
Supporting Users With Disabilities

Users with disabilities may require specialist equipment or software in order to be able to use their computer effectively, and you may need to take a role in specifying and supporting it.

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IT Writer

Impaired vision, blindness and motor disabilities can make fundamental tasks such as typing input into a standard keyboard or reading from a standard monitor impossible, but there are solutions available which can vastly improve accessibility and make computer use a realistic option. Solutions include changing settings in existing software, obtaining accessibility software, and simple or elaborate hardware solutions.

Many disabled employees were able-bodied when they began their working lives, and subsequently became disabled as a result of injury or illness; others were born with disabilities or acquired them at an early age. You may need to help an existing employee improve their computer access, or help set up a system for use by a new employee. If it is not clear precisely what type of equipment the user requires then advice and information can be sought from a number of disability information organisations (see Resources box), some of which can arrange assessment, or from vendors. This article aims to provide an overview of equipment available, but neither endorses particular models nor aims to be comprehensive.

Impaired Vision

There are some very cheap and simple ways you can improve PC access for people with mild to moderate vision impairments. Large print keytop stickers (approximately US\$8 to 16) or a keyboard “glove” (from US\$18) with high-contrast key labelling can both make it easier to locate keys on the keyboard; both are available from www.inclusive.co.uk. Less cheap but just as simple is to obtain a larger monitor for users who have problems reading the screen; text can be displayed at larger size without reducing the amount of text onscreen.

Windows 95, 98, NT and Me offer some built-in Accessibility Options which can help sight-impaired users (see box for further details). Adjusting screen resolution, the size of the mouse pointer, colour schemes (higher contrast schemes may help), and the font size of menus, buttons and dialog boxes can make a difference. There are also some limited screen magnification options. AbilityNet also provides a number of useful factsheets on this and other accessibility topics - see box.

If the above options do not give the required ease of use then next to consider are commercial screen magnification packages. Freedom Scientific at www.hj.com/ offers the MAGic 8.0 Screen Magnification package with Speech, aimed at people with low vision. This costs US\$545 and magnifies information the user chooses on the screen from two to 16 times normal size. The speech option can either read text aloud as the user types it, or read text as the user moves the mouse across it. MAGic 8.0 is available without the speech option at US\$295. Dedicated screenreading speech software will be discussed below under Blindness - Without Braille.

Braille-Literate

Severely sight impaired or blind users who are Braille-literate will probably wish to use a refreshable Braille display and a Braille embosser (printer). The former replaces the screen for blind users, letting them read the screen content in Braille which constantly refreshes to reflect screen changes. Papenmeier's two-dimensional Braille displays (from Sighted Electronics at www.sighted.com/braillex.html) allow blind users to establish the structure of the complete screen content by means of a structural display represented by four dots per screen line (see Figure 1). A

simple touch on the routing key integrated into the structural display tells the Braille display which part of the screen information the user wishes to read; it is displayed and the user can begin reading. These displays cost between US\$4500 and US\$14075 depending on model. Also take a look at www.blazie.com or www.keyalt.com for refreshable PowerBraille displays which cost between US\$4,495 and US\$10,550.

Braille embossers enable blind users to produce hard copy suitable for their own use. Similar to printers, these devices produce embossed Braille on one or two sides of special Braille paper, and there's a fair choice of models on the market. If you're considering purchasing such a device check out www.brailer.com/speed.htm, where there's a discussion on the subject of quality and speed versus price, and statistics on many of the models available. At www.blazie.com you'll find the Blazer Braille Embosser at US\$1695, and the Blazer Inferno Braille Embosser, which claims embossing speeds of 50 characters per second or more, at US\$2795. They also offer the VersaPoint Duo Braille Embosser, which produces double-sided printing and costs US\$3795. Check what software is required for refreshable Braille displays and Braille embossers to work; they may require output from a screenreading package, which adds to the cost if you are not using one anyway for speech output.

Also from Sighted Electronics is the Braille In software-independent keyboard (see Figure 2), which connects to a user's PC just like a standard keyboard and does not require any special software in order to work. You can use it with whatever platform you wish. It offers full 102-key keyboard support, emulating all the functions of a standard keyboard, but users can also plug a standard keyboard into the Braille In keyboard and use both simultaneously if they find it easier to perform particular operations on one rather than the other. Braille In costs US\$795.

Blindness - Without Braille

Voice recognition and synthetic speech screenreading software are two related options which can solve problems for a variety of users. Voice recognition allows users to input information verbally to the computer and can either be hands-free (no use of keyboard) or with minimal use of keyboard for functions. Synthetic speech screenreading software provides audible output of screen content and thus is suitable especially for visually impaired and blind users. Voice recognition systems require training so that they respond accurately to the sound of the user's voice, and they can be difficult to use because the software will not be able to distinguish between words which sound alike, but it can be worthwhile getting to grips with such a system if other options are limited.

Two of the most popular voice recognition systems are both from Dragon Systems Inc. DragonDictate, which is a discrete-speech recognition system, and Dragon Naturally Speaking, which is a continuous speech system, are available from www.lhsl.com and voicerecognition.com. Dragon Dictate Power Edition, Version 3.0 costs US\$199 and Dragon Naturally Speaking Professional Edition costs approximately US\$695. The latter also offers tailored editions for Medical, Legal and Public Safety workplaces. A product called KeyStone has been developed for use with either DragonDictate or Dragon Naturally Speaking and provides many facilities, including checking spelling and words which sound alike, and special scripts for training Naturally Speaking. It can be purchased bundled with the Dragon products from The Literacy Centre at the-literacy-center.com, or alone at US\$410 for the version compatible with Naturally Speaking and US\$340 for the "Lite" version designed for use with DragonDictate.

Other voice recognition software is available. IBM ViaVoice Pro 8.0, for instance, is available from www.amazon.com for US\$173. It's compatible with Win95, 98, 2000, NT and Me, and can provide "playback" of the verbal input you've spoken into the PC as well as natural language control of Excel, Outlook and Word. It has been lauded by some reviewers as a serious competitor to Naturally Speaking, yet is considerably cheaper. As well as the Pro version there is a Standard version (offering fewer features), versions for the Mac, and both Legal and Medical vocabulary add-ons.

For screenreading software check out Keyboard Alternatives & Vision Solutions at www.keyalt.com/ksoftware.htm, where a fair range is offered. The popular JAWS for Windows costs US\$795 for the Win95/98/Me version and US\$1195 for WinNT. JAWS stands for Job Access With Speech and uses an integrated voice synthesizer

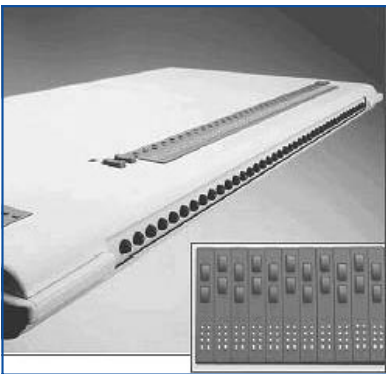


Figure 1 - The Papenmeier refreshable Braille display.



Figure 2 - The Braille In keyboard.

with your computer's sound card and speakers. JAWS can also output to refreshable Braille displays. The package supports popular applications such as word processors, email programs, spreadsheets, web browsers and much more, and can be customised - the voice can be adjusted, as can typing echo. Also take a look at www.nanopac.com/JAWS.htm and www.hj.com/JAWS/JAWS37.htm.

Also available from Keyboard Alternatives is Window-Eyes, a standalone screenreading package which is compatible with many popular voice synthesizers; it costs US\$595. JawBone is a "bridge" program designed to use when both JAWS and Dragon Naturally Speaking are required. It enables users to utilise voice commands to control JAWS, and costs US\$590. outSPOKEN is available for Windows and the MAC and allows blind users to negotiate Win95/98 and the MAC GUI respectively without resorting to a complicated screenreading package, but it does require a separate synthesizer. outSPOKEN (for either platform) costs US\$695, and the recommended synthesizer is Keynote GOLD, also priced at US\$695.

Options For Motor Disabilities

Those with upper limb disabilities may have problems using conventional keyboards. Some users will find life easier if relevant Accessibility Options built into Windows are enabled (see box). However, there are specialised keyboards and hardware accessories available for those who need more help.

Among the more conventional of the specialised keyboards are extra-large keyboards, which can aid users who benefit from a larger key area to aim for; compact keyboards, which can be useful for single-handed users or those who find it hard to stretch, and are also easier to fit between the arms of a wheelchair; headstick and mouthstick keyboards for those with severe upper limb impairments; and keyboards for those with only one hand. Further information on the above keyboards can be found in "Alternative Keyboards" in this issue of PCSA [*and continued next month - Ed*].

Chord keyboards do not have a full range of keys, and instead allow letters to be chosen by the user pressing a specified combination of keys. Chord keyboards are a suitable option for those with good motor skills in one hand; however, more conventional one-handed keyboards may be a preferred option. The BAT Chord keyboard (see Figure 3) from Infogrip is available from www.nanopac.com and cost US\$199.

Keyboard emulation enables a keyboard layout to be displayed onscreen, and keys



Figure 3 - The BAT chord keyboard.



Figure 4 - Typical onscreen keyboard emulation.

AbilityNet Factsheets

AbilityNet can be found at www.abilitynet.co.uk and offers advice, information and assessment to disabled users on computer accessibility. While some of the facilities offered are UK-centric, the Web site is full of information, most of which is equally relevant wherever you live.

Particularly useful is the range of factsheets and skillsheets which can be downloaded free of charge from www.abilitynet.co.uk/content/factsheets/Factsheets.htm. These are in Adobe PDF format and you'll need the Adobe Acrobat reader in order to read them. Below I have listed a few of the most relevant factsheets and skillsheets:

- Free And Cheap Solutions For People With Vision Impairment
- High Visibility Features In Windows
- Keyboard And Mouse Alternatives
- Single Handed Keyboard Use
- Suppliers (Alphabetical List)
- Touch Typing Skills For Visually Impaired Users
- Using A Computer With A Vision Impairment
- Voice In - Voice Out (Voice Recognition For Visually Impaired Users)
- Voice Recognition Systems
- Accessibility In Windows
- Changing Colours In Windows
- Changing Toolbars In Word

selected using some type of mouse device, a touchscreen or a switch (discussed below). Figure 4 shows a typical onscreen keyboard emulation. When a switch is used the choices are presented one after another by being highlighted in sequence - first the top line, then the next, then the next, and then it returns to the top line and continues cycling if the user has not operated the switch. When the user selects a line then the software will highlight each letter on that line in sequence until the user operates the switch to select. Hands Off!, available from www.inclusive.co.uk, is an example of such software, and costs approximately US\$288. A touchscreen is a screen with a specially sensitive surface which can be used with onscreen keyboard software for direct input via the screen surface. A touch window is a clear sensitive window which you place in front of a screen and use in conjunction with it to create the same effect as a touchscreen. Touchscreens and windows are available from www.touchwindow.com; from US\$375 for built-in touch and from US\$125 for add-on touch.

Resources

A number of organisations worldwide offer advice and information to disabled users on computer accessibility:

Information on assistive technology (sponsored by the National Institute on Disability and Rehabilitation Research, US Department of Education)
www.abledata.com

AbilityNet (see box)
www.abilitynet.co.uk

Washington Assistive Technology Alliance
wata.org

List of links for adaptive computer products
www.makoa.org/computers.htm

Trace Research & Development Center is a pioneer in the field of technology and disability
trace.wisc.edu

Microsoft, Apple and IBM have their own accessibility information pages:

Information on built-in accessibility, by disability and by product, with free resources
www.microsoft.com/enable

Mac-specific and general information, and a special needs database
www.apple.com/disability

Accessibility Centre with information on products by disability and much more
www-3.ibm.com/able/index.html

Many relevant commercial sites provide information as well as products for sale. Vendors of computer accessibility products:

Hardware and software for vision impairment
www.sighted.com

Braille embossers etc
www.brailleur.com

Assistive technology products, especially for vision impairment
www.hj.com and www.blazie.com

Speech products
www.lhsl.com

Speech products
the-literacy-center.com

Voice recognition specialists
voicerecognition.com



Figure 5 - The No Hands Mouse foot mouse.



Figure 6 - The HeadMouse wireless optical sensor unit sits on top of the monitor.

When keyboard input (conventional or other) is slow and difficult, then predictive software to offer word completion can make a big difference, particularly for long words. If a user types (or otherwise selects) the first few letters of a word, the software will offer a number of suggested complete words from which the user can select with one movement. At www.inclusive.co.uk you will find PredictAbility at approximately US\$46, and Penfriend at approximately US\$96. They both offer word prediction but the latter also provides onscreen keyboard facilities and many other features.

Use of a conventional mouse can pose problems for many, but fortunately there are a number of alternatives from which to choose. Trackballs can be easier for some than the conventional mouse because they don't require the device to be moved across the table; instead, the device remains static and a much smaller movement is required to operate it. Others may find a touchpad the best solution for them; similar to those frequently found in notebook computers, they are also available separately from www.cirque.com/products/index.shtml, priced from US\$40. Joysticks designed for disabled users can emulate mouse function and can be easier to use for those with reduced co-ordination. Alternatively, the No Hands Mouse is a foot-operated mouse (see Figure 5) which uses two pedals to emulate traditional mouse operation. One pedal controls cursor movement, while the other performs the mouse click. It allows use of a standard mouse at the same time, which can be useful if two users need access to the same machine or for support, and is available from Hunter Digital at www.footmouse.com for US\$290.

Some people will need to use a mouse operated by head movement. HeadMouse, available from shop.store.yahoo.com/fos/headmouse.html for US\$1795, uses a

Resources (Continued)

Microphones suitable for use with voice recognition software
www.shure.com/computer.html

Alternative keyboards
www.keyalt.com

Over 80 types of touchscreens and touchwindows
www.touchwindow.com

Standalone touchpads
www.cirque.com/products/index.shtml

No Hands Mouse
www.footmouse.com

HeadMouse
shop.store.yahoo.com/fos/headmouse.html

HeadMouse, access software, sip and puff
www.orin.com

The QuadJoy mouth-operated mouse
www.quadjoy.com

Assistive technology for PC use
www.nanopac.com

Assistive technology specialists
www.4access.com

Software for people with disabilities
www.sensorysoftware.com

Special needs products and information
www.inclusive.co.uk

Previous PCSA articles on related subjects can be found on your PCSA CD:

Supporting Users With Disabilities, PCSA 77, File: M0214
Understanding Speech Technology, PCSA 78, File: M0130
Windows 95 Accessibility Options, PCSA 111, File: E1203

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Built-In Accessibility Options

At www.microsoft.com/enable/products/chartwindows.htm a table shows which accessibility features are available in which Windows versions, and links are provided to Step By Step guides which give further information. Accessibility options available in Windows include (among others):

- For vision impairment: High Contrast Schemes, Pointer Schemes, Pointer Visibility, Magnifier, Cursor Width Control.
- For motor impairment: StickyKeys (allows multi-key combinations to be entered one key at a time), FilterKeys (ignores “bounced” keys and similar problems), MouseKeys (uses the keyboard to control mouse movement), SerialKeys, ToggleKeys, Pointer Speed & Acceleration, Configure Mouse, Cursor Blink Rate (for seizure disorder).

For information on built-in Apple Mac accessibility features visit www.apple.com/disability and click on the link.

wireless optical sensor unit which sits above the monitor (see Figure 6). This unit tracks a tiny disposable target which is placed on the user’s forehead or glasses. HeadMouse can be used in combination with onscreen keyboard emulation to replace the keyboard as well as the mouse. The device has sufficient precision for the user to control the mouse pointer to the individual pixel, thus making it suitable for use with CAD applications and similar as well as for standard use. See also www.orin.com/access/headmouse/.

A Sip and Puff switch is a small pneumatic switch not unlike a straw which allows the user to perform mouse clicks by breathing in or out. It can be programmed so that breathing in, for instance, performs a double-click while breathing out performs a single. Some such switches are wireless, whereas some are mounted on a flexible “gooseneck” stand. They can be used either for mouse function (and thus for keyboard function through use of keyboard emulation) or for input using Morse Code or similar. A number of other switch devices are available: paddle switches can be operated with minimum dexterity or pressure; a lever switch can be clamped to furniture and positioned for use by any suitable part of the body, such as arms, knees, head and so on; proximity switches do not require actual contact and can be operated by bringing a body part into a certain area, and fibre optic switches are operated by blocking a light beam in a similar way.

The QuadJoy is a mouse designed specifically for those without limb function and is operated by the mouth. It has 0.75 inches (approximately 2 cm) of travel and the button action is sip and puff. It costs US\$540 and is available from www.quadjoy.com.

Monitor arms and articulating arm supports can improve comfort and accessibility; monitor arms can be purchased from regular office supplies companies for as little as US\$30, but arm supports will usually need to be sourced from specialist suppliers. Voice recognition, discussed earlier in the article, may also be the right choice for some with motor disabilities.

Conclusion

Neither the sources nor the products mentioned above are necessarily the best or most suitable; the examples are merely intended to give you an idea of what is readily available on the market. Many vendors mentioned in connection with a particular product also supply a whole range of disability-related products for computer access, so if you’re serious about purchasing take a look around. The Resources box lists vendor links and other sources of information.

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