Modern and new computing and engineering technology that is of help to people with disabilities

Written by: https://www.fiverr.com/jaclinejerry
Date: 3 February 2017

Employer Contact Details
Email: management@jevan.com.au
Website: http://www.jevan.com.au
LinkedIn: http://www.linkedin.com/in/jevanpipitone
Facebook: http://www.facebook.com/jevanpipitone

Almost 10 percent of the world's population—650 million people—live with some type of disability.1 A disability is any physical, sensory, or cognitive impairment that makes daily activities more difficult. Many people are born with a disability. Others acquire a disability later in life, from an accident, an illness, or the aging process. Many older individuals are diagnosed with chronic conditions that lead to functional or cognitive disabilities. In the United States, for example, about 15 percent of people over the age of 65 require some form of assistance with their basic daily activities.

Recently, however, the shift from analog technology to digital technology has eliminated many of these barriers. The reason is simple: digital information can easily be converted into voice, text, or even physical patterns (e.g., Braille), allowing the development of many more low-cost, readily available general purpose devices that also can be used by people with disabilities. The digital era has led to many advances in technology that have directly improved the quality of life for the disabled community. As discussed below, technology that improves accessibility for people with disabilities generally falls into three categories:

• Assistive technology (technology designed specifically to improve a disabled person's functional capabilities)

• Adaptive technology (technology that provides a mechanism that allows people with disabilities to use technology that would otherwise be inaccessible to them)

• Accessible technology (technology that has many broad applications but helps remove barriers and make the world more accessible for people with disabilities).

An assistive device could be a wheelchair, reacher, or a disability product that allows you to use a computer. If you experience difficulties performing certain tasks it's possible that an assistive device can help you overcome your problems.

Other Disability Aids Include:

- Advanced technology walking products to aid people with disabilities, such as paraplegia or cerebral palsy, who would not at all able to walk or stand (exoskeletons).

- Standing products to support people with disabilities in the standing position while maintaining/improving their health (standing frame, standing wheelchair, active stander).
- Seating products that assist people to sit comfortably and safely (seating systems, cushions, therapeutic seats).
- Walking products to aid people with disabilities who are able to walk or stand with assistance (canes, crutches, walkers, gait trainers).
- Wheeled mobility products that enable people with reduced mobility to move freely indoors and outdoors (Examples: wheelchairs and scooters).

Certain devices, such as eyeglasses and hearing aids obviously require an expert's assessment, but many assistive devices for the enhancement of daily life such as wheelchairs, walkers, bath seats and grab bars are easily obtainable in general and specialty stores including online disability product websites.

You will also find pharmacy personnel are usually quite happy to provide information on a variety of other assistive products like magnifying glasses, bath seats, joint support bandages, pill organizers, canes, etc.

Specialty computer stores often carry items like screen reading software that include screen enlargement features for persons with vision impairments. Voice recognition systems, modified keyboards and computer mice are also available for people with mobility and dexterity limitations.

When selecting assistive technology products for computers, it is crucial to find the right products that are compatible with the computer operating system and programs on the particular computer you will be using.

What the Future Holds for Assistive Technology

This is a very exciting time for new developments in assistive technology. Not only are existing AT programs regularly updated, but new and previously unseen technology is on-route to improve accessibility for persons with disabilities. With the advent of e-book readers like the Kindle, Sony E-reader, and recently the Nook released by Barnes and Noble, there could be another wave of new methods for people with learning disabilities and other conditions to access e-books and books. While not all of the devices have text-to-speech capability, some of them do, and if it proves useful, other producers of e-book readers will probably follow suit and adopt that utility in the near future.

By current estimates, more than 4,000 assistive technologies have been designed for the disabled and seniors. These devices include everything from wheelchairs to a wide assortment of high-tech tools and many companies today are turning their research and development to assistive technologies.

People with disabilities meet barriers of all types However, technology is helping to lower many of these barriers. By using computing technology for tasks such as reading and writing documents, communicating with others, and searching for information on the Internet, students and employees with disabilities are capable of handling a wider range of activities independently. Still, people with disabilities face a variety of barriers to computer use. These barriers can be grouped into three

functional categories: barriers to providing computer input, interpreting output, and reading supporting documentation. Hardware and software tools (known as adaptive or assistive technologies) have been developed to provide functional alternatives to these standard operations. Specific products, and approaches to using them, are described below.

Mobility Impairments

Some wheelchairs may not fit under standard height computer tables and some computer users do not have enough use of their hands and arms to operate a standard keyboard or mouse.

Input

Equipment which provides flexibility in the positioning of monitors, keyboards, documentation, and table tops is useful for many individuals with disabilities. Plugging all computer components into power outlet strips with accessible on and off switches makes it possible for some individuals to turn equipment on and off independently.

Some technology assists individuals with little or no use of their hands in using a standard keyboard. Individuals who have use of one finger, or have access to a mouth- or head-stick or some other pointing device, can control the computer by pressing keys with the pointing device. Software utilities can create "sticky keys" that electronically latch the SHIFT, CONTROL, and other keys to allow sequential keystrokes to input commands that normally require two or more keys to be pressed simultaneously. The key repeat function can be disabled for those who cannot release a key quickly enough to avoid multiple selections. Keyboard guards (solid templates with holes over each key to assist precise selection) can be used by those with limited fine motor control.

For those with more severe mobility impairments keyboard emulation is available, including scanning and Morse code input. In each case, special switches make use of at least one muscle over which the individual has voluntary control (e.g., head, finger, knee, mouth). In scanning input, lights or cursors scan letters and symbols displayed on computer screens or external devices. To make selections, individuals use switches activated by movement of the head, finger, foot, breath, etc. Hundreds of switches tailor input devices to individual needs. In Morse code input, users input Morse code by activating switches (e.g., a sip-and-puff switch registers dot with a sip and dash with a puff). Special adaptive hardware and software translate Morse code into a form that computers understand so that standard software can be used.

Speech input provides another option for individuals with disabilities. Speech recognition systems allow users to control computers by speaking words and letters. A particular system is "trained" to recognize specific voices.

Special software can further aid those with mobility impairments. Abbreviation expansion (macro) and word prediction software can reduce input demands for commonly used text and keyboard commands. For example, word prediction software anticipates entire words after several keystrokes and increases input speed.

Output

Screen output does not present a challenge, but individuals with mobility impairments who have difficulty obtaining output from printers may need assistance from others.

Documentation

On-screen help provides efficient access to user guides for individuals who are unable to turn pages in books.

Blindness

Individuals who are blind cannot access visual material presented on the computer screen or in printed materials.

Input

Most individuals who are blind use standard keyboards, however, Braille input devices are available. Braille key labels can assist with keyboard use.

Output

Speech output systems can be used to read screen text to computer users who are blind. Special software programs (called screen readers) "read" computer screens and speech synthesizers "speak" the text. The availability of earphones for individuals using speech output systems can reduce the distractions for others nearby. Refreshable Braille displays allow line-by-line translation of screen text into Braille on a display area where vertical pins move into Braille configurations as screen text is scanned. Braille displays can be read quickly by those with advanced Braille skills, are good for detailed editing (e.g., programming and final editing of papers), and do not disrupt others in work areas because they are quiet. Braille printers provide "hard copy" output for users who are blind.

Documentation

Scanners with optical character recognition can read printed material and store it electronically on computers, where it can be read using speech synthesis or printed using Braille translation software and Braille printers. Such systems provide independent access to journals, syllabi, and homework assignments for students who are blind. Electronic versions of documentation can support computer users who are blind if it is delivered in an accessible format.

Low Vision

For some people with visual impairments the standard size of letters on the screen or printed in documents are too small for them to read. Some people cannot distinguish one color from another.

Input

Most individuals who have visual impairments can use standard keyboards, but large print keytop labels are sometimes useful.

Output

Special equipment for individuals who are visually impaired can modify display or printer output. Computer-generated symbols, both text and graphics, can be enlarged on the monitor or printer, thereby allowing individuals with low vision to use standard word processing, spreadsheet, electronic mail, and other software applications. For individuals with some visual impairments, the ability to adjust the colour of the monitor or change the foreground and background colors is also of value. For example, special software can reverse the screen from black on white to white on black for people who are light sensitive.

Anti-glare screens can make screens easier to read. Voice output systems are also used by people with low vision.

Documentation

Scanners with optical character recognition can read printed material and store it electronically on computers, where it can be read using speech synthesis or printed in large print.

Hearing or Speech Impairments

Speech and hearing disorders alone do not generally interfere with computer use. However, advanced speech synthesizers are close enough to human quality to act as substitute voices and thus provide a compensatory tool for students who cannot communicate verbally. Students with portable systems can participate in class discussions once adapted computers provide them with intelligible speaking voices. Word processing and educational software may also help students who are hearing impaired develop writing skills.

Input

Students with hearing or speech impairments typically use a standard keyboard and mouse.

Output

Alternatives to audio output can assist the computer user who is hearing impaired. For example, if the sound volume is turned to zero, a computer may flash the menu bar when audio output is normally used.

Documentation

Individuals with hearing or speech impairments typically do not have difficulty using standard written or on-screen documentation.

Specific Learning Disabilities

Educational software where the computer provides multi-sensory experiences, interaction, positive reinforcement, individualized instruction, and repetition can be useful in skill building. Some students with learning disabilities who have difficulty processing written information can also benefit from completing writing assignments, tutorial lessons, and drill-and-practice work with the aid of computers. For example, a standard word processor can be a valuable tool for individuals with dysgraphia, an inability to produce handwriting reliably.

Input

Quiet work areas and ear protectors may make computer input easier for individuals with learning disabilities who are hyper-sensitive to background noise. Software that aids in

Efficient and accurate input can also assist. Some people can compensate for high rates of input errors by using spell checkers, thesauruses, and grammar checkers. In addition, word prediction programs (software that predicts whole words from fragments) have been used successfully by students with learning disabilities. Similarly, macro software which expands abbreviations can reduce the necessity to memorize keyboard commands and can ease the entry of commonly used text.

Output

Some individuals with learning disabilities find adaptive devices designed for those with visual impairments useful. In particular, large-print displays, alternative colors on the computer screen, and voice output can compensate for some reading problems. People who have difficulty interpreting visual material can improve comprehension and the ability to identify and correct errors when words are spoken or printed in large fonts.

Documentation

Some individuals with learning disabilities find it difficult to read. Computer documentation provided in electronic forms can be enlarged on the screen and/or read aloud with speech synthesis systems to make it accessible.

More than 20% of U.S. adults live with some form of disability, according to a September 2015 report released by the U.S. Centers for Disease Control and Prevention. The latest generation of smartphones, tablets, and personal computers are equipped with accessibility features that make using these devices easier, or at least, less onerous, for those who have sight, speech, or hearing impairments. These enhancements include functions such as screen-reading technology (which reads aloud text when the user passes a finger over it); screen-flashing notification when a call or message comes in for the hearing impaired; and voice controls of basic functions for those who are unable to physically manipulate the phone or computing device's controls.

Other technologies that can help the disabled have or are coming to market, and not all of them are focused simply on providing access to computers or smartphones. Irrespective of the accessibility provided, most market participants agree more needs to be done to help those with disabilities to fully experience our increasingly digital world.

Mobile Access Technologies

A significant number of accessibility-related applications and enhancements are in use today. The aforementioned screen readers are interfaces that have been developed to make it easier for people to view and interact with content on their computers, and vary in complexity and features offered. Screen reader software can range in cost from free, such as the Orca software that works with applications such as Open-Office, Firefox, and the Java platform, to for-pay options such as Serotek's System Access, which provides access to Microsoft Windows, Outlook, Adobe Reader, and Skype.

Other technology designed to help people who cannot see interact more easily with their computing devices includes a software/hardware solution that reads content on the computer and then provides output in braille. The software captures words and images from web pages, then converts that content into a digital version of braille, which is then used to electromechanically control a set of pins contained in cells, which are arranged side-by-side. When a blind person touches each cell, the pin configurations are reconfigured to represent the next line of the text being read. Some examples of these types of refreshable braille displays include the 40-cell Freedom Scientific's Focus 14's Ultra-Portable Wireless Braille Display ($1,295) and the larger, 80-cell Alva BC860 Braille Display ($8,995), which offers simultaneous connectivity with two computers or a computer and a smartphone.

Accessing Life

A key concern of both researchers and educators has been the focus on technology for entertainment or productivity, perhaps in lieu of focusing on tools that help people with daily tasks and activities. While the growing use of technology in game consoles has helped drive development of assistive technologies, some researchers believe not enough is being done to figure out how such technologies can be specifically adapted to help those with significant disabilities.

Pröll and his team developed assistive technology using the Microsoft Kinect that allows severely disabled people to access a computer completely hands–free. By using the Kinect's sensors to track a person's head movements and facial expressions, the movement impaired can control the mouse-cursor and mouse buttons without using their extremities.

Accessing Health

Kyle Rector, a graduate student at the University of Washington, developed a software application called Eyes-Free Yoga to assist and guide blind or sight impaired people into six yoga positions, such as the Warrior I and Tree positions. Eyes-Free Yoga uses geometry to calculate the proper angles needed to complete a yoga pose, and then reads the person's body positioning using the Kinect's cameras and skeletal-tracking technology. The application compares the user's body positioning against the correct pose geometry, and provides verbal instructions and auditory feedback to guide the person into the proper position.

Another issue impacting the availability of assistive technology is a lack of a centralized push for accessible solutions from the disabled community. Because the needs and challenges of blind people are distinct from the needs of those with other impairments, such as hearing loss, muscular control issues, or other disabilities (such as dyslexia), there is no centralized advocate for increased accessibility.

Clearly, those with disabilities have backing from government and industry organizations. The U.S. Department of Labor Office of Disability Employment Policy (ODEP) serves as an advocate for those with disabilities, and the Assistive Technology Industry Association (ATIA) is an association of manufacturers supportive of the development of assistive technologies. However, because the needs and challenges of blind people are distinct from the needs of those with other impairments, such as hearing loss, muscular control issues, or other disabilities (such as dyslexia), there is no single advocate from the disabled community itself to push for greater innovation.

The Center's largest program, Access Computing, provides funds to increase the participation of students with disabilities in the computing field. Led by Sheryl Burgstahler, founder of the DO-IT Center, and Richard Ladner, a professor of computer science and engineering at the University of Washington, the program is designed to help disabled students get more involved in the computing field, which may lead to better integration of accessibility features in the applications and technologies of the future.

Still, the relatively small market sizes for those with specific disabilities makes it difficult for mainstream technology or hardware providers to justify the development, production, or distribution of accessible technology aimed specifically at each of those communities. That is where technologies that have been successfully used in other fields can and should be examined to see how they might be used to address accessibility issues.

Reference:

http://www.itif.org/files/DQOL-7.pdf

http://www.washington.edu/doit/working-together-people-disabilities-and-computer-technology

https://www.disabled-world.com/assistivedevices/

http://cacm.acm.org/magazines/2016/4/200156-existing-technologies-can-assist-the-disabled/fulltext

More (other than report):

http://mashable.com/2011/10/05/tech-disabled/#qzEjOcHynSq4

https://www.aaas.org/news/science-and-technology-could-do-more-help-people-disabilities-experts-say