

A thick red vertical bar runs down the left side of the page. At the bottom of this bar, a pattern of red and white squares of varying sizes extends outwards, resembling a digital or pixelated effect.

Creating Access for People with Disabilities through Speech and Language Technologies

“For Americans without disabilities, technology makes things easier. For Americans with disabilities, technology makes things possible.”

Mary Pat Radabaugh

*Study on the Financing of Assistive Technology
Devices of Services for Individuals with Disabilities¹*

Introduction

For people with disabilities, barriers to access are not just physical - they can be technological as well. Individuals with hearing, vision, and physical mobility impairments face unique challenges when it comes to using technology many of us take for granted. For instance, imagine surfing the Web if you are blind, or trying to click a mouse if you are paralyzed and cannot use your hands.

In order to ensure equal access for the 54 million Americans with a disability, the federal government has expanded and strengthened Section 508 of the Rehabilitation Act Amendments, which is part of the Workforce Investment Act signed by former President Clinton in August 1998. The goal of Section 508 is to eliminate barriers to information technology for people with disabilities, make available new opportunities to those individuals, and encourage development of technologies that will help achieve these goals.

Section 508 encompasses a huge range of technology products, how they work, and how they are documented and supported. While this creates new challenges for both purchasers and suppliers, it also creates new opportunities for those ready to meet the demand. Making products accessible to people with disabilities often increases their ease of use and functionality for all users, thereby expanding their value in the marketplace.

Speech and language technology and products are already being used to provide access to electronic and information technology for people with a variety of disabilities. This paper provides a brief overview of how speech and language technology can assist federal agencies, manufacturers, developers, employers, and support organizations to provide access for people with disabilities.

NOTE: This paper assumes that readers already possess a general understanding of Section 508. For an introduction to Section 508 requirements and technology standards, please see Appendix A.

How Speech and Language Technologies Can Provide Access for People with Disabilities

Disability Categories

The Section 508 technology standards were created to address five major categories of disabilities:

1. Visual impairments—blindness, low vision, color blindness
2. Hearing impairments—deafness and low hearing
3. Mobility impairments—limited or no manual dexterity, strength or reach, tremors, seizure disorders
4. Cognitive impairments or learning disabilities
5. Speech impairments

Speech and language technologies can be deployed to enable individuals with disabilities to use electronic and information technology in many different ways. Here are just a few of the most important applications.

Text-to-Speech Technology

Text-to-speech technology reads, understands, and converts computer-generated text into spoken form. This technology has already been incorporated into a growing number of products and applications, including telephony, Internet voice portals, and embedded devices, as well as many assistive technology products. It can benefit individuals with a variety of disabilities, such as limited or no vision, limited or no mobility, learning disabilities, and cognitive impairments.

Speech Recognition

Speech recognition software applications are one of the most dramatic areas of development in the speech and language technology arena. Individuals with limited or no mobility, limited or no vision, and/or learning disabilities or cognitive impairment can use speech recognition software to input text into a personal computer, create documents, navigate the Internet, and control the desktop by voice. In addition, some software programs also contain text-to-speech software that will read documents out loud.

Most speech recognition software programs can be used with virtually any Windows®-based application; some can also be used with Macintosh applications. Depending on individual needs, speech recognition can be used on its own or in conjunction with other assistive software or hardware to provide access.

Dictation frees the individual from the keyboard and mouse to allow the input and modification of text and information. After a brief training period, many users can achieve 98-99% accuracy, resulting in a higher productivity level than most typists. Eliminating the need for keyboards and mice can actually increase users' productivity, as well as remove limitations and obstacles for people with disabilities.

Many individuals with learning disabilities, including dyslexia, successfully use speech recognition software to learn to read, develop writing skills, and compose homework.

In addition to off-the-shelf software, speech recognition technology can be used by software developers and manufacturers to speech-enable their own products, applications, and Web sites. Guidelines are available to help Web developers build their sites so they are easily navigable by speech recognition software.

Internet Voice Portals and Telephony Applications

A growing number of traditional companies and new service organizations are taking advantage of speech recognition and text-to-speech technology to communicate to their audiences. According to the Datacomm Research Company, more than 2 billion people will use Internet voice portals, speech-enabled Web sites, and Web-based interactive voice response systems by the year 2005.²

Some airlines have telephone numbers travelers can call to check on flight arrivals and delays. Without human intervention, the system understands their request using speech recognition technology, finds the information, and reads back the latest update using text-to-speech software.

In addition, new companies that offer a wide assortment of information are now promoting their services. A variety of Web sites can be accessed over the telephone through voice portals. Horoscopes, weather, and the latest headlines are just some of the information that can be accessed using everyday speech.

These applications provide an excellent means of access for individuals with vision and mobility impairments.

Embedded Applications

Once limited to the world of science fiction, speech technology is rapidly becoming commonplace. High-end luxury automobiles now have speech functionality built in to control such tasks as temperature control and audio entertainment to free the driver to focus on the task at hand.

Manufacturers around the world are working to embed similar features into their products. In the not-so-distant future, it will be commonplace for a wide assortment of consumer electronics from lighting to televisions to list voice-activated controls among their features. Office equipment such as fax machines, copiers, and printers with embedded speech technology will assist both people with disabilities and their fellow office workers.

Information Management Using Audio Mining

A tremendous amount of information generated today is archived in video or audio recordings. Getting to the specific information an individual needs can be a daunting task. Audio mining technology now exists to help narrow the search and increase productivity. Events can be recorded, encoded, and cataloged for quick search and retrieval. This digitized format is suitable for streaming over the Internet and further reduces barriers of time and location.

This has implications for individuals who for any number of reasons would be restricted from an activity, such as attending classes at a school or university. It would also aid individuals with learning disabilities who would benefit from review and repetition of key topics, or who need to study at their own pace.

Screen Reading

Screen reading applications can assist visually impaired people as well as individuals with learning disabilities. Screen readers read scanned or electronic text aloud using synthetic speech. Some screen readers also increase the size of the actual text or highlight the words as they are read to assist those with limited vision to follow along.

Many users prefer this technology to physical magnifiers that are difficult to use and distort images. Individuals with cognitive impairments or learning disabilities can also use screen-reading applications. The combined audio and visual presentation helps struggling readers to increase reading accuracy, speed, and comprehension.

ScanSoft Offerings

Introducing ScanSoft

ScanSoft is the leading supplier of imaging, speech, and language solutions that make businesses more productive. The company's portfolio of solutions and technologies automate a range of manual processes to help consumers, professionals, and enterprises save time, increase productivity, and improve customer service.

With the recent acquisition of Lernout & Hauspie assets, ScanSoft adds speech and language solutions to its portfolio of productivity-enhancing applications and technologies. The robust group of assets includes RealSpeak™, the industry's foremost text-to-speech technology, the popular Dragon NaturallySpeaking® speech recognition software, and technology aimed at the rapidly growing telecommunications, automotive, and mobile device markets. ScanSoft's speech-based technology and intellectual property is widely considered the finest in the industry and represents a strategic growth opportunity for the company.

Here are some of the ScanSoft technologies, applications, and products that address the accessibility requirements set forth in Section 508.

RealSpeak Text-to-Speech Technology

The RealSpeak text-to-speech solution reads, understands, and converts computer-generated text into the most natural sounding and intelligible voice available. RealSpeak is based on concatenation algorithms, where actual human voice segments are stored, indexed and used to convert ASCII text into speech. RealSpeak analyzes the entire sentence, including punctuation, prior to assembling the word segments. In this way it can accurately simulate not only the word but also, the prosody and melodic characteristics that are vitally important to conveying meaning. In addition, custom pre-processing modules initiate action in the system early in the text-to-speech interface. This pre-processing provides a seamless interface and improves the end-user experience.

RealSpeak is currently being used by companies and information service providers worldwide to distribute information. Employees, customers, and end users can obtain needed information such as weather and travel updates or have their e-mail read to them. RealSpeak helps make information available anywhere, anytime, through any device, which provides increased access for everyone, including people with disabilities.

Automatic Speech Recognition (ASR)

ASR is the process by which machines translate spoken input into text strings. ScanSoft's ASR for telephony is a multi-lingual, speaker independent, small to large vocabulary, phoneme-based speech recognition engine. It provides continuous speech, keyword spotting, continuous digit recognition and dialog development. These engines are well suited for digit replacement, and command and control, as well as more complex applications where natural, continuous speech and dialogs are required.

ASR technology is ideal for creating embedded solutions. From automobiles to office equipment, the ability for an appliance or machine to understand spoken instructions increases comfort and convenience as well as removing barriers for those with disabilities.

Dragon NaturallySpeaking speech recognition software

Dragon NaturallySpeaking software is an off-the-shelf product ready to install on a PC. It can also be licensed for multiple users. A variety of products are available to meet the needs of business, legal, medical, and public safety professionals, as well as home-based workers. This award-winning family of products allows users to dictate into virtually all Microsoft® Windows®-based applications, as well as navigate the desktop and the Web with voice command-and-control. Dragon NaturallySpeaking software also includes text-to-speech technology that enables users to hear documents and e-mail read aloud.

The software is currently being used in thousands of public and private settings to increase office productivity and to provide access to electronic and information technology. For example, one large federal agency based in Baltimore, Maryland, provides Dragon NaturallySpeaking software to more than 100 employees with disabilities ranging from RSI to vision impairment to quadriplegia. The employees use the software with multiple applications to input text and data and to operate their computers, including Microsoft Word and a Unix-based data entry program.

Dragon NaturallySpeaking can be customized to meet the needs of people with a variety of disabilities. For example, custom voice commands can be created to enable a user with no mobility to fill out a form by voice. Users can create, send, and listen to e-mails, using voice commands. A complicated task that would typically take several minutes to accomplish by keyboard and mouse can be completed in just seconds by voice.

Dragon MediaIndexer™

Dragon MediaIndexer software catalogs spoken content so it can be searched for specific words and phrases. Built on the same speech recognition engine used in the ScanSoft® AudioMining™ technology, MediaIndexer can catalog any content, pre-recorded or live, analog or digital, and can also encode the content to digitized format suitable for Web streaming – all in real time.

The index files contain all of the recognized words, as well as time stamps for when each word occurs, so that it can be synched with the streamable encoded file. These files can then be easily searched over the Web for specific words and phrases, allowing users to see and hear only the sections of the media that interest them. Searches can be within a single index, or across multiple indexes.

MediaIndexer can help make media content accessible to people with limited or no mobility, limited vision, or cognitive impairments.

Conclusion

Section 508 covers a wide variety of products, from the Internet to software applications to personal digital assistants (PDAs) and fax machines. Including speech and language technologies in these devices increases accessibility for a wide range of impairments. Although Section 508 only applies to federal agencies, many state and local governments have announced plans to adopt the same or similar requirements for their populations, and the governments of other countries have expressed interest in similar regulations.

While no one enjoys the increased bureaucracy involved with new government regulations, this is an opportunity to add value to products for government, enterprise and consumer markets. The demand for information, anywhere, any time is growing at an unprecedented pace. Developing alternate means of accessing this information is an integral part of the strategy of forward-looking companies worldwide.

ScanSoft and our partners have many years of experience and expertise in developing and providing technology and products that assist people with disabilities. We will work with any federal agency or potential customer to help them assess which compliance standards apply to their situation and determine whether our technology or products meet the appropriate 508 standards or provide equivalent accessibility by alternate means.

Whether mandated by the government, driven by market demand or the special needs of millions of people worldwide, ScanSoft is committed to developing products that enable everyone to maximize their potential.

1 “Study on the Financing of Assistive Technology Devices of Services for Individuals with Disabilities,” A Report to the President and the Congress of the United States, March 4, 1993, National Council on Disability

2 “Voice of the Internet: Opportunities for Voice Portals and Voice ASPs,” Datacomm Research Company, Chesterfield, Missouri, October 2, 2000.

Legal Notice

This document contains forward-looking information that involves risks and uncertainties including statements about ScanSoft's plans, objectives, expectations and intentions. Readers are cautioned that forward-looking statements include known and unknown risks and uncertainties, including uncertainty of new product development, the risk that newly introduced products may contain undetected errors or defects or otherwise not perform as anticipated, early state of development of the speech, language, and medical information technology markets, the ability of ScanSoft's customers to successfully integrate and commercialize ScanSoft's technology, the retention of key technical and other personnel, currency and other risks related to international operations, rapid technology change and intense competition, as well as other risks set forth in ScanSoft's filings with the Securities and Exchange Commission. The forward-looking statements contained herein speak only as of the date of this white paper.

ScanSoft, MediaIndexer, RealSpeak, AudioMining, and Dragon NaturallySpeaking are trademarks or registered trademarks of ScanSoft, Inc or its affiliates in the United States and/or other countries. All other products, fonts, company names and logos are trademarks or registered trademarks of their respective companies.

Copyright © 2002 ScanSoft, Inc. All Rights Reserved. ScanSoft, Inc. does not provide any assurances on the accuracy of the product. The product can also be subject to changes without notice. ScanSoft, Inc. shall not be responsible for or liable to any customer for decisions made based on this document. The information contained in this white paper does not constitute legal advice. If you have questions regarding the Americans with Disabilities Act, The Workforce Investment Act, Section 508 or any other law, you should consult a qualified attorney. ScanSoft cannot provide an opinion regarding the accuracy of any compliance plan.

Appendix A: Section 508 Overview

What is Section 508?

Section 508 requires federal agencies to make computers, Web sites, fax machines, copiers and other forms of technology accessible to employees and members of the public with disabilities. Specifically, Section 508 requires that “When Federal agencies develop, procure, maintain, or use electronic and information technology, Federal employees with disabilities have access to and use of information and data that is comparable to the access and use by Federal employees who are not individuals with disabilities, unless an undue burden would be imposed on the agency.”¹ Section 508 also requires that member of the public with disabilities who are seeking information or services from a federal agency have comparable access as people who do not have disabilities.

According to the Section 508 standards, which went into effect June 20001, electronic and information technology includes “information technology and any equipment or interconnected system or subsystem of equipment that is used in the creation, conversion, or duplication of data and information. The term electronic and information technology includes, but is not limited to, telecommunications products (such as telephones), information kiosks and transaction machines, World Wide Web sites, multimedia, and office equipment such as copiers and fax machines.”²

Electronic and information technology is considered accessible to people with disabilities if it is usable in a variety of ways that do not depend on a single sense or ability. For example, a system that provides output only in audio format would not be accessible to people with hearing impairments, and a system that requires mouse actions to navigate would not be accessible to people who cannot use a mouse because of a dexterity or visual impairment.

The hardware, software, etc. does not have to be accessible on its own, but does need to be compatible with some form of assistive technology (e.g. screen readers, speech recognition software, text-to-speech technology) that makes it accessible. For example, a person who is blind may need add-on software that reads text aloud in order to use a word-processing program. If the word-processing program could not be made compatible with a screen-reading program, it might not be accessible. Section 508 does not require that assistive devices be purchased, but does require that covered EIT be capable of having such devices added at some later time as necessary.

What are the 508 Standards?

The US Architectural and Transportation Barriers Compliance Board (Access Board) (www.access-board.gov), an independent federal agency devoted to accessibility for people with disabilities, developed the detailed technical and functional performance criteria that are being used to determine whether a technology product or system is “accessible.” The standards aim to provide accessibility for people with a variety of impairments, including cognitive, hearing, mobility, speech, and visual disabilities. The standards are organized into six sections:

- Software Applications and Operating Systems (primarily focuses on usability for people with vision impairments)
- Web-based Intranet and Internet Information and Applications (primarily ensures access for people with vision impairments who rely on assistive products such as screen readers and refreshable Braille displays)
- Telecommunications Products (primarily focuses on access for people who are deaf or hard of hearing who rely on hearing aids, cochlear implants, assistive listening devices, and TTYs)
- Video and Multimedia Products (primarily focuses on access for people with vision or hearing impairments who rely on captioning or video description features)
- Self Contained, Closed Products (requires that access features be built into products such as information kiosks, calculators, and fax machines, so that individuals with disabilities can use the products without attaching their own assistive devices)
- Desktop and Portable Computers (applies to alternate access methods for keyboards, touch screens, biometric identification, and ports and connectors)

What are the key exemptions?

- Undue burdens. Federal agencies do not have to comply if it would impose an “undue burden” to do so. An undue burden means a significant difficulty or expense. However, the agency must explain why meeting the standards would pose an undue burden for a given procurement action, and must still provide information and data to individuals with disabilities through an alternate means of access that can be used by the individuals.
- National security systems used for military command, weaponry, intelligence and cryptologic activities are exempt. However, this exemption does not apply to normal business and administrative systems used by defense agencies.
- Micropurchases (under \$2500) are exempt through January 1, 2003. However, agencies are still required to provide reasonable accommodation for the disabled under section 504 of the Rehabilitation Act of 1973, regardless of the size of purchase.

How will federal agencies determine if a product is Section 508 compliant?

Currently, there is no uniform testing procedure to determine if a product is compliant with Section 508 standards. Although the Government Services Administration (GSA) is developing a template for manufacturers to use to describe how each of their products addresses (or will address) the standards, a completion date for the template has not been announced. In the interim, manufacturers and vendors are being asked to evaluate their own products to determine if they are compliant. This situation places considerable risk on the manufacturer. Manufacturers who claim complete compliance could face liability if a federal agency to which it sells products is subsequently sued by disabled individuals.

EIT manufacturers and suppliers have been working closely with government agencies and disability support organizations to create voluntary compliance standards and tools. The Information Technology Industry Council has developed a series of templates to assist federal contracting officials in fulfilling their acquisition planning responsibilities (see Appendix B for more information).

The “requirements officer” at each federal agency is responsible for determining whether a particular program or piece of equipment is Section 508 compliant. The requiring official must identify which standards apply to a particular procurement, conduct market surveys, prepare technical specifications and minimum requirements, and recommend for purchase the most compliant items available.

There is widespread recognition that implementing the 508 standards is a process that will take time and cooperation on all parts. When the Federal Acquisition Regulations for Electronic and Information Technology Accessibility were published last spring, the regulations acknowledged that initially, many products will not meet 100% of the Access Board’s technical standards. The regulations state that agencies must comply with whatever accessibility standards can be met with supplies or services that are commercially available at the time of purchase.

How will Section 508 be enforced?

There is an administrative complaint process that enables any individual with a disability to file a complaint alleging that a federal department or agency has not complied with the accessible technology standards in a procurement made after June 21, 2001. Although individuals with successful suits may receive injunctive relief and attorney’s fees, they cannot be awarded compensatory or punitive damages. Individuals may also file a civil action against an agency. Complaints and lawsuits can only be filed against products that are procured by the agency.

¹ Electronic and Information Technology Accessibility Standards, Architectural and Transportation Barriers Compliance Board, Published in the Federal Register on December 21, 2000.

² *ibid*

Appendix B: On-Line Resources

U.S. Government Sites

The Access Board: Independent federal agency devoted to accessibility for people with disabilities.
www.access-board.gov

Federal IT Accessibility Initiative (FITAI): An interagency effort, coordinated by GSA, to offer technical assistance and to provide an informal means of cooperation and sharing of information on implementation of Section 508.
www.section508.gov

Center for IT Accommodation (CTIA):
Established in 1984, the CTIA is a nationally recognized model demonstration facility influencing accessible information environments, services, and management practices.
<http://www.itpolicy.gsa.gov/cita/index.htm>

Computer/Electronic Accommodations Program (CAP): Provides assistive technology accommodations and services to persons with disabilities at the Department of Defense (DoD).
<http://www.tricare.osd.mil/cap/default.htm>

Department of Justice Americans with Disabilities Home Page
<http://www.usdoj.gov/crt/ada/adahom1.htm>

Department of Justice Section 508 Home Page
<http://www.usdoj.gov/crt/508/508home.html>

Presidential Task Force on Employment of Adults with Disabilities:
Its mission is to create a coordinated and aggressive national policy to bring adults with disabilities into gainful employment at a rate that is as close as possible to that of the general adult population.
http://www.dol.gov/dol_sec/public/programs/ptfead/main.htm

Disabilities Rights Office (DRO): The DRO, housed in the FCC's Consumer Information Bureau, provides technical assistance to consumers, businesses, and government agencies on their rights and responsibilities to facilitate disability access in the foundations and frontiers of telecommunications.
<http://www.fcc.gov/cib/dro/welcome.html>

Office of Disability Employment Policy (ODEP): The mission of ODEP, under the leadership of an Assistant Secretary, will be to bring a heightened and permanent long-term focus to the goal of increasing employment of persons with disabilities.
<http://www.dol.gov/dol/odep/>

National Institute on Disability and Rehabilitation Research (NIDRR): The United States Department of Education's Office of Special Education and Rehabilitative Services (OSERS), through its National Institute on Disability and Rehabilitation Research (NIDRR), conducts comprehensive and coordinated programs of research and related activities to maximize the full inclusion, social integration, employment, and independent living of disabled individuals of all ages.
<http://www.ed.gov/offices/OSERS/NIDRR/>

Publications

Federal Computer Week

<http://www.fcw.com>

Government Computer News

<http://www.gcn.com>

Associations & Organizations

RESNA (Rehabilitation Engineering and Assistive Technology Society of North America) – an interdisciplinary association of people with a common interest in technology and disability.

<http://www.resna.org>

National Organization on Disability (NOD)—promotes full and equal participation of America’s 54 million men, women and children with disabilities in all aspects of life.

<http://www.nod.org>

The Trace Center—presently working on ways to make standard information technologies and telecommunications systems more accessible and usable by people with disabilities. This work is primarily funded by the National Institute on Disability and Rehabilitation Research (NIDRR) (U.S. Department of Education), through the following center grants:

<http://www.trace.wisc.edu>

Appendix C

Voluntary Product Accessibility Template

The Information Technology Industry Council (ITI) has developed a series of templates to assist federal contracting officials in fulfilling their acquisition planning responsibilities. ITI developed the template as a voluntary tool that contractors can utilize or modify to provide information regarding their own particular product characteristics. Further, the Template is not intended to serve as the basis for a centralized database of competitive access features for product comparisons. Rather, to optimize market creation, the ITI urges reliance on competition and innovation. Therefore, it believes that the manufacturer is in the best position to keep the complex and always-evolving information in the Template up to date, and to provide any supporting details necessary to enable government procurement officials to assess a product’s accessibility features.

Available Templates:

- Software Applications and Operating Systems
- Web-Based Internet Information and Applications
- Telecommunications Products
- Video and Multi-media Products
- Self-Contained, Closed Products
- Desktop and Portable Computers
- Functional Performance Criteria

For more information about ITI and the Voluntary Product Accessibility Template, please contact ITI at:

<http://www.iti.org>

1250 Eye Street NW Suite 200

Washington, DC 20005

202-737-8888

Fax: 202-638-4922