The Sidekick was the first mobile phone to offer instant messaging. A popular feature for many customers, it had special significance to those with hearing and/or speech disabilities, since it allowed them to have conversations without the need for specialized equipment. Wireless devices designed to deliver rich multi-media experiences at museums are enjoyed by a broad array of museum visitors. Predictive-text software that completes the words you type on your mobile device has become a mainstay on many smartphones, even though it was initially designed for the disability community. In (often noisy) public venues around the world, closed captioning has become a fixture, not something that is focused solely on the hearing impaired. And as the nation's infamous baby boom population matures, mobile features that enlarge text, utilize voice-command technology or transfer text to voice narration offer broad benefits.

The past 20 years have marked extraordinary growth and innovation in wireless. Americans across the spectrum are benefiting from mobile broadband – and stand to reap the benefits of future innovations that make this progress more accessible and inclusive for all Americans. With the Federal Communication Commission's goal to extend broadband's opportunities to all Americans, and its specific emphasis on people with disabilities, it is clear that policymakers are committed to unleashing the next generation of mobile broadband. The wireless sector shares this commitment, and looks forward to participating in the ongoing dialog informing our mobile future and its meaning to Americans with disabilities.



54 MILLION AMERICANS

For the 54 million Americans living with disabilities and the 35 million Americans who have a severe disability, access to life-enhancing mobile technologies is no small matter. This demand will grow substantially as the more than 78 million baby boomers age and increasingly rely on a steady stream of innovations that help overcome limitations in mobility, vision, hearing, memory and other areas. Just to give one example, hearing loss alone for the aging boomer population is projected to double by 2030. For these communities, mobile innovation—both in devices and applications—can help overcome everyday challenges in seamless and convenient ways.

Like most Americans, many people with disabilities consider their mobile device to be an indispensable tool in their everyday lives. Nearly 90% of American adults have a mobile device, and 85 percent of Americans with disabilities reported wireless device ownership in 2007.

This is a highly diverse community, which has a broad range of adaptive needs. For the approximately 37 million deaf or hard of hearing adults in the U.S., newer text-based communications methods, such as short message service (SMS) texting, real-time Internet texting known as Internet relay chat (IRC), and instant messaging are important advances. Additionally, some wireless providers offer access to Video Relay Service, which enables people with hearing disabilities who use American Sign Language to communicate with voice telephone users through video, rather than typed text. The individual can communicate via sign language through a specialized operator watching the video, allowing for much more rapid-fire conversation than typed text allows.

Meanwhile, 21.2 million adult Americans report experiencing significant vision loss, which mobile innovators are working to address through screen readers, voice activation, magnification, Braille functionality and other features.

Those with cognitive disabilities – including individuals with developmental disabilities, acquired brain injury, Alzheimer's and severe mental illness – comprise more than 20 million Americans, or seven percent of the U.S. population. Advances from mobile GPS technology to timed medication reminders to photos associated with contacts can help individuals manage the daily activities of living independently. Caregivers, too, can rely on customized and often free or low-cost applications to help them provide better support.

National Statistics of Americans with Disabilities

DISABILITY	U.S. STATISTICS
Deaf/Hearing Impaired	37 million adults have trouble hearing - from partial hearing loss to being deaf.
Blind/Vision Impaired	21.2 million have experienced significant vision loss in varying degrees - from blindness to difficulty seeing, even with visual aids.
Mobility Manipulation/ Limitation	Nearly 26 million adults report some form of physical disability, and more than 33 million or 15% of adults, have difficulty functioning physically.
Speech Impairment	Approximately 6 to 8 million people have a form of language impairment.
Cognitive Disability	More than 20 million Americans have cognitive disabilities, which include mental impairments and developmental disabilities, acquired brain injury, Alzheimer's disease, and severe and persistent mental illness.

Americans with physical disabilities face a different set of challenges. With this community hands-free, voice activated applications and features are dramatically expanding access to all the resources of connected smartphones. Nearly 26 million adults in the United States report some form of physical disability, and more than 33 million or 15% of adults, have difficulty functioning physically. A person with limited reach may not be able to use a standard workstation or desktop phone in a hotel. But their customized mobile device can provide both phone communication and access to the Internet—making travel for work or leisure that much easier and more enjoyable.

While a struggling U.S. economy has clearly presented challenges for all Americans, for those with disabilities the unemployment rate was 13.9 percent in March 2010, compared with 10.1 percent of Americans without a disability. The opportunity gap grows even wider when you consider the employment-population ratio, which stands at 22.5 percent for individuals with a disability versus 70.2 percent for Americans without a disability. When it comes to the digital divide, just 42% of those with disabilities have broadband at home, compared to the national average adoption rate of 65%. Educational disparities must also be reconciled. Across the board, people with disabilities have lower levels of educational attainment than those without disabilities. Less than half (12.5%) of people with disabilities between ages 21 and 64 had a bachelor's degree in 2007, while nearly 31 percent of people without a disability had obtained this educational level. Technology can make impressive strides to alleviate this divide too – from mobile applications that aid the individualized needs of students with disabilities to online classes paired with adaptive features, such as speech-to-text.

The population of Americans living with disabilities is large, growing and diverse. Mobile innovation offers an unprecedented opportunity to help these individuals lead more full and independent lives. Mobile device penetration is substantial in this community, as it is with all Americans—offering a widely accessible on-ramp to an explosively growing array of robust and easy-to-use tools that are transforming mobile devices from “smart” phones to powerful tools for accessibility and opportunity.

A PUBLIC & PRIVATE COMMITMENT

From the release this year of the FCC’s National Broadband Plan to the landmark commitments made in the Americans with Disabilities Act 20 years ago, public policy has had a long history of supporting mobile innovation generally and accessibility innovation specifically. This remains today a cornerstone of digital inclusion efforts.

The ADA represents an important policy milestone—denoting a crucial period during which lawmakers established essential protections ensuring the rights of people with disabilities. For telecommunications companies, specifically, the ADA requires providers to offer Telephone Relay Services (TRS), enabling callers with hearing and speech disabilities who use text telephones and callers who use voice telephones to communicate with each other through a third-party communications assistant.

The ADA’s vision has been echoed and reinforced throughout the years. Provisions in the Telecommunications Act of 1996 require manufacturers and providers of telecommunications equipment to design equipment and services that are accessible and usable by individuals with disabilities. Rulemakings are now underway to update Section 255 of the Telecommunications Act, including modernizing requirements related to hearing aid compatibility and closed captioning tied to video programming and emergency communications.

Additionally, on Capitol Hill, the 21st Century Communications and Video Accessibility Act of 2009 (H.R. 3101) seeks to extend key technologies, such as captioning, to content on television, the Web and mobile devices. The bill also requires Internet providers and equipment manufacturers to ensure user interfaces are accessible to individuals with disabilities, for example, mandating that on-screen menus



have audio output for individuals with vision impairments. The FCC supports this bill, and the legislation has been the source of extraordinary public-private collaboration to yield final legislation that is workable from a technology standpoint and meaningful in the real-world benefits it delivers to these important consumers. A companion Senate bill, The Equal Access to 21st Century Communications Act (S.3304), was introduced in early May.

A recent promising policy development is the FCC's National Broadband Plan. As a part of the Plan's overall goal to bring the benefits of broadband to all Americans, the FCC has presented three specific recommendations that relate to increasing access for people with disabilities: 1) Creating a Broadband Accessibility Working Group within the Executive Branch to coordinate policies that promote broadband adoption by people with disabilities; 2) Establishing an Accessibility and Innovation Forum at the FCC to advance best practices; and 3) Modernizing accessibility laws, rules, and related subsidy programs by the FCC, the Department of Justice and Congress. Additionally, as part of the FCC's recommendations that the Universal Service Fund be used to promote broadband, the National Broadband Plan recommends allocating \$10 million for technology applications and development to enable people who are deaf or blind to access broadband services more readily.

The past 20 years track an innovative trajectory that has dramatically increased the rate of digital inclusion among all communities. Particularly among people with disabilities, mobile broadband innovation has played a significant role and key policies to date have been constructive in supporting broad innovation from across the mobile innovation ecosystem.

THE ROLE OF ACCESSIBLE TECHNOLOGY

For those living with a disability, access to innovative mobile devices and services provides a fundamental connection to the world. From keeping in touch with loved ones to finding and maintaining a job, advances in mobile communications are inextricably tied to enhanced opportunities for Americans living with a disability.

Employment

A connected smartphone coaches an individual with cognitive disabilities through the tasks associated with their assembly line job. A person with low vision navigates phone menus using enlarged text to participate in a conference call, and utilizes the phone's text-to-speech function to quickly read email. A man with limited mobility uses speech-to-text software to transcribe a report. To be competitive in today's work force, people with disabilities need access to the same technology tools and can benefit from the flexibility and processing power of today's increasingly robust and agile mobile tools.

One goal of the Americans with Disabilities Act is to ensure equal workplace opportunities. However, real-world challenges remain. While attitudinal barriers remain a challenge, new technologies can help individuals with disabilities reduce some barriers to employment. Businesses today rarely rely on information in print format alone, but use electronic means to share information. This can provide increased accessibility for people with visual or learning disabilities. Real-time conversations using American Sign Language can enhance communication among people who are deaf and, through relay services, with people who have no hearing loss and cannot sign. This enhanced communication can help employers ensure that deaf employees are given equal opportunities in the workplace and, through full inclusion, begin to decrease attitudinal barriers about disability.

Mobile innovation can expand access to the kind of education, experience and training that make individuals attractive to employers and eligible for better-paying jobs. Students can download books and assignments in accessible formats rather than facing delays associated with the distribution of accessible handouts and textbooks. Broadband, both wired and wireless, is also expanding entrepreneurial opportunities and remote work opportunities, such as telecommuting. In fact, the National Telecommuting Institute reports that over the next two years it expects the number of individuals they place for in-home jobs will double, thanks in part to broadband-enabled innovation.



Even with all of this progress, today our nation faces a challenging economy and a fiercely competitive job market. Less than 25% of working-age Americans with disabilities are employed today, compared to more than 70% of those without a disability. While many with disabilities are unable to work, clearly accessibility barriers remain that mobile innovation can help reduce or remove. At the lowest income levels the gulf is most apparent. In 2007, the poverty rate of disabled Americans stood at 24.7 percent—nearly three times the poverty rate for those without disabilities.

Mobile technology and broadband-powered applications can help place people with disabilities on equal footing in the competitive job market. And resources are emerging that help these communities connect to work-related opportunities. Can a more concerted push in this area make a real difference? Beyond the individual benefits of raising the employment rates of the disability community, one study shows that a single percentage point increase in the employment rate of people with disabilities would yield over \$11 billion in total economic output between 2010 and 2030.

These innovations will have broad benefits throughout society. As the U.S. population ages, more workers will experience challenges in their ability to complete certain tasks. By 2020, one in five U.S. workers will be 55 years of age or older. This represents a more than 50% leap from the year 2000. As Americans age, demand for accessible technology will increase. Devices designed with the needs of people with disabilities in mind can help address some of the needs faced by a graying U.S. work force, including vision or hearing loss, as well as changes in dexterity or mobility. Mobile devices can support flexible work options that help more American remain in the work force.

Health Care

For those living with a disability, quality health care is essential to leading healthy, independent lives. And today, mobile innovation is playing a more important role in patient well-being.

For those with mobility limitations, Verizon's Telehealth Collaboration Services, which enable video consultations between patients and physicians, will soon extend to the mobile Web, allowing individuals to receive the care they need without traveling to a doctor's appointment or connecting to a wired Internet source. AT&T is also trialing wireless devices that monitor patients' health remotely and share the results electronically with their doctor. Along similar lines, Triage Wireless offers a monitor that records the patient's vital signs and transmits them to physicians. The objective? Higher quality care at a lower cost, as well as greater convenience for patients.



It is estimated that only 50 percent of patients take their medication as prescribed. In this case, too, remote monitoring can help. Today's digital technology can help all patients, including those with memory issues, remember to take their medications, even alerting caregivers or concerned loved ones via e-mail, automated phone calls or text messages should a patient fall behind schedule. And, while it may sound like science fiction, there is now even a "digestible chip" that patients can swallow with their medication, which informs health care providers if their patients are on track taking their prescriptions.

According to the National Organization on Disability, people with disabilities are more than twice as likely to put off getting the care they need due to affordability issues. They are also four times more likely to lack health care coverage that addresses their unique needs. While these health care barriers exist, mobile technology is helping connect disabled citizens with quality care, all while reducing the cost and inconvenience associated with hospital visits and stays.

Mobile phone-based health care services alone are expected to dramatically improve the efficiency of how health care and social care providers do their work—by allowing them to access an individual's information from anywhere. And the demand and industry interest is there. The projected annual growth rate of wireless home-based health care applications and services is 180%, and is expected to reach \$4.4 billion in 2013.

Meanwhile, the broader market for assistive technology is also growing substantially, and is on track to reach \$49.3 billion in 2013. According to 2007 figures, the vision and reading aids segment has the largest market share, generating \$24.9 billion; comparatively, communications aids netted \$4.4 billion.

But most important are the human benefits these technologies offer. Imagine the peace of mind of knowing loved ones with health conditions can get more of the care they need from the comfort and convenience of home. And, a recent report confirms that a mobile health-based system of remote monitoring vital signs and medication compliance also produces better care, which leads to more positive overall health.

Mobile innovations are already playing a powerful role in American health care and are enhancing the care of those living with a range of disabilities. With more widespread adoption and next generation mobile advances, these tools and services will become even more life-enhancing.

Education

At the intersection of mobile innovation and broadband technologies, a new world of learning opportunities is being unleashed. For Americans with disabilities, difficult, inaccessible or nonexistent transportation remains a barrier to higher education. Online education can provide unprecedented options to learn and earn degrees. Access to broadband also can mean something as basic as access to textbooks in a timely fashion.

Where do disabled Americans stand on the education spectrum? In 2007, 35.3% of working-age Americans with disabilities reported having a high school diploma, compared to 87% of all adults in 2009. Only 27.9% of disabled individuals said they have some college or an associate degree, and a mere 12.5% had a bachelor's degree or higher level of education, compared to about 19% of all Americans.



The Americans with Disabilities Act requires that materials and information be available in alternative formats. But many students have experienced significant delays in obtaining alternatives to print text. Broadband can make curriculum accessible to more students, while encouraging teachers to think about ways in which a larger number of students can benefit from the lesson at hand. Achieving this goal typically hinges on taking advantage of new technologies—from utilizing programs that transcribe videos to making assistive learning devices available. New technologies are allowing for creative ways for educators to make curriculum accessible to the unique learning styles of students with and without disabilities, many times in unobtrusive ways. One way mobile technologies are changing students' lives? In the past, students who cannot speak had to carry around large devices to speak for them. Now, many are able to use mobile applications on leading smartphones to do the job.

For students with visual impairments, even attending classes in person can become more dynamic and interactive – if equipped with the right tools. Screen readers and refreshable braille displays can provide access to class presentations using laptops and or mobile phones connected to the Internet. Presentations and interactive materials can be made more accessible by providing real-time access to high-tech educational tools. Imagine a business course where a web-based program allows students to understand the impact of their decisions—and a blind student can follow along using an accessible browser.

Speech-to-text software also can help students both in the classroom and online. Programs such as Dragon NaturallySpeaking and IBM ViaVoice allow students to dictate their written assignments. These programs as well as apps that rely on voice commands like Vlingo and Microsoft's Voice Command are also being used on mobile devices by many non-disabled Americans for their ease and convenience.

Speech-to-text programs and captioning are helping students with hearing loss as well as new language learners and those with other disabilities, participate in online classes and view videos on sites like YouTube. And, video-to-VGA converters are allowing small mobile devices to be used with larger screens, allowing students the flexibility of a smaller device to carry around with the option to hook up to a larger stationary device, such as a classroom computer.

In the classroom, Smartpen by Livescribe allows real-time digital transcription of notes and recites the lesson back to the student – a welcome tool for a broad spectrum of students, including those with disabilities. There also are mobile apps available for special education teachers and speech therapists to help develop and track customized lesson plans tailored to the unique needs of each student.

Those with physical impairments have a different set of challenges in the classroom and online. For students who have trouble interacting with a standard computer, keyboards with larger keys and programmable features help facilitate typing, and trackballs or a HeadMouse, which controls the on-screen cursor with the natural movements of a user's head, can be easier to use than a traditional mouse. And for those who cannot use a traditional computer, speech-to-text software is a key tool for completing assignments.

These advances are opening new doors so people with disabilities have the same opportunities in education as all Americans and the same ability to participate in lifelong learning.

Emergency Response

As the FCC explored in its study discussing broadband access for people with disabilities, mobile broadband will benefit E-911 in a significant way. The next generation of innovation will help facilitate equal access to emergency communications for people with hearing and speech disabilities, and provide real-time interoperable video, voice and text capabilities.

Innovation is underway that will enable people with disabilities to touch a single button on a cell phone to send a pre-recorded message alerting professionals that the caller is disabled and in an emergency situation. First responders will then be able to track the call and hear what's happening at the scene as they dispatch help.

Similarly, the Wireless Rehabilitation Engineering Research Center (RERC) is now testing technology that would enable Americans with disabilities to receive emergency alert feeds on their mobile devices, and deliver the news in the appropriate format for that user. With the FCC's approval, these services may help people with disabilities have the same rapid notification regarding emergencies as other citizens. In partnership with the Georgia Institute of Technology, the Wireless RERC is also testing the effectiveness of emergency mobile video among individuals who use sign language in partnership with interpreters to relay messages. Even today, many people with disabilities receive local emergency alerts on accessible mobile devices, notifying them in a timely way of weather emergencies, such as tornado watches and flooding.



To ensure E911 services are available for all Americans, U.S. wireless providers have invested billions of dollars in upgrading their networks, and are working diligently to enhance emergency 911 through partnerships with local phone companies, governments and public safety officials. Through continued coordinated efforts, and as more local 911 centers become next-generation capable, enhanced E-911 can become a reality for citizens nationwide.

Broadband plays a vital role in accelerating the deployment of enhanced E-911 services, and it is a focal point of the FCC's National Broadband Plan. For instance, an Internet protocol-based E-911 service could increase access for those with disabilities due to its capacity for text-based communication and video connections. This type of IP-based 911 would open up an array of options, including texting and sending video, images and photos to the emergency center—all of which has public safety benefits that extend far beyond the disability community. But, in order to achieve these next-generation communications, policymakers must ensure funding is available for local emergency call centers to utilize these communications, better enabling first responders to do their job in an emergency.

ACCELERATING NEXT-GENERATION TECHNOLOGIES

The exponential expansion of wireless innovation and consumer adoption of mobile devices has laid a powerful foundation for expanding opportunities and enhancing the modern quality of life of all Americans. From pro-investment policies that unleashed profound capital investment in robust U.S. wireless infrastructure to the rapid and diverse innovation from large companies to garage innovators we see in the exploding apps universe today, significant attention is being devoted to utilizing mobile innovation to transform the lives of the more than 54 million Americans living with disabilities.

This more than 25-year journey of explosive mobile technology growth has yielded significant benefits and breakthroughs, perhaps most notably for people with disabilities.

From helping those with hearing, speech and visual disabilities to aiding those with mobility limitations and cognitive disabilities, mobile devices have fundamentally transformed the way people with disabilities engage the world and this benefits us all.

Deaf and Hearing-Impaired

For the approximately 37 million deaf or hard of hearing adults in the U.S., mobile innovation has helped open the door to full participation in the digital age. Captioning has expanded far beyond televised emergency warnings. The invention of needed tools often results from the people who understand those needs firsthand. That was the case when a Google software engineer, who also happens to be deaf, pioneered the creation of a captioning tool for videos posted on the company's YouTube site. Today, that technology has evolved to include an auto-translation tool capable of adding captions in 50 languages to YouTube videos for a global audience. AT&T Lab's MIRACLE also allows users to search for video based on text as well as visual information and speech segmentation, changing the way people can search for video online.



Other cutting-edge innovations, such as new devices with front-facing cameras, will be particularly helpful for those who rely on sign language to communicate with the outside world. Similarly, new text-based communication—ranging from the captioned telephone to Internet relay chat (IRC) to instant messaging—are proving a powerful addition to traditional communications devices for the deaf. Real-time-text exchange on mobile phones has taken off, and today's smartphones offer wireless email, texting and the ability to participate in social media such as Facebook and Twitter.

For those, who can't access traditional voicemail, some mobile phones can even be equipped with a voice-to-text voicemail box, allowing customers to read a transcription of each voicemail on the screen. This last innovation, in particular, exemplifies a common trend where tools developed for the disability community have an even broader commercial application—in this case, allowing people to check voicemail while in a meeting or other environment where audio output would be inappropriate.

What's next on the horizon? A new wireless captioning system holds the potential to improve the quality of life of deaf Americans. A new system developed at Georgia Tech Research Institute promises to provide people who have hearing loss with a way to caption real-life events such as school plays—as they occur. The device translates auditory information into text and displays it on a screen, and also has the capability to share additional statistics and information related to the outing. A PDA, laptop, or even a micro-display that plugs into a PDA and attaches to eyeglasses or a headband are all options for viewing the transmission of auditory information at the venue.

Whether for work or entertainment, mobile innovations are enabling citizens with disabilities to participate more fully in our society and enjoy richer lives. As next-generation mobile advances continue to evolve, the impact on jobs, health care, education and more will continue to deliver an even higher quality of life.

Blind or Vision-Impaired

Most of us at some point have found ourselves staring into the kitchen pantry, asking what there might be to eat. What if that can of peas on the back shelf could answer you? For those who are blind or vision-impaired, the inability to distinguish items can be challenging. Now, innovative mobile applications are utilizing smartphone cameras to scan and announce the contents of grocery items, nutrition labels, and even pill bottles. Screen readers on mobile phones can even make going to a store unnecessary. This is just one tool in a new wave of mobile applications that is making daily life easier and not only for people who have vision loss.

Recent projections reveal that 21.2 million Americans have experienced significant vision loss - from total blindness to difficulty seeing, even with visual aids. Given the fact that approximately 9 million Americans ages 45 to 64 report vision loss, the vision-impaired population is expected to grow dramatically as these baby boomers age. Fortunately, mobile innovation is pioneering new tools for this growing population, helping ensure more Americans can live without limits.

Voice commands are one important area of promise. For example, Vlingo, which is available on many mobile devices, responds to voice prompts, helping users navigate phone menus and browse the Internet. Additionally, T-Mobile recently announced that its new MyTouch 3G Slider will offer a voice command “genius button,” allowing the phone to be voice-controlled at the touch of a single button. For those who struggle to see the text on their phones, Mobile Magnifier allows users to adjust the font size for easier viewing. Also, Android’s screen-reader, TalkBack, voices the text displayed on a user’s phone. Also valuable are the mobile GPS audio capabilities that can direct you to your destination—whether driving or walking.

And, even more exciting wireless innovation is on the way. As an adjunct to its wireless captioning project, the Georgia Technical Research Institute is developing location-aware systems for public spaces, such as airports and hospitals. Utilizing WiFi-enabled smart phones, the technology would share directional information in a variety of formats, including audio, video and text. Researchers



describe the technology as a “personalized ‘You Are Here’ map.” This next-generation innovation is similar to another initiative currently being developed by the Atlanta Veterans Administration Medical Center, which is creating “Talking Braille Signs,” to direct those with vision impairments. These advances, and others, represent the powerful combination mobile technology and broadband provide – and far more is to come.

Mobility Manipulation Disabilities

For many people with physical disabilities the mobile Internet proves to be a powerful resource for connecting to online communities, as well as accomplishing daily tasks from banking to shopping. The convenience of these activities, combined with other innovative technologies that promote employment is expanding opportunities for work and play.

Nearly 26 million adults in the United States report some form of physical disability, and more than 33 million or 15% of adults, have difficulty functioning physically. Furthermore, those who have difficulty going outside the home have the lowest employment among people with disabilities. For these Americans, technological innovations are helping alleviate disparities and providing greater access to everything from community and social engagement to jobs.

For instance, voice command technology enables those with mobility limitations to type on a computer. It is now a standard feature of Apple computers and is available for new iPhones and iPads, as well. From text on a Web page to numbers in a database, Macs are now designed to read everything highlighted by the cursor. And, more recently, Apple integrated a reverse version of VoiceOver to the iPhone that performs functions according to the user's voice prompts – a welcome solution for many who live with physical disabilities. This feature is becoming more prevalent throughout the smartphone market, and is greatly enhancing the accessibility of these devices. Individuals with limited mobility can also now easily access their iPods, thanks to a specially interfaced wireless remote.



For those with more severe physical disabilities, breakthroughs are emerging that will help individuals perform tasks independently or with minimal assistance. The converging sciences of computer modeling and robotics promise to bring new advances in electric powered mobility and manipulation devices. And, brain-computer interface technology holds the potential to enable those with physical disabilities to perform tasks with their thoughts. From controlling an electric wheelchair via a brain-computer interface to learning how to use a prosthetic limb, this technology holds liberating possibilities and represents the next great frontier of mobility innovation and accessibility.

Speech Impairment

The days when children with disabilities had no choice but to use “special” assistive technologies are fading thanks to sleek smartphones armed with applications that help them communicate. In this new world of text-to-speech software and sophisticated mobile apps, millions of Americans now have more choices and innovative ways to make their voices heard.

Approximately 6 to 8 million people in the United States have a form of language disability. Because the underlying conditions are wide-ranging, diverse approaches are needed. The best assistive tools may vary not only by condition but by individual preferences and unique needs. For example, deaf children in the United States often learn sign language to communicate instead of or in addition to using speech. Language disorders in adults also result from stroke, head injury, mental impairments, autism or other congenital or acquired disorders of brain development. Accommodations and adaptations are varied—a need that may be addressed with the proliferation of mobile apps.

Mobile innovation now offers an array of convenient and low- or no-cost communications options. Mobile phones with voice output software can convey typed messages. Additionally, voice-augmentation



devices, which synthesize speech, can interface with leading wireless devices. Many of today's phones also offer text-based messaging channels, which enable silent communications. And video exchange (such as that of the new iPad and iPhone) offers those who use sign language and/or speech read another non-verbal, tech-assisted communications option.

Similarly, the rise of ever more sophisticated smartphones and netbooks offer a compelling combination of power, portability and size that can be combined with downloadable text-to-speech software. These new technologies, in some cases, may be an effective and less-costly alternative or addition to speech devices covered by private insurance and Medicare. Downloadable software can provide an immediate or interim way to address communication challenges. Additionally, experts say individuals with speech impairments – particularly children – often prefer to use technology that is more mainstream and thus considered less stigmatizing.

Cognitive Disability

While mobile devices have long been used to help guide those with cognitive disabilities, the Wireless Rehabilitation Engineering Research Center is now testing innovations like the PocketCoach, which instructs those with intellectual disabilities in how to perform assembly line jobs. This technology reflects a strong step toward potentially increasing the employment rate of people living with a cognitive disability.

More than 20 million American citizens have cognitive disabilities, which include mental and developmental disabilities, acquired brain injury, Alzheimer's disease and severe and persistent mental illness. As our nation ages and medical advances extend Americans' longevity, these numbers are expected to rise – a fact that underscores the importance of mobile innovation in this area.

In addition to memory difficulties, common challenges associated with cognitive disabilities include conceptualizing, planning and sequencing thoughts and actions. Fortunately, today's mobile technologies can help address these issues and give those with cognitive disabilities greater independence and self-sufficiency. For example, mobile devices are ideal for setting up regular reminders for people who need extra assistance completing daily tasks. Many mobile devices now come equipped with this capability and some PDAs and smartphones can be enhanced with special software that includes spoken and picture cues. Additionally, universal design has sparked the development of more versatile features that are helpful to those with cognitive disabilities, such as key shortcuts, voice prompts, lighted keys and more, that assist users in controlling their device.



Navigating the outside world can also be challenging for those with cognitive disabilities. For example, the public transportation system can be a disconcerting maze if help is not readily available. However, thanks to GPS, the recently developed Travel Assistance Device helps guide riders with cognitive disabilities safely to their destinations. The GPS, located inside the mobile device, lets the user know when they are approaching their destination by vibrating and sending a prerecorded message. As a result, people with cognitive disabilities can go about their daily lives with greater independence and less stress.

CHALLENGES AND OPPORTUNITIES

Thanks to advances in mobile technology and the Internet, people with disabilities have unprecedented access to life-enhancing opportunities today. Gone are the days when individuals with vision loss are forced to wait months or even years for information to be available in braille or via audiotape. Today's text-to-speech technologies, downloadable commercial audiobooks and specially formatted library books for people who have disabilities make all this information available in an instant. Consider those with mobility limitations who have difficulty leaving their homes. Computers equipped with software and specialized devices allow them to work from home, order groceries, shop and pay bills online, and connect with the outside world. Smartphones also have evolved into profoundly versatile tools – offering a fast-growing array of customizable features that reflect the individual needs and interests of each specific user.

The wireless sector's commitment to developing products aligned with the highest standards of universal design is ensuring greater accessibility of new technologies. Of course, even with the exponential growth of technologies aiding those with disabilities, there is still more work to be done. Historically, computer ownership and technology adoption has been slower among people with disabilities. For example, while approximately 79% of adult Americans use the Internet, only 38% of Americans with disabilities go online.

Meanwhile, wireless device ownership among people with disabilities increased 13% - from 72% to 82% - between 2001 and 2006. And the value associated with mobile devices is being made clear by people with disabilities. When asked to rate the importance of having a cell phone accessible, 81% of the respondents of an American Foundation for the Blind survey said they consider it "very important" and lauded the versatile functionality of their phones. Reasons expressed for not using wireless technology range from physical limitations to cost, and some said they lacked technological literacy or simply didn't need such devices. Many public and private stakeholders are working to address these concerns.

Furthermore, sheer technological evolution is alleviating cost as a barrier to access – and extending greater opportunities to individuals with disabilities. The world of 3G and 4G broadband innovations is speeding inexpensive and free applications that can be downloaded instantly. For example, text-to-speech software from NextUpTalker to GhostReader can be combined with a high-performance, low-cost computer, such as a netbook. These options are typically far less costly than more traditional devices created specifically for people with disabilities.



The impressive adaptability of smartphones and other mobile devices continues to have a transformative impact on the accessibility of these tools for people with disabilities. Emerging innovations, such as brain computer interface technology, which allows individuals to perform tasks using their thoughts alone, will also bring new modes of communication to the marketplace.

Accessibility. Affordability. Tech Literacy. Innovation. The real-world impact of these shared industry and policy objectives cannot be overstated. With sound policymaking spurred on by the National Broadband Plan, the mobile innovation community will continue to unleash powerful new cycles of innovation that will advance an inclusive and accessible connected nation.

THE FUTURE OF MOBILE INNOVATION POLICY

The upcoming 20th anniversary of the Americans with Disabilities Act marks more than a prominent policy milestone. The legislation's inception also represents a time when wireless was in its infancy and on the brink of a still-ongoing revolution in how we lead virtually every aspect of our modern, connected lives. Explosive innovation in mobile and wireless technologies has unleashed a new world of opportunities for all Americans, including remarkable strides in accessibility and connectivity for those with disabilities.

If there is one key takeaway from this brief glimpse into the innovation underway today and its impact in the lives of people with disabilities, it is this: We have barely scratched the surface of the transformation possible at the intersection of mobility, accessibility and the high-speed Internet. From private sector innovators to public sector policymakers, the collective question we all must ask now is: How can we continue to support and accelerate this broad and meaningful progress? And, how can we ensure that people with disabilities feel welcomed to the table?

As discussed in this report, both the FCC and Congress have put meaningful ideas and proposals on the table. The National Broadband Plan brings reinvigorated focus to these opportunities in our contemporary and connected world. And, we have learned a great deal from the progress made over the last two decades. A balanced regulatory approach that supports innovation and investment has given this nation the most robust wireless infrastructure in the world. Consumer demand and the ingenuity of diverse innovators have combined to unleash advances in health care, job creation, education, public safety and beyond. Now the public and private sectors must continue to work collaboratively to speed the next generation of progress and ensure it is widely accessible, so all Americans can reap the benefits.

How do we propel the next evolution of our mobile future and make it widely accessible? Here are some key themes for consideration:

1 Robust Innovation Requires More Spectrum

Delivering on the next-generation of innovation that is creating these extraordinary breakthroughs for people with disabilities will require significant amounts of wireless capacity. As innovation moves beyond texting, voice activation and innovative hardware features to high-bandwidth activities such as live-streaming video, significantly more bandwidth will be required to ensure all of this progress can be delivered in a robust and reliable way. The FCC has committed in its National Broadband Plan to making more spectrum available for consumer wireless services. People with disabilities have a huge stake in the success of these efforts, and in urging the FCC to begin taking action today.

2 FCC Should Consider Economic Needs

As noted in this report, people with disabilities are more likely to be unemployed or underemployed than the U.S population as a whole. The FCC should consider actions that would remove unnecessary cost barriers that put mobile broadband out of reach for those living at or near the poverty level. It is widely documented that wireless taxes and fees are among the most regressive in the United States today. Their impact on adoption of these increasingly essential services should be more carefully considered. Additionally, the FCC should be commended for supporting in its National Broadband Plan funds for technology applications and development to enable people who are deaf or blind to access broadband services more readily.

3 More Services for Disability Community Should Go Mobile

Leading public and private institutions should lead by example in acknowledging the growing role of connected mobility tools in the lives of people with disabilities. Government agencies that provide services to these communities should consider expanding their online footprint to include mobile-friendly applications, services and other resources. Leading U.S. companies should undertake similar efforts to reach out to and respond to the needs of this community, which comprises 1 in 5 Americans.

4 Foster Collaboration Between Innovators & Disability Communities

Universal design—the notion that technology should be easily accessible to people with disabilities—is the galvanizing vision behind the most leading-edge devices and applications that are allowing mobile innovation to help transform the lives of people with disabilities. Leading wireless carriers should continue their strong support for this principle. Hardware and applications innovators should consider collaboration with disability communities as standard procedure. Reaching out to organizations and research and development ventures at universities and elsewhere that specialize in technology and people with disabilities can help ensure products and services connect with all Americans. Feasibility and other practical barriers will at times present themselves—a fair point that favors a public-private collaboration model. However, we believe it is hardly coincidence that those companies that lead today in taking this principle to heart are among the most innovative and successful in the marketplace.

5 Modernize Local 911 Infrastructure

Enhancing emergency 911 for all Americans, including individuals with disabilities, should be a national priority. Wireless providers have invested heavily in networks that can identify the location of wireless 911 calls. Now broadband holds the potential to take emergency 911 to the next level with text- and video-based communications of potentially life-saving significance to Americans with disabilities. Achieving these enhancements requires local public safety and 911 centers to be next-generation capable. This is a significant—and worthwhile—investment, and the federal government should consider assisting in these important local efforts that promote public safety.

Conclusion

Twenty years have elapsed since the passage of the Americans with Disabilities Act (ADA), and in that time, wireless has helped deliver on the promise of this landmark legislation, ushering in greater digital inclusiveness for the 54 million Americans with disabilities. Today, with the FCC signaling its commitment to life-enhancing innovations, the mobile sector, from wireless providers to garage innovators, is poised to unleash the next wave of our mobile future and bring even greater benefits to the disability community.

RESOURCES

1. Americans with Disabilities Act
www.ada.gov
2. Individuals with Disabilities Education Act
<http://idea.ed.gov/>
3. U.S. Dept. of Education National Institute on Disability and Rehabilitation Research
<http://www2.ed.gov/about/offices/list/osers/nidrr/index.html?src=mr>
4. FCC Broadband Plan
www.broadband.gov
5. FCC Working Paper: A Giant Leap & A Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities
<http://download.broadband.gov/plan/fcc-omnibus-broadband-initiative-%28obi%29-working-report-giant-leap-big-deal-delivering-promise-of-equal-access-to-broadband-for-people-with-disabilities.pdf>
6. National Coalition for Assistive and Rehab Technology
www.ncart.us
7. American Association of People with Disabilities
www.aapd-dc.org
8. Coalition of Organizations for Accessible Technology
www.coataccess.org
9. National Center for Accessible Media
<http://ncam.wgbh.org>
10. Georgia Tech Research Institute
www.gtri.gatech.edu
11. Mac-cessibility Network
<http://maccessibility.net>
12. American Foundation for the Blind
www.afb.org
13. Coleman Institute for Cognitive Disabilities
<http://www.colemaninstitute.org/>
14. The National Spinal Cord Injury Association
<http://www.spinalcord.org/>
15. World Institute on Disability
<http://www.wid.org/>
16. Inclusive Technologies
<http://inclusive.com/>
17. AT&T Accessibility Resources
<http://www.wireless.att.com/learn/articles-resources/disability-resources/disability-resources.jsp>
18. Sprint Accessibility Resources
<http://shop.sprint.com/en/about/community/accessibility.shtml>
19. Verizon Accessibility Resources
<http://aboutus.vzw.com/accessibility/index.html>
20. T-Mobile Accessibility Resources
http://www.t-mobile.com/Company/Community.aspx?tp=Abt_Tab_Safety&tsp=Abt_Sub_TTYPolicy

ENDNOTES

1. "A Giant Leap and a Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities," Federal Communications Commission, April 2010.
2. <http://www.wireless.att.com/learn/articles-resources/disability-resources/disability-resources.jsp>
3. <http://aboutus.vzw.com/accessibility/index.html>
4. http://www.t-mobile.com/Company/Community.aspx?tp=Abt_Tab_Safety&tsp=Abt_Sub_TTYPolicy
5. <http://shop.sprint.com/en/about/community/accessibility.shtml>
6. "A Giant Leap and a Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities," Federal Communications Commission, April 2010.
7. Jeffrey S. Passel and D'Vera Cohn, U.S. Population Projections: 2005-2050, at p. 20, Pew Research Center (Feb. 2008)
9. Hearing Loss Association of America, Hearing Loss Stats for Adults, <http://www.hearingloss.org/learn/factsheets.asp>.
10. "Cell Phone Usage Continues to Increase," Harris Interactive, 4/4/2009.
11. Wireless RERC, "Survey of User Needs (SUN)," Funded by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR), January 2008.
12. "The Impact of Broadband on People with Disabilities," Charles M. Davidson and Michael J. Santorelli, December 2009.
13. Pleis J.R., Lethbridge-Çejku M. (2007). Summary health statistics for U.S. adults: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10 (235).
14. Coleman Institute for Cognitive Disabilities
15. According to the ACS, a physical disability is defined as condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying."
16. National Center for Health Statistics, Disabilities/Limitations, <http://www.cdc.gov/nchs/FASTATS/disable.htm>.
17. Bureau of Labor and Statistics, "March Disability Employment Statistics," March 2010.
18. Bureau of Labor and Statistics, "March Disability Employment Statistics," March 2010.
19. "A Giant Leap and a Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities," Federal Communications Commission, April 2010.
20. 2007 Disability Status Report United States, Cornell University, Rehabilitation Research and Training Center on Disability Demographics and Statistics, published 2008.
21. 2007 Disability Status Report United States, Cornell University, Rehabilitation Research and Training Center on Disability Demographics and Statistics, published 2008.
22. "The Impact of Broadband on People with Disabilities," Charles M. Davidson and Michael J. Santorelli, December 2009.
23. Pleis J.R., Lethbridge-Çejku M. (2007). Summary health statistics for U.S. adults: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10 (235).
24. According to the ACS, a physical disability is defined as condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying."
25. National Center for Health Statistics, Disabilities/Limitations, <http://www.cdc.gov/nchs/FASTATS/disable.htm>.
26. Fact Sheets prepared by the National Institute on Deafness and Other Communication Disorders (NIDCD).
27. Coleman Institute for Cognitive Disabilities, fact sheet.
28. "CAPS: Context Aware Prompting System for Persons with Cognitive Disabilities," Wireless RERC, Funded by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR).
29. Alan Hubbard, COO, National Telecommuting Institute, Inc., Statement at the Broadband Access for
30. People with Disabilities Field Hearing (Nov. 6, 2009).

31. Bureau of Labor and Statistics, "March Disability Employment Statistics," March 2010.
32. 2007 Disability Status Report United States, Cornell University, Rehabilitation Research and Training Center on Disability Demographics and Statistics, published 2008.
33. Robert E. Litan, Great Expectations: Potential Economic Benefits to the Nation From Accelerated
34. Broadband Deployment to Older Americans and Americans with Disabilities, New Millennium Research Council (Dec. 2005)
35. The Wide Range of Abilities and its Impact on Computer Technology, Forrester Research, published 2003.
36. "Consumer-Driven Medicine: How to Create a New Healthcare System," Darrell M. West, Brookings Institution, October, 8, 2009.
37. Wireless Healthcare: Analysis and Forecasts, Parks Associates, 8/5/2009
38. BCC Research, Disabled and Elderly Assistive Technologies in the U.S., June 2009.
39. BCC Research, Disabled and Elderly Assistive Technologies in the U.S., June 2009.
40. PRNewswire, "mHealth for the Elderly to Become a High Growth Consumer Electronics Market," October 14, 2009.
41. 2007 Disability Status Report United States, Cornell University, Rehabilitation Research and Training Center on Disability Demographics and Statistics, published 2008.
42. Educational Attainment in the United States: 2009, U.S. Census Bureau, 4/2008
43. 2007 Disability Status Report United States, Cornell University, Rehabilitation Research and Training Center on Disability Demographics and Statistics, published 2008.
44. Educational Attainment in the United States: 2009, U.S. Census Bureau, 4/2008
45. "A Giant Leap and a Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities," Federal Communications Commission, April 2010.
46. "The Impact of Broadband on People with Disabilities," Charles M. Davidson and Michael J. Santorelli, December 2009.
47. Reena Jana, Business Week, "How Tech for the Disabled is Going Mainstream, September 24, 2009.
48. <http://www.research.att.com/projects/Miracle/index.html>
49. Disabled World, "Text Phones for the Deaf," January 20, 2009.
50. Pleis J.R., Lethbridge-Çejku M. (2007). Summary health statistics for U.S. adults: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10 (235).
51. Pleis J.R., Lethbridge-Çejku M. (2007). Summary health statistics for U.S. adults: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10 (235).
52. My San Antonio, "AT&T's Universal Design Makes Cell Phones More Disabled-Friendly," April 11, 2008.
53. According to the ACS, a physical disability is defined as condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting, or carrying."
54. National Center for Health Statistics, Disabilities/Limitations, <http://www.cdc.gov/nchs/FASTATS/disable.htm>.
55. 2007 Disability Status Report United States, Cornell University, Rehabilitation Research and Training Center on Disability Demographics and Statistics, published 2008.
56. Reena Jana, Business Week, "How Tech for the Disabled is Going Mainstream, September 24, 2009.
57. Rory A. Cooper, Live Science, "Robotic Systems Help People with Disabilities," August 14, 2009.
58. Mobile Technology News, "A (Virtual) Smart Home Controlled By Your Thoughts," May 11, 2009.
59. Fact Sheets prepared by the National Institute on Deafness and Other Communication Disorders (NIDCD).
60. "Text-to-Speech Technology Reaches an Inflection Point," Ashlee Vance, The New York Times, September 19, 2009.
61. "Text-to-Speech Technology Reaches an Inflection Point," Ashlee Vance, The New York Times, September 19, 2009.
62. "CAPS: Context Aware Prompting System for Persons with Cognitive Disabilities," Wireless RERC, Funded by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR).

63. Coleman Institute for Cognitive Disabilities, fact sheet.
64. Rich Shopes, Tampa Bay Tribune, "Device Helps Disabled Gain Independence," January 5, 2009.
65. "Internet Use and Home Broadband Access," Pew Internet and American Life Project, April, 2009.
66. Wireless RERC, "Survey of User Needs (SUN)," Funded by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR), January 2008.
67. American Foundation for the Blind online survey findings pertinent to SUN (AFB. AccessWorld, Vol. 7, No.5)
68. Wireless RERC, "Survey of User Needs (SUN)," Funded by the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (NIDRR), January 2008.



MobileFuture
Wireless. Innovation. Freedom.

